THE DESIGN AFTER

Cumulus Conference Proceedings Bogota 2019

Cumulus Conference
Proceedings Series
06/2019 Bogota

Universidad de los Andes Colombia   ARQ·DIS   C

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Proceedings Series

Cumulus Association of
Universities and Colleges
of Art, Design and Media

Bogota 2019

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SENSING THE CITY, SENSING THE RURAL

The track seeks to examine the role of technology in the urban-rural balance.

SOMEWHERE, NOWHERE, ANYONE, EVERYONE

Is it possible for designers to learn and design along with small communities?

FICTION AND DE-INNOVATION

The focus of the track is the articulation between world-making exercises and design methods that reformulate The identity of design.

"...This publication offers insights for practitioners, communities, educators and organizations for contemporary and future challenges."

This publication is a compilation of 71 articles written by experienced educators, researchers and students spanning 21 countries around the globe. The tracks address critical questions,

• examining the role of technology in the rural-urban balance,

• learning and designing along with small communities,

• the interaction and redefinition of the grounds of design, fiction, architecture and games,

• the construction of dialogues between science and design to solve real world problems and take research one step further,

• the meaningful possibilities of the roles of design to create new production models and economic systems,

all these addressed through the analysis of curricula, case studies, research and consulting. Overall, this publication offers insights for practitioners, communities, educators and organizations for contemporary and future challenges. Along with rapid change in every aspect of the public realms: social, cultural, geopolitical, environmental and economic, our discipline must enhance its capacity to reimagine itself to better interpret wellbeing-and-do.

My profound gratitude to all authors for sharing their insights and views on design and education; to the scientific committee, peer reviewers, our fabulous keynotes and our internal editorial design and production teams. I would also like to express my appreciation to all Cumulus Team, with special regards to Mariana Amatullo (president) for her trust and encouragement, Eija Salmi (secretary general) and Justyna Molik (coordinator), for their generous support and wisdom through preparation of this Cumulus edition at our campus.

Finally, my sincere gratitude to all conference attendants, to Universidad de los Andes, our donors and everyone who actively participated in the process of making this a meaningful event and a significant contribution to our design community.

HERNANDO BARRAGÁN
DEAN, SCHOOL OF ARCHITECTURE AND DESIGN,
UNIVERSIDAD DE LOS ANDES - COLOMBIA

There is a significant shift underway for Cumulus. With a membership soon surpassing 300 institutions from all five continents, we have an expanded global purview for engagement that allows us as a community of artists, designers, educators, practitioners and researchers to embrace a new pluralism that goes hand in hand with our expanding diversity and our growing geographical scope. In no other time in recent history has there been more urgency than today to recognize the critical necessity for people, projects and the exchange of ideas to cross borders and have the capacity to inspire collaboration and learning beyond differences.

Since its founding in 1990, Cumulus has been in many ways a pioneer organization in championing international dialogue and social responsibility in higher education and advocating for the vital role artists and designers play in shaping better and more humane futures for all. *The Design After Cumulus* conference organized by the University of Los Andes in Bogotá, Colombia, signals both in its location (this is only the second time the Cumulus community gathers in Latin America since we became a fully international association in 2006) and its provocative theme, an opportunity for all of our members and conference participants to reflect on a 21st century world order that is transforming at break-neck speed. These changes are unleashing new geographical nodes for agency and action, and in turn have consequential implications for the future impact of our creative disciplines. Whether it is about technological disruption in how we live and work, the interconnected nature of geopolitical strife and violence, the mounting inequity within many of our cities, the race and gender disparities still present in so many organizations

and communities, and the critical vulnerabilities of our warming planet—the challenges we face as human beings demand from all of us a new sense of urgency, focus and purpose.

In his recent and deeply influential book *Designs for the Pluriverse*, Colombian anthropologist Arturo Escobar provokes us with the following question: "If we start with the presupposition, striking perhaps but not totally far-fetched, that the contemporary world can be considered a massive design failure, certainly the result of particular design decisions, is it a matter of designing our way out?"[i] With this question, Escobar brings to bear an important ontological turn to our current design narratives and practices. It is clear that we have an imperative to address Escobar's question and the substantive contributions compiled in the proceedings of this conference offer insightful responses and points of entry that enable to do just that. In their aggregate, the contributions that follow attest as well to the readiness of the Cumulus community to embrace the great uncertainty we face as human beings who inhabit an increasingly fragile ecosystem. Many of these contributions I believe are characterized by the creative confidence and the generative optimism required to imagine "the design after" for our possible futures.

I am grateful to the leadership team, faculty, staff and students from the Universidad de los Andes for inviting us to Bogotá, and for curating such a rich space for inquiry, reflection and dialogue with this conference. "We live not in a settled and finished world, but in one which is going on and where our main task is prospective."[ii] This is a reflection the American philosopher John Dewey and one of the founders of my university, The New School, made long ago. It captures with a poignant humility our collective task ahead.

i   Escobar, Arturo. *Designs for the pluriverse: Radical interdependence, autonomy, and the making of worlds.* Duke University Press, 2018.

ii   Dewey, J. Democracy and Education. London, UK: Macmillan Publishing, 1916; North Chelmsford, MA, USA: Courier Corporation, 2004.

"...In no other time in recent history has there been more urgency than today to recognize the critical necessity for people, projects and the exchange of ideas to cross borders and have the capacity to inspire collaboration and learning beyond differences."

MARIANA AMATULLO, PHD
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BRIGITTE BAPTISTE

Chancellor of Universidad EAN and former Director of the Biological Resources Research Institute "Alexander von Humboldt" of Colombia from January 2011 until July 2019. Brigitte studied biology at the Pontificia Universidad Javeriana, has a Master in Latin American Studies from the University of Florida and a Doctor Honoris Causa in Environmental and Sanitation Engineering. While working as a researcher at Unit of Rural Studies at the Faculty of Economic Science from the Pontificia Universidad Javeriana, Brigitte began teaching in the Master of Rural Development and Environmental Management.

Brigitte has participated in many national conservation and environmental planning projects. Her work focuses on cultural landscapes, the analysis of the process and transformation of the territory, the construction of history of the ecological-economic productive system, the multicultural analysis of use and management of biodiversity, biocomplexity, biospeleology and biopolitics. Brigitte's work also includes gender and culture studies.

MARTÍN TIRONI

Is a sociologist and professor at the School of Design, Pontificia Universidad Católica de Chile. He holds a PhD from the Ecole des Mines de Paris and a Master's degree from Université Paris-Sorbonne V. He is currently Visiting Fellow (2018) at the Center of Invention and Social Process at Goldsmiths. His research areas are designed anthropology, digital technologies and mobility, and urban infrastructures. He recently published 'Unpacking a Citizen Self-tracking Device: Smartness and Idiocy in the Accumulation of Cycling Mobility Data' (with M. Valderrama) in Environment and Planning D: Society and Space. He is currently developing a research project (Fondecyt, 2018-2021) titled Datafication of urban environments and individuals: analyzing the designs, practices and, discourses

DORI TUNSTALL

Is a design anthropologist, public intellectual, and design advocate who works at the intersections of critical theory, culture, and design. She is the first black female Dean of the Faculty of Design at Ontario College of Art and Design University. She leads the culture-based Innovation Initiative focused on using ways of knowing how to drive innovation processes that directly benefit communities.
With a global career, Dori served as Associate Professor of Design Anthropology and Associate Dean at Swinburne University in Australia. She wrote the biweekly column Un-Design for The Conversation Australia. In the U.S., she taught at the University of Illinois at Chicago. She also organized the U.S. National Design Policy Initiative and served as a director of Design for Democracy. Industry positions included UX strategists for Sapient Corporation and Arc Worldwide. Dori holds a PhD in Anthropology from Stanford University and a BA in Anthropology from Bryn Mawr College.

MONIKA BIELSKYTE

Is a creative director, strategist, and speaker with a special interest in exploring & translating immersive media technology space & digital formats of reality – VR, AR & MR. She works to inspire people to see these new mediums & tools as a means to expand the human potential – creatively, intellectually, emotionally, physically. Having worked with the likes of Ridley Scott Associates, Dreamworks, Universal, CERN, Intel, and Aston Martin, she is the founder of ALLFUTUREEVERYTHING (AFE), a content platform focused on radical innovation.

EVA DE KLERK

Is a Dutch artist and independent professional in participatory city development. Her work includes the regeneration of deprived industrial and residential areas in close co-operation with the local community and creative scene. Including the regeneration of the NDSM Shipyard and the deprived residential area Heesterveld Creative Community in Amsterdam, the former airport Tempelhof in Berlin (Germany) and projects in Osaka, Tokyo (Japan), Seoul, Inchoeon (South-Korea) and so on. Eva published her book Make Your City covering 20 years of experience in self-organization according to the The City as a Shell philosophy. The foreword of her book is written by the renowned sociologist Saskia Sassen based in New York.

DANIEL GRUSHKIN

Is the founder and executive director of the Biodesign Challenge, an international student competition that partners artists, designers, and biologists to envision the future of biotechnology. He is co-founder and former executive director of Genspace, a nonprofit community laboratory dedicated to promoting citizen science and access to biotechnology. Fast Company ranked Genspace fourth among the top 10 most innovative education companies in the world. Dan was a fellow at the Woodrow Wilson International Center for Scholars where he researched the field of synthetic biology in 2013-2014. He also was an Emerging Leader in Biosecurity at the UPMC Center of Health Security in 2014. As a journalist, he has reported on the intersection of biotechnology, culture, and business for publications including Bloomberg Businessweek, Fast Company, Scientific American and Popular Science.

KEYNOTES

CONFERENCE ORGANIZERS

Cumulus founded in 1990 is an organization that serves art, design, education and research with participating institutions at the highest level in the world. An environment which enables the transfer of knowledge and best practices, allowing its members to create networks and contacts in flexible and dynamic forums, promoting cooperation and innovation.

Cumulus has 299 members from 57 different countries. The Faculty of Architecture and Design at Universidad de los Andes has been part of Cumulus since 2013. Los Andes will host Cumulus 2019 opening a space in Latin America to unfold the role of design in these diverse, changing territories and in the process of transformation. Cumulus 2019 will be the space where specific views on complex situations will be debated and where novel and disruptive perspectives will be proposed.

CUMULUS HAS 299 MEMBERS

FROM 57 DIFFERENT COUNTRIES.

Universidad de los Andes, founded in 1948 is ranked as the best university in Colombia and the fifth in Latin America (according to the QS range). It is a University that has transformed the country, promoting social impact research.

The Faculty is composed of two departments: Architecture and Design, founded in 1948 and 1994 respectively. An academic professional and administrative team of the highest level together will welcome visitors of Cumulus 2019.

The Faculty's academic program tracks and structures have evolved to allow courses to adapt to the development of disciplines, technologies and social realities of the region. Cumulus 2019 will be a window displaying interests, supporting the new academic, cooperation, creation and research alliances.

UNIVERSIDAD DE LOS ANDES HAS APPROXIMATELY

15,000 STUDENTS, MORE THAN 1,000 ARE INTERNATIONAL.

**CUMULUS CONFERENCE
BOGOTÁ, OCT 30 / NOV 1, 2019**

CONFERENCE THEME

In the dawn of the new millennium, the design is experiencing a moment of expansion, recognition, mutation and integration, other disciplines would envy. It retains its aura and transcends the realm of the tangible becoming a form of thought, dialogue and ontology. The turn of the millennium has staged disruptions and catastrophes: from wars against terror to exacerbated fundamentalism; from the financial crises to the flood of inequities and migrations.

In the absence of better words, the "post" prefix has characterized the last half-century: postmodern, postfeminist, post capitalist, post humanist, post truth. Before creating post design, would it be worth thinking about an after design? Can design capture another vision of the human being, cultures and ecosystems that surround humans? Have designers thought about what will happen next?

We are a species that mutates and subsists revealing great adaptive capacities. We manage to debate emerging issues, without fear of experimental vocabularies while being critical, collaborative and speculative. Design today is transdisciplinary and plural.

Hosting Cumulus in Colombia is the result of this transition, placing humans in a border crossing, in an eclectic habitat a place as contradictory and vital as the change of the millennium. When design is about thinking in action and transition, it questions its original logic and gives birth to diversity. In Bogotá, Colombia, different perspectives will be found transcending the discipline, questioning what will become of design: the design, after.

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SENSING THE CITY, SENSING THE RURAL

This track deals with the ongoing radical transformations that the urban and the rural spaces are experiencing in post-digital times. Transformations that are the result of the tensions between the computational and the physical domains, that affect both cityscapes and landscapes. The track seeks to examine the role of technology in the urban-rural balance. How can we reinforce connections between rural and urban spaces? How can information extracted from these spaces be used? How can design at different scales benefit from technology to observe, perceive and build the territory? If by 2050, two-thirds of the world population will live in cities, how will this impact rural environments

TRACK CHAIRS
ISABEL ARTEAGA
ANDRÉS BURBANO

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BUILDING NEW IDENTITIES WITH BATIK

As our global language of fashion becomes ever more blurred, where cultural identities are fragmented and no longer separated by land masses but rather the speed of the Wi-Fi, we start to acknowledge the multiple layers of contradictions. Our cultural and social values continue to clash, being misinterpreted, poorly translated or diluted for commerce. Batik from Southeast Asia offers a wealth of cultural importance that has in recent years become reduced to kitsch novel products, the treasures collected by the many adventurous traveller seeking real experiences in a tourist town. The craft of batik has a local mode of communication and visual identity mediating our past and future relationships, is essential to unlocking global design language.

This paper aims to explore new methods into unlocking the past to open innovative possibilities for culturally appropriate futures, both for the region and global design language. Through a series of case studies conducted yearly, across 2017-2019 in Singapore and Bali, Indonesia, the traditional craft of cap batik and its approaches have been questioned and explored. Enabling a visual dialog of indigenous material that is rarely discussed within academia and its role within design. Equipped with this knowledge, future designers are able to untangle various contradictory element in designing and build new identities for appropriate cultural design.

Keywords: conflicts, cultural appropriation, batik processes, indigenous knowledge, craft.

INTRODUCTION

"When a baby is born, it is immediately wrapped in textiles: swathed in muslin or towelling that absorb fluids and soften contact, retaining the comfort of the womb. For the newborn, touch, temperature, smell, sound, light and dark define the world; there is no language apart from that of the senses, and cloth provides the primary formation of space and touch. This early experience is one of feeling and haptic sensation, a metamorphic place of change and growth, without language... touch is one of the last sensations as well as the first."

(Conroy,. D., W. within Jefferies, J. et el. 2016. p361)

Fashion and textiles play an integral role in our very existence, whether manmade or natural, it is at the core of our nature. It reflects the present and intrinsically communicates an intimate relationship with our body and the world around us. (Bourdieu 1984; Wilson 1985), It has evolved from our physical interactions since birth, addressing both our basic needs and the psychological. Through our ability to craft and innovate our imagination over time it has manifests beyond fabric that first wrapped the body as a form of protection to communicate the wearer's intention, filled with layers of meaning and interpretations. They are hard to describe but known to the wearer on an intuitive level, tangibly understood through fabric and intimately known through the realisation of fashion. (Jefferies, J. et al. 2016. p361)

This complex understanding of fabric and fashion both records and reflects our culture, history, geographical place and our sense of self. Simply going beyond a projection and enters a relationship of perceptual knowledge exchange with the wearer and those around them. (Bourdieu 1984; Wilson 1985) Fabric shapes our understanding of material culture and our senses mediate this.

"A sensorial turn, gives evidence for the continued evolution of textiles in relation to the body, while opening up the complexity of the past and present sensory histories that offer fresh insights for the future."

(Jefferies, J. et al. 2016. p.365)

However, as Georg Simmel noted, "fashion is a cultural system that tells individuals groups how to behave, moulding people into static identities." (Simmel., G. 1957) greater enhanced by our growing global communications and social media resulting in a homogenised mass fashion culture that is shallow and surface. These communicative qualities held by fashion today are losing integrity and at risk of not fully being understood. As the fashion industries and global market space swell with digital aided production, design processes and communication continue to

develop, our cultural and social values clash, thus producing blurred and fragmented cultural identities. This new age of fashion lacks 'sensory experiences' that was crafted at its centre, woven in the very fabric. Our method of making shifts digitally for more efficient and time-sensitive approaches facilitated by the growth of commerce. With the ease of global communication and the internet, we find ourselves separated only by the speed of the Wi-Fi, producing a distorted, detached reality of fashion. (Arditi 1996).

Craft and the act of crafting with its engineering and reflective approach managed by the designer mediating the multiple complexities of material culture are lost in the speed of the advancements we see today. We need to acknowledge the multiple layers of contradictions we face today and the new challenges this sets for our future designers.

This paper examines batik from Southeast Asian as a craft to help tackle these issues within fashion studies through deconstructing the process and act of crafting. Batik remains to offers a wealth of cultural importance both as a global tool for communication through its innate processes and its historical modes of visual worth to the small pockets of artisans that are still dotted throughout Southeast Asia. Batik, like all craft and design is a thoughtful act of creating that utilises our ingenuity mirroring our lived environment. This highly visual craft allows designers and makers to enter a state of

"sensual physical processes, getting lost in the making... entering that infant world of sensation and iteration. (The maker being an extension of the craft tool,) that enfolds and extends physical abilities".

(Jefferies, J. et el. 2016. p325)

This being an intuitive dialogue of our sensory communication through the crafting stages that connect to our humanity. Designers learn how to handle this 'sensual physical processes', through doing and thinking through craft solutions. The repetitive technical actions found in batik cap work are focused within this study. This process drives action and allows designers to enter a state of sensory explorations to mediate new concepts that evolve from vague realisations. (Cross, 1999).

The process of cap batik with its repetitive nature holds irony at its core. The robotic stamp like action governed by designers mediating of tools and materials trap a symbolic relationship within the work. (Terib, 2008 p.19) It is a laborious and time consuming process that is heavily reliant on the skill of the designer to create decorative surfaces using a wax resist dye method for textile. It is built upon layers of wax created by copper tools called canting or caps that transfer wax to cloth and block dye from bleeding out. Each layer of wax, trapping different hues

of dyestuff, producing a complex spatial depth. It's boundaries only lie beyond the craftsperson's skills to trap each layer before the next. This being the beauty and independence of thought in craft. Transforming the wax from the drawing and mark-making process into an authentic and real surface design that the craft of batik holds key to its technical beauty.

The craft of cap batik allows for this ideation of cultural value exchange, reflecting heritage through its creation and explored within this study. Batik caps form a basis of physical memory and act as a storyteller allowing for designers to critically engage in a dynamic relationship of our indigenous past and possible global languages.

METHODOLOGY

This inductive starting point aims to deconstruct the act of crafting batik and places importance upon cap tools used within creating fashion fabric. This paper draws upon the author's previous professional experiences working around the world in textiles and his dual cultural language teaching in Singapore as a British expatriate. Immersed in the local culture and teaching of heritage textiles within Singapore, he utilises this exchange of knowledge in the conducive environment to establish a pivotal point in reflecting the local craft for future thinking.

Applied through a series of case studies conducted annually across 2017-2019 the second level students on the Ba (Hon's) Fashion Design and Textiles programme took part in this two-phase study. Firstly, in Bali, at Pondok Cocoa Learning Retreat where students were engaged in a cultural exchange with local craft artisans and communities, equipping them with the needed knowledge. This applying an experiential learning theory (ELT) to enable a cross-cultural exchange of heritage knowledge. (Ng, K, Y. and Dyne,. L. V. 2009)
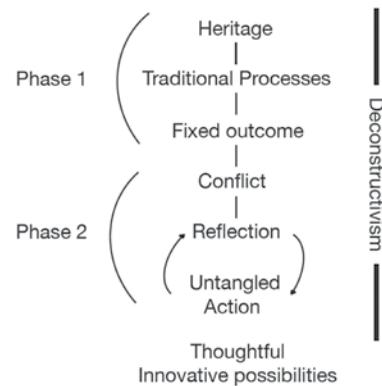
Figure 1. Martin Bonney, Design approach. 2019

This knowledge then applied to a deconstructive, coined by Derrida (1976) being utilised across the field of design practices, expresses an ambiguous futuristic overtone (Lupton. et al., 1994.) Students during phase 2 then question the future perspective embracing a full system change. Not simply just taking apart or dissecting elements, it is a formal approach that allows for new ideas to manifest through design communication and discovery of existing structure. (Lupton. et al., 1994.)

The second phase implemented the deconstructive ideology through workshops that were conducted at LASALLE College of the Arts, Singapore to generate a paradigm shift of the traditional values and craft knowledge for future thinking. By understanding the culture and significance to the region, students were then able to challenge and question through a deconstructive method "... to undo both a given order of practices and the very system of conceptual oppositions that make the order possible." (Poyner 2003 p.46) The deconstruction method allows for students to reflect and untangle their actions, rethinking and redoing batik.

The students were supported with a handout to help prompt and frame the direction of deconstruction. The questions were loosely framed following objective analysis approach with the intention to trigger the past and prompt student thinking towards the cultural importance of the tool/ artifact and to open discussion and communication. The questions were:

- How old do you think the Batik cap is?
- What material is it made out of?
- What imagery is it depicting?
- Does this imagery have a meaning?
- Press, peel and remove is the given action for batik what else can you do? Can you untangle the action? Make it your own?

PHASE ONE, UBUD INDONESIA AND CONFLICT

The week-long excursion at Pondok Cocoa Learning Retreat located in Ubud, Bali Indonesia has been implemented into the second-year degree programme firstly as a disruptive approach to alienate students from the western ideals of fashion and the comforts of Singapore. The rural environment of Bali being rich in resources offers social-cultural conflict within the set activities. This helps broadens student knowledge through this cultural exchange and experiential learning. (Ng, K., Y., Dyne. L., V., Ang. S., 2009 p.227) While working with local communities and artisans, students gain understanding towards globalisation through experiences encountered bringing the context of Southeast Asia and the vast wealth of social, cultural, economic, political and technological differences. Students were also given independent time in the

evenings to explore the local villages, towns to indulge in the food and culture.

Over the course of the week, students visited a number of pre-organised venues and took part in a number of activities aimed at equipping them with multicultural skills. The set activities implemented for 2017 to 2019 consistent follows the criteria below:

- To introduce local companies that generate familiar products for a global market.
- To prompt social and cultural values.
- To prompt traditional, heritage practices and engagement.

The first site visited was John Hardy, a renowned silversmith. The marketing manager each year took students around both the design studio and workshop exploring a wide range of learning, from how they nurture a local community of artisans and craft peoples, to how to run a successful global business supported by consciously reclaimed material for fine jewellery. (John Hardy online, Retrieved from: https://international.johnhardy.com)

Pacagusti, a local double ikat weaving master with a wealth of knowledge on traditional clothing and ceremonial dress introduced students to weaving and how he engages with a community of female workers within the village. Through these

workshops, students learned the heritage practices of single and double ikat weaving and how natural dye is displaced in the process of heritage garments for speed and efficiency.

Threads of Life is a world renown fair-trade business. It empowers the local people to use their craft and heritage to produce heirloom-quality textile and craftsmanship. Students were immersed in the traditions of Batik and Indonesia culture passed from master artisans. Information and practical process of how natural dye and the complex processes of making Indigo was instilled. (Threads of Life, Retrieved from: https://www.threadsoflife.com)

Ben Morris, a local businessman / craft artisan /collector of heritage fabrics was invited to present his collection of rare fabric (2017-2018). His unique and captivating folklore tales surrounding the fabric, enhancing the transference of cultural exchange to the students.

In 2019, David Metcalf (a professional travel photographer and cultural operator), Stephanie Brooks (a travel writer) and Daisy (a dyer tribe woman from Kalimantan) each presented their experiences of local craft and culture, raising awareness to environmental, social and cultural deprivation communicated through their respective practice of photography, storytelling and traditional dance performance.

Figure 10. Top left. Martin Bonney, Ben Morris's collection and talk. 2017
Figure 11. Top right. Martin Bonney, Ben Morris's collection and talk. 2018
Figure 12. Bottom left. Martin Bonney, Song and dance, Daisy. 2019
Figure 13. Bottom right. Martin Bonney, David Metcalf and Stephanie Brooks talk. 2019

PHASE ONE, OUTCOMES

As phase one have no fixed final outcomes, this allows students to freely explore and submerge in the local culture with pre-planned activities. However, through reflection over each year students commented on a number of observations, from the time artisans spend creating craft and the discrepancy in the final cost, opening debates of technology, human labour, and fast fashion. With each year group being slightly different, the overall effectiveness to equip students with this cultural sensitivity is unprecedented, grasping the core of craft and the heart of batik to then allow the possibility to deconstruct it.

PHASE TWO, DECONSTRUCTION

During Phase two, students were giving the individual task to deconstruct batik caps while being respectful of the artifact/ tool and what it communicates when producing a new textiles design with local or heritage value.

These batik caps used within this study over the course of the 3 years were to enable the exchange of cultural heritage and

knowledge. The caps dating back to the 1900s being carefully chosen as they contain a variety of attributes that give an opportunity for students to deconstruct. These attributes considered are:

- Visually identifiable and familiar as a visual tool
- Functionality and process driven
- Represents cultural contexts beyond its functionality.

The students were also provided with fabric, silk habotai, or cotton, and other needed materials such as wax, heating pot, and reactive dye. The process was roughly divided into three stages:

- Demonstrating batik knowledge
- Questioning the artifact/ tool and batik
- Making decision for surface design

DEMONSTRATING BATIK KNOWLEDGE

Students demonstrated the appropriate method of batik following on from phase one, often spending a lot of time and consideration during this stage. Using smaller fabric to explore the hand and communicate the subtleties of pressure and controlling the tool.

Figure 14. Left. Martin Bonney, Lasalle's Batik cap collection. 2019
Figure 15. Martin Bonney, Top right. Floral motif 2019
Figure 16. Martin Bonney, Bottom right. Indonesian motif. 2019

Figure 16. Martin Bonney, Left. Student development 2017/18
Figure 17. Martin Bonney, Right. Student development. 2019

Caps were first created to speed production regulating the hand in duplicating a repetitive pre-desired motif for commercial use before the time of digital printing. From these craft tools, the student discovered a blend of 'waxy past' colonial imagery and indigenous knowledge that remained locked away. This traditional resist stamps lies within a space of ambiguity, essentially locked in time, being a historical tool and artifact with a fixed voice, communicating colonialism from the region. The swift movement of batik like that within drawing, a 'narrative' or language is bestowed in the real world taken from its process. (Treib., M 2008) The press and peel action allows students to engage in a cross-culture intuitive exchange.

There are more similarities than differences at this stage spanning across all workshop conducted within this study as students try to replicate what was taught by the Balinese master. Feedback from students at this stage often consists of frustration as it is difficult to create a perfect resist surface as intended. The inability to follow the teaching of the master batik artisans, the student often left feeling like a failure.

QUESTIONING THE ARTIFACT/ TOOL AND BATIK

This disappointment strengthened the next step. Deconstruction of the artifact both as a tool and form of cultural heritage conflicts the traditional values of batik. This questioning generated conflict in the design process where students face the unknown problems of balancing the past, future and craft possibilities. Students manipulated incomplete heritage language from the tool mixed with their contemporary influence. This tacit discovery of ambiguous construction of material thinking allows for ideation. (Goldschmidt, 1997).

This is being the early design process where they engage in resolving the mediation of the tool through its doing (Lawson,

Figure 18. Top, Martin Bonney, Student discovery. 2019
Figure 19. Left, Martin Bonney, Student discovery after scrunching. 2019
Figure 20. Centre, Martin Bonney, Student discovery scrunching. 2019
Figure 12. Right, Martin Bonney, Student discovery, layered. 2019

Figure 22. Left, Martin Bonney, student final fabric design. 2019
Figure 23. Centre, Martin Bonney, student final fabric design. 2018
Figure 24. Right, Martin Bonney, student final fabric design. 2019

2006). Students then twist, pleat, flic the wrist or smudge and wiggle the tools to conceive novel and unexpected results free in a sensory state. (Cross, 1990).

This free approach to exploring the tool and its multiple possibilities offer a recommunication of fixed thinking surrounding batik. In the process of crafting, the student constantly balances the element of past, future, and craft as a mode of recommunicating possibilities. They enter an iterative stage of reflection and action, as the copper caps reheat and wax sets in the cloth. This allows the student time to conceptualise ideas or discover the problem to solve ideating possible solutions in parallel.

MAKING DECISION FOR SURFACE DESIGN

Students learn how to handle this ambiguous process through the questioning, addressing their own needs and requirements, generating an abstracted concept necessary to create a finished surface design. (Cross, 1999). During the act of doing students become more intuitive and engaged in the negotiation of untangling the traditional fixed action towards an abstracted outcome. They often demonstrated a degree of separation to inject creativity in reflection to the tool and its heritage. Rather than just creating a surface design of chaos, they had a sensitive approach to its original cultural intention allowing for open possible future of craft tools.

CONCLUSION, DESIGN APPROACH

The diagram above articulates the iterative design concept discovered during this study identifying 3 main elements: Craft, Past, and Future. The interaction between elements further gives rise to tradition, conflict and abstract respectively. With each category, balance is needed in creating appropriate textiles. The key subcategories of how this was utilised to empower the student was discussed throughout this paper, where key concepts identified were used for further idea generation processes.

This paper reveals the importance and ability that both experiential learning has on bestowing social cultural values and the relevance of deconstructive approaches to tackling key system changes needed within fashion design studies today. It demonstrates the value of artifact as tools in the teaching of craft, culture and past heritage, shaping the future role of craft in our design language. Instead of viewing conflict in a negative light, the antagonistic nature of traditional craft and contemporary influence should be seen as a process to aid new designers to develop fashion and textile that is appropriate and thoughtful. Following on from this research other craft tools can be greater explored in the exchange of design languages and cultural information. The next stage of this research is to continue mapping other craft tools from the region to question how they can continue to offer possible future perspectives. This research raises the concerns that underline the relationship between materials and our being, calling for greater consideration towards how we teach or practice textile design with a focus on future thinking.

Figure 26. Martin Bonney, Design approach. 2019

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SENSING IGOLI: APPLYING TYPOLOGICAL ACTIVITY SYSTEM MODELS IN THE DESIGN OF INNOVATIVE AND APPROPRIATE URBAN TECHNOLOGIES

While much of the development of 'smart' technologies occurs in the Global North, the logical expectation is that in the near future 'smart' technologies will be implemented across the world. Technology is never value neutral and always carries particular cultural and political assumptions. Ensuring technology is meaningful to people implies that it should acknowledge and support their conceptions and desires. If the particular needs and contexts of local, urban African communities are not recognised, 'smart' technologies, when implemented in urban contexts such as Johannesburg, South Africa (also known as *iGoli* in isiZulu — the City of Gold), may be undertaken in an uncritical and perhaps even detrimental manner.

This paper describes an interdisciplinary project involving fourth-year industrial and interaction design students working in collaborative teams to consider how the emerging 'smart' technologies of the 21st Century, can be implemented in a human-centric manner, particularly in the complex context of Johannesburg. The central conceptual framework that orientated the teams' design thinking was a novel integration of McCullough's Typology of Thirty Situations (TTS) with Engeström's Activity System Model (ASM).

Keywords: smart technology, 4IR, activity theory, urban contexts, Johannesburg

INTRODUCTION

This paper describes an interdisciplinary project involving fourth-year industrial and interaction design students working in collaborative teams to consider how the emerging 'smart' technologies of the 21st Century, can be implemented in a human-centric manner, particularly in the complex context of the inner-city of Johannesburg, South Africa.

If statistical models are correct, one decade from now, there will be nearly 30 cities around the world with more than 10 million inhabitants; with some cities even expanding beyond the 20 million mark (Muñoz & Cohen, 2016, p. 71). It is predicted that nearly 90% of this influx into cities will take place in Africa and Asia (Praharaj, Han, & Hawken, 2018, p. 36).[1] As populations rise coupled with largely stagnant economies, the services and infrastructure in many urban centres struggle to meet the demands and expectations of those living there, resulting in a declining standard of living (Khatoun & Zeadally, 2016, p. 46).

There is therefore an increasing need for cities to respond in innovative and creative ways to these challenges (Snow, Håkonsson, & Obel, 2016, p. 92), one such approach is to make cities 'smarter'. Considering with the finite limit of our planet's resources, economic instability and climate change (Gascó-hernandez, 2018, pp. 50-51; Kitchin, 2014, pp. 1-2) there is no "one-size-fits-all" solution to the variations of contextual complexities facing urban centres. However, from the beginning of human activity, technology has been an important means for people to enact control on the environment in both positive and negative ways (Kline, 2003). To this point, this paper, addresses how the opportunities afforded by 'smart' technology, can be envisioned to provide a positive contribution to urban futures.

'Smart' cities are described as places where digital technology integrates with urban infrastructure, architecture, everyday objects, and sometimes even human bodies to "address social, economic and environmental problems" (Townsend, 2013, p. 15). At a technological level there is a fairly consistent view of what 'smart' city infrastructure includes, however there is less consensus on how the design of 'smart' cities should be approached (Gascó-hernandez, 2018, pp. 50-51; Kitchin, 2014, p. 1). At one extreme is a 'top-down' approach typically categorised as city-wide planning and/or high-level technological implementation (Gardner & Hespanhol, 2018, p. 54). On the

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1   While the UN predictions of global population growth (United Nations, 2017) are currently being debated (see Bricker & Ibbitson, 2019), the fact remains that in Africa and Asia numerous mega-cities already exist under extreme environmental and economic difficulties.

other, is a 'bottom-up' community-led, site specific approach characterised by authors such as Greenfield (2017), Townsend (2013), Kitchin (2014), de Waal (2014) and Rose (2015). Much of this discourse is framed in terms of 'the right to the smart city' (Cardullo, Di Feliciantonio, & Kitchin, 2019) which places emphasis on "small-scale or finer grain workings of the city" (Gardner & Hespanhol, 2018, p. 55).

An important acknowledgment at this point in time is that there are no existing 'smart' cities, only cities trying to be 'smart' (Snow, Håkonsson, & Obel, 2016, p. 92). To this end the 'smart' city concept is typically centred on speculative visions of how cities could be.

Thus, particularly for academics, designers, architects and urban planners in the Global South, now is the time to act. Technology is never value neutral and always carries particular cultural and political assumptions (Al-Hunaiyyan, 2009; Bardzell & Bardzell, 2015). Ensuring technology is meaningful to people implies that it should acknowledge and support their conceptions and desires (Krippendorf, 2007) thus, if the particular needs and contexts of local, urban African communities are not recognised, smart technologies, when implemented in urban contexts such as Johannesburg may be undertaken in an uncritical and perhaps even detrimental manner. However, as design practitioners in the Global South, we are in a good position to do something about it.

In reference to the broader framings of the 'smart' city, as interaction and industrial designers, we are principally concerned with preparing our students to design creative and innovative urban experiences at the immediate, embodied scale. Thus, the student project, which is the focus of this paper can be understood as operating within a bottom-up, participatory mode. In this manner it aligns closely with the field of urban informatics[2] and as such can be compared to other research concerned with preparing students for 'smart' city design such as Gardner and Hespanhol (2018) and Caldwell et al. (2013).

However, since much of the existing student work and indeed theoretical accounts of bottom-up smart cities originate from the disciplines involved in the built environment, as product and service designers we sought to establish the effectiveness of working within the broader 'smart' city conceptual setting by firstly, focusing the role of the product within the 'smart' space, and, secondly, orientating the design activity in alignment with theoretical concepts, specifically activity theory, which has been proven to be effective in product design.

The structure of this paper is as follows. **Firstly**, Johannesburg, as the site of the project, will be very briefly introduced. This introduction will be complimented by a short framing of considerations of human activity in contemporary city-making. **Secondly**, the activity theory framework will be introduced outlining fundamental historical and conceptual precedents. In particular, Engeström's Activity System Model (ASM) will be discussed in reference to how, it was adapted in the Typological Activity System Model (TASM) to focus on urban spatial activities. **Thirdly**, the methodology of the student design project is outlined. **Fourth**, the application of the TASM in the student's design process is illustrated and described in a brief examples of work. **Lastly**, in the discussion section of the paper, we critically reflect on the effectiveness of the TASM to enable the students to engage with emerging technologies through a consideration of the embedded social.

SPATIAL AND THEORETICAL CONTEXT

Established in 1886 as the mining town, Johannesburg with an estimated population of nearly 5.6 million,[3] is the largest city in South Africa and its economic centre. Like most cities of its size, Johannesburg is a highly complex city faced with many (often paradoxical) challenges such as poverty and waste; urban sprawl and high-density; slum conditions and gentrification (Ruhiiga, 2017). The focus of the student project was centred on the inner city of Johannesburg characterised by both urban decay and renewal. While Johannesburg was built as an apartheid city and as such has numerous societal issues, the students involved in the project, many of whom live in the city, where expected to engage with their experience of the city. As a city, Johannesburg is a location buzzy with human activity.

The notion of activity as the fundamental unit of human-centric design has an established tradition in architecture. For example, Alexander's (1977) A *Pattern Language* focuses on the interactions between the physical spaces and the way in which they inhibit or facilitate shared societal values and customs (Benyon, 2014, p. 33). Likewise, premised on three categories of activity namely: *necessary*, *optional* and *social* activities Gehl (1987) is concerned with the everyday activities of people and the impact of these activities on urban planning. In contemporary architectural practice these considerations of place have been incorporated into the concept of the *architectural program*, a strategic method

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2   According to McCullough (2015, p.16) the field of urban informatics seeks to "collect, share, embed, and interpret urban infrastructural and environmental data" whilst emphasizing human-centric priorities such as "urban resilience, livability, and socialization".

3   The city has a greater metropolitan area with a population of over 10 million (World Population Review , 2019)

which associates the functional requirements of a space with the activities and behaviours that they are envisioned to support (Shepard, 2011, p. 23). One of the ways to focus in on the various human activities that take place in cities is through McCullough's Typology of Thirty Situations (McCullough M. , 2005, pp. 52-57).

McCullough's theory of [activity] typology suggests that the modelling of daily life ensures a cultural sustainability in the urban environment that can be incorporated into the design of place through activity 'types' (2005, pp. 52-57).[4] Activity typology suggests that environments should be perceived not in terms of what they can contain but rather in terms of the possible human activities they can support. Thus, McCullough (2005, pp. 119-120) provides a *Typology of Thirty Situations* as detailed in Table 1. Each element of the typology suggests a situated action that describes the everyday living patterns of a particular category of place (McCullough M. , 2005, p. 118). For example, the situation "Gathering (places to meet)" recognises that in the urban sphere certain environments exist to support the human activity of meeting other people.[5]

While referring to activity, McCullough, as with many other authors from an architectural background, does not specifically unpack the concept of activity. However, in product design, and most notably interaction design, activity is an often-theorised concept[6]. We will therefore briefly unpack the concept of activity in relationship to activity theory.

Activity theory proposes that in order to study subjects and objects the most effective manner to do this is by studying the manifest activity between them (Leontiev, 1978). Therefore, by studying how people act we can arrive at a much more accurate understanding of a person's motivations. "Broadly defined, activity theory is a philosophical and cross-disciplinary framework for studying different forms of human practices as development processes, both individual and social levels interlinked at the same time." (Kuutti, 1995). Originating in Russian psychology through Lev Vygotsky (1982) and his student Alexei Leontiev (1978) it was popularized in Western discourse mainly through its dissemination by Yrjö Engeström (1987). Enegeström's activity model depicts mediated action undertaken by a person (subject/s), towards the solution of a problem (object), mediated by tools (technology), in order to achieve the goal (outcome). This model

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4   McCollough's theory is focused on activity, and hence we describe it as activity typology to differentiate it from more generic concepts of typology.

5   Activity typologies are not meant to be regarded as definitive and timeless but should rather instead recognise as a human-centric, emergent situated contributions to institution-building (McCullough, 2005, p. 57).

6   See Rogers' *HCI Theory Classical, Modern, and Contemporary* (2012)

(at work....)
1.   Deliberating (places for thinking)
2.   Presenting (places for speaking to groups)
3.   Collaborating (places for working with groups)
4.   Dealing (places for negotiating)
5.   Documenting (places for reference resources)
6.   Officiating (places for institutions to serve their constituencies)
7.   Crafting (places for skilled practices)
8.   Associating (places where businesses form ecologies)
9.   Learning (places for experiments and explanation)
10. Cultivating (places for stewardship)
11. Watching (places for monitoring)
 (at home....)
1.   Sheltering (places with comfortable climate)
2.   Recharging (places for maintaining the body)
3.   Idling (places for watching the world go by)
4.   Confining (places to be held in)
5.   Servicing (places with local support networks)
6.   Metering (places where services flow incrementally)
(at on the town....)
1.   Eating, drinking, talking (places for socializing)
2.   Gathering (places to meet)
3.   Cruising (places for seeing and being seen)
4.   Belonging (places for insiders)
5.   Shopping (places for recreation retailing)
6.   Sporting (places for embodied play)
7.   Attending (places for cultural production)
8.   Commemorating (places for rituals)
(on the road....)
1.   Gazing/touring (places to visit)
2.   Hoteling (places to be at home away from home)
3.   Adventuring (places for embodied challenge)
4.   Driving (car as place)
5.   Walking (places at human scale)

Table 1. McCullough's typology of thirty situations (2005, p. 120).
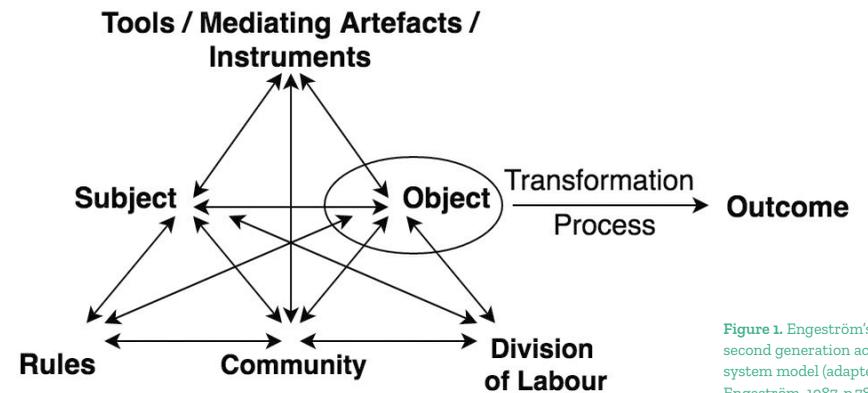
Figure 1. Engeström's second generation activity system model (adapted from Engeström, 1987, p.78).

highlights how cultural and socio-historical factors influence human activity, these factors include conventions (rules), social organisation (division of labour), and the context of the subject's broader society (community).

Activity theory is useful to focus on the operations undertaken in an environment, these then lead into actions, driven by goals, that finally lead to the higher order motivation behind the activity. It is difficult for most individuals to access the emotional motivations behind rational actions, but activity theory provides a means to start with the more rational operations and actions in order to delve into the subconscious of human motivation. As a means to practically engage with the complexity of motivations

AUTONOMY / INDEPENDENCE	Feeling like you are the cause of your own actions rather than feeling that external forces or pressure are the cause of your action
COMPETENCE / EFFECTANCE	Feeling that you are very capable and effective in your actions rather than feeling incompetent or ineffective
RELATEDNESS / BELONGINGNESS	Feeling that you have regular intimate contact with people who care about you rather than feeling lonely and uncared for
SELF-ACTUALIZING / MEANING	Feeling that you are developing your best potentials and making life meaningful rather than feeling stagnant and that life does not have much meaning
SECURITY / CONTROL	Feeling safe and in control of your life rather than feeling uncertain and threatened by your circumstances
MONEY / LUXURY	Feeling that you have plenty of money to buy most of what you want rather than feeling like a poor person who has no nice possessions
INFLUENCE / POPULARITY	Feeling that you are liked, respected, and have influence over others rather than feeling like a person whose advice or opinion nobody is interested in
PHYSICAL THRIVING / BODILY	Feeling that your body is healthy and well-taken care of rather than feeling out of shape and unhealthy
SELF-ESTEEM / SELF-RESPECT	Feeling that you are a worthy person who is as good as anyone else rather than feeling like a "loser"
PLEASURE / STIMULATION	Feeling that you get plenty of enjoyment and pleasure rather than feeling bored and under stimulated by life

Table 2. Sheldon et al. (2010) Top-10 Psychological Needs. This version is based on Hassenzahl (2010 p. 46.)

Sheldon et al's top 10 psychological needs (Sheldon, Elliot, Kim, & Kasser, 2001) are useful as a means to predict why certain human activities take place. As designers, this provides the opportunity to understand the driving force behind action, and therefore design within that desire, as opposed to possibly misinterpreting simple operations or more complex actions as reflecting real needs.[7]

In summary and in order to better situate this project in the urban context, we equate the "object" of Enegström's ASM with McCullough's typology of thirty situations (2005, p. 120), and the "outcome" informed by the 10 Psychological Needs (Sheldon, Elliot, Kim, & Kasser, 2001) to arrive at the TASM. As designers, a product intervention is situated conceptually at the point of the "mediating tool" in the T/ASM, however as opposed to typical use of activity theory in Human Computer Interaction where it is focused on micro or product wide interactions (Kaptelinin & Nardi, 2012), we rather use the TASM as a research tool to frame the overall urban ecosystem as a means to contextualise product and service design.

TEACHING METHODOLOGY

The project commenced with a series of short theoretical lectures that presented the conceptual framework of the project to the students. Major themes presented included: the 4th Industrial Revolution (Schwab, 2016), Floridi's 4th Scientific Revolution (2014), Embodied cognition (Dourish, 2004; McCullough M. , 2005) and Activity theory (Kaptelinin & Nardi, 2012; Engeström, 1999).

Students from both departments were combined into small design teams. Teams were tasked with exploring a particular activity typology in the Johannesburg inner city district using a range of qualitative and quantitate design research methods, framed by the TASM model. This exploration was situated, and people focused. Students were expected to visit their selected spaces throughout the duration of the project and engage with the communities using them.

Once the initial design research was completed, students, again, applied concepts from activity theory to guide their speculative design considerations of future city-making in Johannesburg.[8]

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7   The use of Sheldon et al's top 10 psychological needs in the TASM is informed by Hassenzahl's use of it in his 'three level hierarchy of goals' model (2010, pp. 44-46).

8   Concurrent to the theoretical lectures and site visits, students undertook weekly Aurdino programming classes. Aurdino is an Open Source computer hardware and software that provided the students with the skills required to prototype their final designs both in terms of interface and product outcomes.

Student teams, through both independent lecturer engagement and in peer critique sessions, critically reflected on their own design concepts and learning development. At the culmination of the project, the entire process was documented through an electronic publication, which included the final prototype outcomes.

CASE STUDY IDŌ: A SPACE FOR RECHARGING BY NATALIA DELGADO AND RIAN PRETORIUS

In this case study we use one student project as an example of how the TASM was applied over seven-weeks. This is one of nine design outcomes from a project that has been refined over three years.

In the chosen case, using the typology "a space for recharging" as the initial starting point, the design team engaged with community members in Johannesburg in order to better understand their experience of physical health. After engaging with participants (subjects in the TASM), they firstly identified a core set of psychological needs which included: bodily health, self-esteem, pleasure and stimulation (Fig. 2).

Once they had established their object and outcome pairing, their research activities then focused on social approaches to exercise as well as exiting technological support for such activities.

The Idō concept consists of two key products, a wearable watch and a mobile application. Beyond recording biometric data

for health feedback, Idō helps to guide movement through the use of integrated sensors to improve technique. Through visual illumination it can sync the users' movements to others, hence creating a shared exercise routine regardless of whether participants are in a shared environment or in the privacy of their own home. Exercises thus become more a more engaging experience, motivating the user to continue with the practice.

Figure 3. Typological Activity System Model

Instruments
- Health & Fitness trackers; fitbits, Smartphones
- Exercise
- Support groups
- Food & drink
- Socialism

Subject
- Students
- Business owners
- people

Object
- Recharging: eating, sleeping, exercising, relaxing, destressing
- Awareness
- Alerts/triggers
- Access to healthcare

Outcome
- Becoming self aware
- and consciously acting on and remedying a stressful situation **healthy mind= healthy body** (and vice versa)

Rules
- Stigmatic perceptions of mental health
- Economic restrictions
- Perceptions of what is 'good' health
- Social norms on what it means to be fit
- Societal standards and health regulations

Community
- Fast paced
- Business envirnoment
- Student hub
- Urban evironment
- Perceived as unsafe

Division of Labour
- Doctors: practice, maintain and assist
- Health ambassadors: promote healthcare
- Family/peers/colleuges: aid and support
- Media: change perceptions/promote health
- Oneself: be proactive with health

Zanele The University Student

22 year old female
Single
Likes to party

"In the wise words of Rihanna- work work work."

About

Zanele is currently completing her final year of studying Architecture at UJ. She can't wait to start working so that she can afford to look after her parents and buy her dream house.

Zanele use to be the center of a party but feels like she no longer has the energy to dance for hours- nevermind the time- deadlines, deadlines, deadlines! She is 90% coffee, 10% tears- but does not regret chosing to study architecture.

Her faviourate food is a good steak and mash.

Key frustrations & Challenges
- The day is not long enough
- DEADLINES
- University is expensive
- Managing parttime job and university work
- Remembering to eat, and drink enough water

Psychographic drivers

A Health
B Self esteem
C Stimulation/pleasure
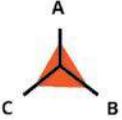
Environmental and tasked based considerations

Zanele is extremely pressurised as she has a part-time job and has less time to work on her assignments. She spends most of her free time catching up on work and some sleep- although not much because she's always worried about what she still has to do. She knows that she has an amazing support system at home but does not want to burden them with her stress and worries- she just wants to make her family proud and prove to herself that she can do this.

Zanele spends is constantly working and the minute she has a free time, she is catching up with her friends or looking for a party.

Work
Commute
Socialisation
Sleep
Eating/drinking
Exercising

VISUAL DATA GATHERED FROM MOVEMENTS DURING WORKOUT TO CREATE AWARENESS OF HOW WE MOVE ENHANCING EXPERIENCE AND ENTICEMENT OF EXERCISING

CURATING SHARED EXPERIENCE THROUGH 'ISOLATION'

SEPERATE OR COLLABORATIVE WORKOUTS WITHIN A COMMUNITY

INSTRUCTIVE LEARNING
AND ASSISTANCE

- VISUAL COLOUR OUTPUT
- SOUND FROM MOVEMENT
- LEARNING THROUGH VIBRATIONS
- ROUTINE TRACKING AND SHARING ABILITY

Figure 5. Curating shared experiences with Idō (Delgado & Pretorius, 2018).
Figure 6. Group Interaction with Idō (Delgado & Pretorius, 2018).

GROUP INTERACTIVE ELEMENT

COLOURS AND MOVEMENT INTERGRATED THROUGH GROUP PARTICIPATION/MOVEMENT

WEARABLE DEVICES CREATES INTERACTION BETWEEN PARTICIPANTS

Case Study Reflection

Reflecting on our experience working with our students on this project, we found the TASM to be a very useful tool. Firstly, it acts as a visual mapping of research process, which enabled conversation and reflection between students, and, with lecturers. Secondly, it allowed students to structure their thinking and to be generally more strategic in design concept development as it encouraged a focus on peoples' goals (objectives) and needs (outcomes) rather than technological and/or aesthetic specification. Thirdly, it provided a background logic that the

students' strategy and ideation could be validated against. Fourthly, it could also be used to systemically speculate on the impact of designerly intervention into a particular urban space. In the sense a change in one of the TASM nodes (typically Tools/Instrument) could be used to predict change in the other nodes. And finally, as evidenced in the provided student example but also true of the other projects, we found the students' concepts to be well-integrated product/service systems. In our previous experience of teaching the same collaborative project we found that students from different disciplines would limit product integration within the knowledge frameworks of their specialisations; whereas we found the TASM enabled better synthesis of design strategy and ideation across the interdisciplinary groups.

CONCLUSION

As design practitioners in the Global South in the post-digital age our students need to be prepared to engage with design approaches that include and integrate computational, physical and spatial domains. Typically, digital and product designers have not explored the spatial realm, however these fields bring their own knowledge with regards to people and technology in an immediate and embodied manner. Activity theory, generally, and the TASM, specifically, help to bridge between product making and urban informatics in a manner that helps students to formulate designerly concepts in a mature and systemic manner.

While we have applied TASM in the urban context only, we believe that it is equally beneficial in its application in the rural context or scaled up to explore more regional contexts. This is an opportunity for future research.

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RESEARCH VIDEO: AUDIOVISUAL ETHNOGRAPHY AND BEYOND

"Research Video" is an interdisciplinary state funded research project (2017 - 2020, Switzerland) in the fields of design, artistic research and visual anthropology with the aim to explore the possi-bilities of video for science communication. The project aims at developing a new standard for scientific publication – comparable to scientific journal publications – through video annota-tion.

In the history of scientific publication, text is the main form to present research results. In our pro-ject we ask the question "Can research results be presented exclusively or mainly through video? If so, what would a standardized, internationally accepted format look like?"

With the development of a video annotation-tool and its application in two exemplary PhD theses as case studies, these questions are explored.

We are going to present the author's PhD project: Her ethnographic fieldwork in Bolivia. It inves-tigates child labor in a country where rates are high, but children's help and lucrative activities have a cultural anchor. Through observation, video workshops, interviews and mixed methods, an audio-visual ethnography is created of the life realities of people who had to start work at an age deemed too young by Western understanding. With a series of short videos, the voices of the "re-searched on" – the child and youth workers and the main actors of this research topic - are made heard and become research data.

Keywords: research video, scientific storytelling, visual anthropology, digital storytelling, childhood studies

AQUA_MATICES: INTERACTIVE AQUAPONICS FOR EXPERIENCE-BASED LEARNING IN STEAM

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AQUA-MATICES is an experiential teaching initiative for learning Math, Arts, Technology, Engineering, Science, Education and Health using aquaponics. Here, we design and implement a portable aquaponic units as a tool for learning through experience. Aquaponics refers to systems of fish and plant growth (food) using the waste of fish as a source of nutrients.

In part 1, ten identical aquaponic units were built for standardization of the biological conditions necessary for the sustainability of the systems. They consisted of 3 L tanks, zebrafish at different densities (1, 2 and 3 fish/L) and basil and mint plants (4 or 8 plants per tank) on volcanic rock substrates. In part 2, the aquaponic units were installed in urban schools, and teaching guides were provided to encourage experiential learning and critical thinking. The usefulness of the units and the perception of teachers and students will be determined.

The aquaponic units constructed are scalable systems that can be adapted to different spaces. The optimal production densities are 2 or 3 zebrafish / L and 8 aromatic plants. The aquaponic units are valuable learning tools in STEAM areas, and also promote a change in the perception of teaching and learning, generate positive attitudes towards sustainable food production and encourage social responsibility. They are a good alternative for bringing rural environments into the cities.

Keywords: aquaponics, teaching, urban spaces, STEAM, schools

INTRODUCTION

Learning through experience is a model in teaching that is centered in the learners and their reflections on their practice. It follows the current tendencies in education, in which the emphasis is in participation, analysis, and construction by the students, moving the focus from the teacher to the learner (Kolb., & Kolb, 2005). MATICES in an acronym for Math, Arts, Technology, Engineering, Science, Education and Health in Spanish (Matemáticas, Arte, Tecnología, Ingeniería, Ciencias, Educación y Salud).

AQUA-MATICES proposes a platform in which the learning process in these disciplines would be constructed from the experience that the students have with an aquaponic system. The principles of the platform are the interactions facilitated in a sociocultural setting, filled with productive and emotional experiences. In fact, at the core of experience-based learning is the interdisciplinary interaction that enables the "brain to understand through emotion".

This study proposes an aquaponic system as a tool to teach and learn through experience, especially in poor live environments. Then, it evaluated the use of the aquaponics with workshops and community surveys before its installation in schools in urban areas.

Rural experience in urban spaces

In experience-based learning, the students go through a cycle composed of concrete experiences, reflective observations, abstract conceptualizations, and active experimentation, constantly (Kolb, 1984). For MATICES, Kolb´s postulate gains more value when there are interactions with the surroundings and nature. However, exposing children and young people to aquatic environments can be complex due to the fact that most schools in urban areas may have logistical barriers such as transportation and safety, even underestimating the potential of the environment (Ernst, 2007).

Educators in earth majors identified a need to be trained in agricultural communication skills to teach these competencies in their classrooms. This exemplifies the necessity of teachers to be immersed in the environment and to be involved in the design of the learning process, in order to create scenarios where the knowledge can be constructed (Pennington, Calico, Edgar, Edgar, & Johnson, 2016). A study of Wardlow., Johnson., Mueller., & Hilgenberg (2002) shows the use the aquaponic systems for teaching agricultural science and technologies. Aquaponic have been used as a practical way to incorporate educational gardening experiences into schools with limited space in urban areas (Clayborn, Medina, & O'Brien, 2017).

Basic knowledge from the rural areas, such as timing and optimal setting for plant growth, effect of plagues, etc. is completely absent in urban environments. Including aquaponic systems in teaching would incorporate some of that knowledge into their learning process and help student become more engaged.

Aquaponic systems

Aquaponic systems combine aquaculture and plant growth. In the systems grows bacterial populations that convert ammonia excreted by the fish into nitrites and nitrates, which in turn, are used by the plants as nutrients (Somerville, Cohen, Pantanella, Stankus, & Lovatelli, 2014), (Bibbiani, Campiotti, Incrocci, Pardossi, Fronte, & Viola., 2017). This system proposed here has a balanced equilibrium between fish and mint and basil plants to make it easy to maintain. It also has a low cost. As mentioned by Marklin, Mathison, Mayer, Nagurka, Caripa & Schabelski (2013) aquaponics provide a great opportunity to incorporate additional techniques and technologies, and can be installed in any kind of educational setting.

Aquaponics in education

Aquaponics have been used as a teaching tool in the United States, and they have the potential to enhance interdisciplinary science education (Hart, Webb, Hollingsworth, & Danylchuk, 2014), (Hart, 2014). In particular, they are seen as an opportunity to give hands-on experience with real and up-to-date life skills (Peal, 2017), and as a way to promote scientific literacy (Junge & Wilhelm, 2014). They have also been used as an opportunity to help reconnect children with natural processes, encourage hands-on learning, and cultivate critical thinking from primary to university education (Hart et al., 2014).

A successful experience with aquaponics in the classroom is the study by Wardlow. et al. (2002), in which classrooms received individual low-cost aquaponic units and teaching guides for learning math and science. The results show a very positive perception of the use of the units and a high interest by the students. However, the major withdraw was the lack of technical expertise and lack of knowledge for implementing the aquaponics Wardlow., et al. (2002). Mullen, (2011) used a simplified desktop aquaponic systems to teach nitrogen cycle in science class. However, in other studies, teachers found the development of their own classroom activities to be challenging.

In her master´s thesis, Emily Hart agrees that the most common challenge encountered by users of aquaponics in education are technical difficulties, but also school restrictions (Hart, 2014)

(Emily Rose Hart, 2013) (Emily Rose Hart, 2013) (Emily Rose Hart, 2013)(Emily Rose Hart, 2013) (Emily Rose Hart, 2013) (Emily Rose Hart, 2013) (Emily Rose Hart, 2013) (Emily Rose Hart, 2013) (Emily Rose Hart, 2013). Aquaponics requires a high level of technical proficiency. For example, systems require the use of constant energy, a functional hydraulic arrangement and maintaining a minimum of biological parameters to keep the live organisms in optimal conditions. The restrictions imposed might be due to infrastructure, water use and other limitations that schools or the educational systems have.

Marklin et al., (2013) mentions the importance of developing research projects for undergraduate students in environmental engineering areas. An aquaponic would be an appropriate platform to design and integrate many devices as part of the construction experience by the students.

DEVELOPMENT

Design and building of the aquaponic units

The standardization of the recirculating systems was carried out at the greenhouse at the Universidad de los Andes in Bogotá-Colombia. Ten identical aquaponic units (Figure 1) were built for standardization of the technical and biological conditions necessary for the sustainability of the systems and animal wellbeing. The experimental design consisted on 3 L-tanks and the combination of different densities of zebrafish (1, 2 and 3 fish/L) and basil and mint plants (4 or 8 plants) per tank, over volcanic rock substrate. All animal procedures were performed in
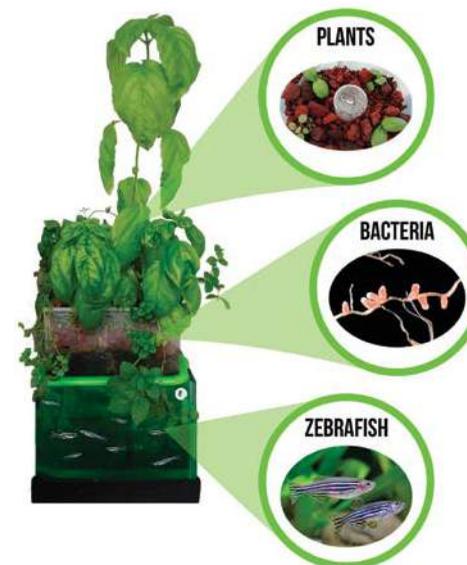
Figure 1. Components of aquaponic system AQUA-MATICES.

accordance with Institutional Animal Care and Use Committee (CICUAL) at Universidad de los Andes (C.FUA_17-019).

Even though schools face different challenges based on the geographical location, teachers knowledge and demographics (Hart, Webb, & Danylchuk, 2013). The construction of the system met the following essential criteria 1. Portability, 2. Low cost, 3. Scaling-up potential, and 4. Safety for all actors involved.

The AQUA-MATICES units offer an optimal relationship between what is easily observable and tangible by the students: the fish and the plants, with what is not, which are the molecular and microscopic component: bacteria, waste, nitrites, and nitrates. In addition, the experience of building the aquaponic allows students to evaluate its technical components and the functionality of the unit in urban spaces.

Demographic

The aquaponics systems are designed for K-12 schools in urban areas of Colombia. Even though the characteristics of the schools might vary, the spaces for which the units are constructed are small and shared by different grades; thus, they should be portable and flexible. Even if the schools have open spaces, the unit is designed for indoors but up-scalable to fit the requirements of the education setup and the curricular needs.

RESULTS AND FINDINGS

Kolb´s Model in AQUA-MATICES

AQUA-MATICES was planned as an educational program that aims to integrate STEAM learning competencies into experience-based learning models, using aquaponic units as educational tools. Figure 2 shows de process of conceptualization by which interaction and experiences following de Kolb´s Model with an aquaponic system involves different components to produce the desire competences.

The Kolb's cycle of experiential learning depicted in the center of figure 2, shows the learning cycle around four stages: (1) having a concrete experience involving the senses, (2) reflecting on that experience, which leads to (3) the formation of abstract concepts (analysis) and generalizations (conclusions), which then are used to (4) test experimental hypothesis, resulting in new experiences (Konak, Clark, & Nasereddin, 2014), (Orey, 2010), (Kolb, 1984).

These new experiences might be the beginning of a new cycle in the experience-based learning model, where the construction of
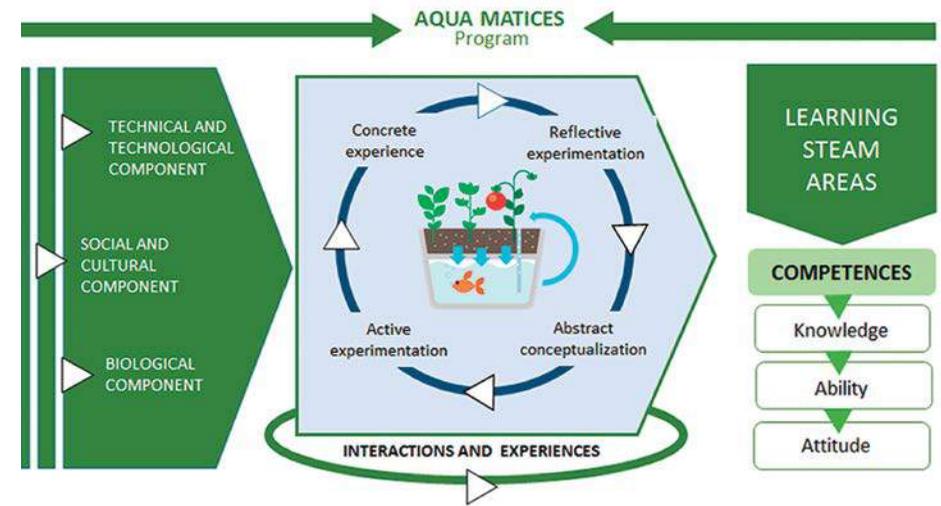
Figure 2. Diagram of The AQUA MATICES Program

knowledge is dynamic, progressive and constructive. Technologies can be used within the formal curriculum as an effective teaching tool where students can learn about food origin (Jon Schneller, Schofield, Frank, Hollister & Mamuszka, 2015).

Inputs in the AQUA MATICES

• **Technical and technological component:** this component includes the basic parameters needed to ensure the basic functioning of the system such as the infrastructure needed to support the materials and the units themselves, and the technological features incorporated. For example, the type and depth of the substrates, the specificities of the pumps and pipelines, and the development of sensors (figure 2).

• **Social and cultural component:** the interaction of agents with nature is a cultural practice that contributes among populations. Based on Puig de la Bellacasa, (2017), the way in which human beings relate to others is a matter of care and involves recognizing and evaluating the practices of participation they have with animals, with objects, and with physical and spiritual entities. Under this scenario, attitudes towards life and food production are integrated into these care practices to promote sustainability, social responsibility and cultural appropriation.

The attitudes towards life and food production are embedded in culture, and their practice encourages social responsibility and cultural appropriation. AQUA MATICES design incorporates the three components of the positive design: a design for

pleasure, design for personal significance and, design for virtue (Jiménez, S., Pohlmeyer, A., & Desmet, 2016). Those components are implicit in constructing interactions and experiences. For example, building an aquaponic system may have different significance for each student. Some may feel connected to the live ecosystem and be critical about the wellbeing of the animals, while others could feel more interested in the technology. However, the interaction with the units gives opportunities for all to learn about all the parts and feel responsible for the system. In addition, the aquaponic can be scalable to the classrooms, it is tangible and practical. It has a high potential for social interactions, which might be used as a sustainable model for the student´s families self-sufficiency (Muñoz Saa & Jiménez Liso, 2017).

- **Biological component:** the live components of our aquaponic system are adult wild type zebrafish and seedlings of two or three weeks of basil and mint. The optimal proportion to grow fish, plants and bacteria species were determined. The experimental design consisted of 6 groups with different densities 1, 2, and 3 fish/L and 4 and 8 plant/growing beds of 259cm2 (n=4-6) and controls. The aquaponic with 3 fish/L and 8 plants produced more foliar growth in comparation with controls with soil and fertilizer (p<0.05). In this group, ammonium transformation was optimal, with most nitrates available for plant growth (p<0.05).

Even though bacteria are not visible by the naked eye, they are very important for the system balance. The biological component is pivotal in the learning experience since it awakens emotions and interactions that may not be ordinary into urban spaces. For the nonvisible bacterial component, interactive activities that indirectly emphasize the role of the microscopic bacteria are designed. For example, card games that indicate the properties and benefits of bacteria species for the aquaponic system may be designed.

Outputs in the AQUA MATICES

- **Learning and teaching STEAM areas:** AQUA-MATICES involves a pedagogical model where competences in knowledge, abilities, and attitudes are considered. Students play a fundamental role in the care of the system, emphasizing the sense of responsibility and test of consequences since the wellbeing of the live organisms is in the hand of the students (and teachers), bringing a strong emotional component in the interactions with the system. Other competences acquired are planning and timing since the activities with live ecosystems cannot be improvised and there are schedules that help maintain the units more easily.

STEAM AREAS	APPLICATIONS	TOPICS	SKILLS AND HABILITIES GET TO STUDENTS
Biological Science	Environment	Efficient use of water and energy	Scientific, critic and analytic thinking skills. Development of a creative approach and collaborative work in a framework of communication issues and extension to the community. Social and environmental awareness of their environment is encouraged. Building and planning aquaponics as a means of finding interactive relations Sensitivity to form, function and meaning from aesthetics and usability, sense of composition, empathy and communication. Meaning of the experience and care.
	Ecology	Water and nitrogen cycle	
	Microbiology	Nitrifying bacteria and benefic microorganism	
	Developmental biology	Embryonic development and life cycle of zebrafish	
	Scientific method	Basic and applied scientific experimentation	
Basic Science	Mathematics	Calculation of proportions, measurements units, efficiencies and growth rates	
	Biostatistics	Basic experimental design	
	Chemistry	Water chemistry	
Engineering	Equipment and structures	Design, planning, and building of aquaponic Systems	
	Hydraulic	Water flows and levels	
Technology	Information and communication	Bid data and monitoring of biological processes	
Art and Design	Emotional and experience Design and communication (Norman, 2004); (Pine & Gilmore, 1999)	Design and experience, food design, aesthetics and nature, shape configuration, color theory, nature patterns, bio design	

Additionally, abilities and skills such as plant manipulation, fish care, and hydraulics construction are intrinsic to working with an aquaponic system. In terms of content and knowledge gain, the aquaponic as a tool can be used to teach in an experience-based model, a multitude of areas in STEAM. From learning basic arithmetic, like counting leaves and learning about water tension, to distinguishing plants from animals to studying energy expenditure, many curricular contents can be taught by interacting with the aquaponic. Table 1 details some examples of the areas, the topics, and competences that can be further studied using an aquaponics. AQUA-MATICES offers the opportunity for students to interact directly with the live aquaponic allowing the development of interests, skills and appropriate academic content and social context.

Table 1. Examples of STEAM areas that can be experienced with aquaponic

School experience

A workshop was designed and implemented at The John F. Kennedy School in Facatativá (Colombia) to investigate the basic knowledge of school children about aquaponics. The teachers of the Natural and Environmental Science Department of the school were interested in bringing aquaponics into the school; thus, the AQUA MATICES team was invited to give an oral presentation about aquaponics before continuing with the workshop, which consisted on active discussion by teams of 8 students from 9th and 10th grade. They imagined, designed and built an aquaponic system in the scenery of their urban school. Each group named their aquaponic and presented their creation. The principal goal was to "teach and learn to get experience".

EXPOCIENCIA experience

During the EXPOCIENCIA fair held from October 29th to 31st of 2018 in Bogotá-Colombia, an activity was carried out to approach primary and secondary education institutions and universities that attended the fair. A demonstration of a functional aquaponic system was presented to socialize the initiative and to gather information about the perception about the use of the aquaponic systems in urban spaces.

Four paper formats with patterns of fish, plants, water, and the city were offered to the students to choose from, and all had the same question: how do you understand the relationship between fish, water and plants in the city?. Prior to that, the students listened to a short talk about the aquaponic systems. A total of 170 responses were collected and analyzed. They expressed interest in carrying out projects in their schools with aquaponic systems in their classrooms and cities environments.

An analysis of the answers given by students and teachers in the EXPOCIENCIA indicates that there is no preference when selecting between plants, fish, water and the city formats. The participants highlighted the importance of the natural cycle between fish and plants showing astonishment since many of them did not know an aquaponic. In addition, topics such as healthy eating, techniques, and technologies involved in aquaponic systems are highlighted. Finally, the participants stated the benefits of having these systems in urban spaces, see table 2.
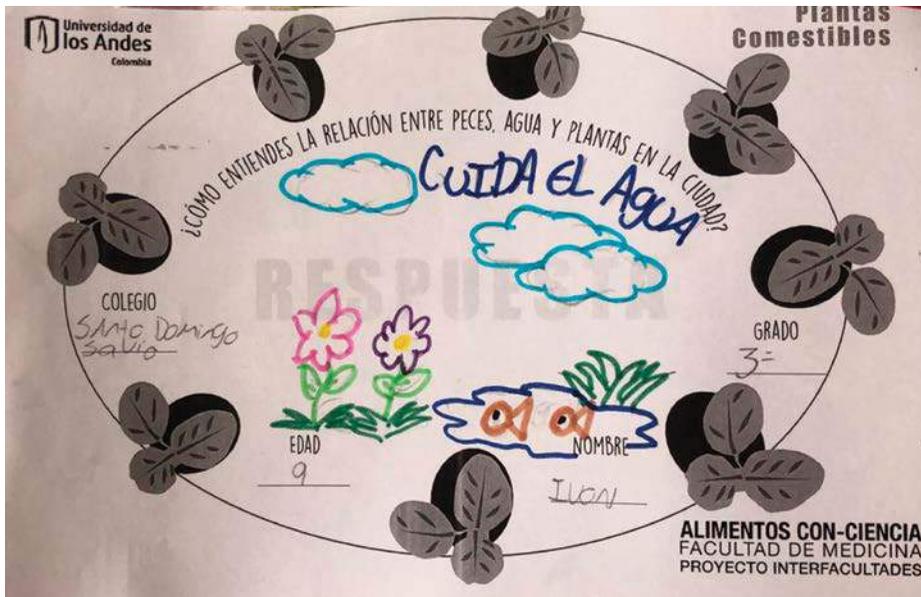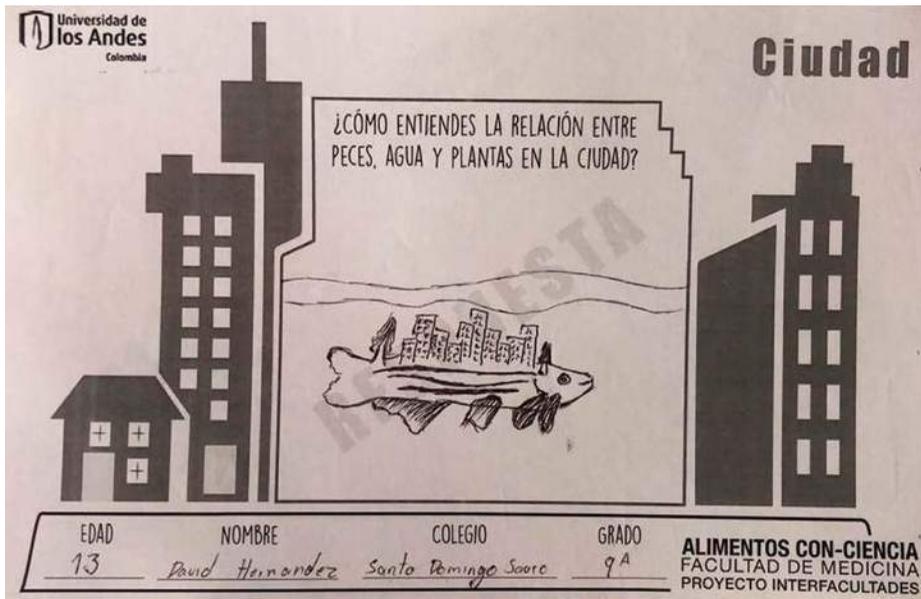
Figure 5b. Aquaponic drawing in EXPOCIENCIA

CATEGORIES	WATER	PLANTS	FISH	CITY
N° Participants	42	49	39	40
Answers: how do you understand the relationship between fish, water and plants in the city?	ID 46 Is understood as a cycle. We can also see the facts of everyday food in the city. It would be an important point since in the rural area there is almost no.	ID 164 It is necessary to know this type of techniques, for us to know what foods we consume.	ID 10 We can also have a fish culture, as well as water to have plant crops, as fish can be kept in places like a pond or aquarium in a small place as well. Then we could have this method in a city.	ID 85 Water is essential because fish live there, and it generates greater confidence and one might think that water is something pure. The plant purifies the water using the waste from the fish.
Age range	7 - 42 years			
	YES: 33 participants (See Figure 4.)		NO: 137 participants	

CONCLUSION

In AQUA MATICES, the aquaponic system is used to encourage the absorption of concepts in STEAM areas. For example, the students interact with plants and fish in a dynamic way, seeing them grow, change color, measuring them. All these activities are participatory, for instance, teams of students build the system, harvest the plants, contemplate fish and share them with the community, etc.

Teaching thought experience-based learning integrates a pedagogical model and it shapes an educational strategy to develop environment and science skills. It promotes design thinking and explores the interactions between STEAM areas. AQUA MATICES designs and offers new educational experiences through the aquaponic systems as a reference in academic environments where it is important to create a connection between the rural and urban zones.

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AN EDUCATIONAL INTERACTIVE DASHBOARD FOR AGROLAB´S AQUAPONIC SYSTEM

We envision a future where urban people will be more aware and responsible of the food chains they prefer and choose. Ideally, they will also grow their own produce and protein sources, such as fish. An aquaponic system enhanced through interactive technologies provides an opportunity for learning about growing food. In our research, we explore the intersection of food growth, learning, and data visualization. To do this, we developed a user experience structure and applied it to an interactive dashboard, that provides real-time data visualization about an aquaponic system. This work is part of a larger project that explores how alternative food production systems – such as aquaponics – can provide novel and sustainable living options in urban settings. In this paper we discuss our ideas, our exploration, and the possibilities offered by current technologies in facilitating food production processes.

Keywords: data visualization, interaction design, aquaponics, urban food growth, HCI

INTRODUCTION

For thousands of years, humankind has developed ways to secure the production of food. From the initial attempts to grow wheat to the current industrialized farms, there have been many lessons learned and technologies involved. Currently, most of our produce comes from very industrialized farms, and most of such production is consumed in cities, where the population is concentrated. We are interested in how food systems can be integrated into the urban landscape (see Choi, Foth, & Hearn, 2013; Lyle., Choi & Foth, 2014), since access to good quality produce in cities are rapidly deteriorating (FAO & PAHO, 2017). Several trends indicate that this direction of research is necessary, such as the need for healthier foods and healthier production processes (ibid), and a general need for knowledge of the production chains.

This work is part of a larger, trans-disciplinary project that aims to develop novel ways to grow food in cities, especially in Latin America, where undernourishment has recently increased. After a plateau of several years, nearly 42.5 million people do not have enough food to meet the required daily calorie intake. This number increased by 2.4 million just between 2015 and 2016 (FAO & PAHO, 2017). Our project explores: 1) how information technologies can inform, motivate, and engage citizens in food production, and; 2) how we envision the use of these technologies in this context.

Our work builds on top of the large body of research about aquaponics (for a recent review on aquaponic systems see Goddek, S. et al. 2019). Although there are advantages and limitations in this model of production (ibid.), this work proposes to explore the design space of aquaponics in an urban, Latin American city. In this way, we want to learn from the differences between our experience and the literature, in order to define novel solutions applicable to our context.

This work contributes to the growing field of research exploring how HCI improves aspects related to growing food in the city (Choi, Foth, & Hearn, 2013; Lyle., Choi & Foth, 2014). This paper is divided as follows: in the next section, we outline the general background of our project, which is followed by a section that presents the work we have done so far. In the fourth section, we describe the exploratory design aspects we took into consideration for future use of interactive technologies. Finally, we present our conclusions and directions of future work.

RELATED WORK

Food Production in the City

The current process of urbanization is ongoing and, according to the UN, nearly 54% of the world´s population lived in cities in 2018 (UN, 2018). Every city responds unevenly to local settings in particular ways, shaping socio-spatial conditions, evolving into large and complex entanglements of social, cultural, political, environmental and economic processes that have a large impact on food systems (FAO, 2019). Thus, it is proposed that growing food in urban settings is increasingly relevant, as it can contribute to food security, decrease the distance that food has to travel from production to distribution centers, and improve people´s physical and mental health (Lyle., Choi & Foth, 2014). Furthermore, as the 2019´s FAO report states, "focusing on the urban landscape does not imply a simple orientation towards food in cities, but instead draws attention to the (re)connections, (dis) locations and (in)justices that can be reworked...that place participatory action and decision-making at the center of an agenda to develop resilient, sustainable food systems". Dos Santos (2016) argues that aquaponics is a sustainable food production system that can play a crucial role in the environmental and socio-economic sustainability of cities that make use of data for the betterment of the lives of its inhabitants. In tandem, these calls for action are relevant for Latin American cities, since five out of thirty-three megacities (cities with more than ten million people) are located in the region (UN, 2018), including Bogotá, where our work is situated.

Aquaponics

Aquaponics is a technology that combines aquaculture and hydroponics systems and are considered as one of the multiple solutions for meeting the Millenium Development Goals from the UN (Goddek et al., 2019). Knaus and Palm (2017) define aquaponics as a combination of fish production (aquaculture) and soil-less plant cultivation hydroponics joined together by a water circulation system. Lennard and Goddek (2019) argue that an aquaponics system should also work in a manner in which the proportion of fish to plants remains at a level that supports the growth of plants using fish wastes.

Aquaponics presents a number of challenges that need to be explored and addressed, such as energy efficiency, nutrient management, pathogen control, profitability, public policy, education, and research (Goddek et al., 2019). In this study, we focus on the capabilities for education that these systems provide.

Food Informatics

From a technical standpoint, our work can be framed in the field of food informatics, defined as how information about food and its production processes could be presented to food researchers and the general public (Koenderink et al., 2019). Current production processes in large farms are information-based, but such information is almost exclusively used inside farms, and the technologies only apply to large quantities of produce. There are some examples of the use of technology in smaller areas such as FarmBot (2019).

Kyaw and Ng (2017) developed a smart aquaponics system in a laboratory setting for urban farming in Singapore, in which sensors´ data is stored in the cloud. A dashboard was designed and used for monitoring the system, and the system can monitor water quality, fish feed, and light intensity, among other things. However, examples such as Kyaw and Ng´s work remain situated in highly controlled environments, isolated from the public.

METHODOLOGY

Disciplinary Approach and Context

The work presented in this paper is part of a larger research project entitled Food-Conciencia. This project is supported by an interdisciplinary grant from Universidad de los Andes, Colombia. The grant is part of a wide institutional effort to foster the interaction of multiple disciplines and academic units in a research setting. Food-Conciencia is a project that aims at bringing together multiple disciplines – detailed below – using aquaponic systems as a common problem, with education about food security at the center of our work. The project is situated within an urban agriculture space called AgroLab, which is where our aquaponic system is located.

Disciplines at Play and Team Composition

The team members come from several disciplines, including Biomedical Sciences, Electronic Engineering, Mechanical Engineering, Zootechnics, Systems and Computer Engineering, and Design. Team members are Faculty members, Research Assistants, and External Software Developers. Such a diverse team tackles this problem from several and complementary perspectives, but also creates challenges due to communication barriers.

AgroLab

The dashboard work that we present here is linked directly to an aquaponics system that is the result of nearly two years of

work of Food-Conciencia. The work of Food-Conciencia is part of AgroLab, which is is an initiative that aims to provide a platform for the exploration of urban farming and all its possibilities; i.e., vertical farming, aquaponics, food security, and the entanglement of food systems at city, regional, and national levels. The AgroLab is also a space for cross/ multi/ inter/ transdisciplinary research and was also conceived as a living experiential classroom, in which students get exposed to different agricultural practices and disciplinary approaches. It is located at 2600 mt above sea level, and it engages both people from our university and from communities that live in the immediate vicinity of the university campus. These diverse groups include people who are experts in urban farming, agriculture, zootechnics, and other related fields, but also includes people with no technical background, who are examples of our future users. In this sense, AgroLab and our dashboard are located in an open space, is located in an open space and it is accessible to people with multiple backgrounds and interests. AgroLab, and the environment in which our dashboard and our aquaponic system is being deployed, could be considered as a site for research in the wild (Chamberlain, Crabtree & Rodden, 2012), in which the environment is not fully under our control.

Figure B. Prototype of our aquaponics installation.

Architecture of the Solution

Figure A. The architecture of our solution aims at working as a data visualization tool in the form of a dashboard, which can be used by members of the community of AgroLab.

The architecture of the dashboard is made up of several discrete components that interact with one another to provide a solution for the visualization of data related to the aquaponic´s state. Figure A shows the general architecture of our solution, which is described in more detail in the following subsections.

Physical Infrastructure

Our project is developed around the newest installation at AgroLab, a self-sustainable, energy-efficient installation for aquaponics. A preliminary depiction of such installation is shown in Figure B. Apart from the spaces for plants and fish, our design has spaces for the necessary filters, water recirculation, sensors, and a frame that supports all the structure. Additionally, we use solar panels to support our power needs, which are related to the water pump, sensors, and processing units. Finally, the design includes places for contemplation and enjoyment of both plants, fish, and the entire site.

A natural division of such sensors is related to the different subsystems of an aquaponics; i.e., water management, soil, atmospheric conditions, monitoring, plant and fish growth monitoring.

In our dashboard we visualizehow some of the subsystems listed above interact with each other. We expect that by monitoring water conditions we can explore how to teach people about water life; in particular, fish as part of an aquaponic system. We include sensors for ph, temperature, and dissolved oxygen, due to their usefulness and relatively low cost.

Soil conditions are also very important to our project. As a result of budget limitations, and the relatively easier maintenance of plants in comparison to fish, we only used electric conductivity and humidity. Electric conductivity and humidity provide a detailed

picture that informs people who are using the dashboard about the conditions of the soil, if they´re not urban farming experts.

As for atmospheric conditions, we included an atmospheric pressure sensor, in order to understand better how this variable affects plant growing. The different plants that we´re planning to grow, which include lettuce, kale, and basil, respond differently to atmospheric pressure changes (Daunicht & Brinkjans, 1996). We want to compare previous studies with the actual conditions of AgroLab, and see if those studies apply at altitudes around 2600 meters above sea level.

Finally, we use a standard webcam in order to monitor the growth of both fish and plants. Although there are other technologies such as infrared cameras that could have some benefits for certain measures in our aquaponic system, we decided to start with a standard webcam in order to better understand its capabilities and limitations in AgroLab.

Computational Infrastructure

There are two main computational elements in our solution: a Microcontroller to capture information from most of our sensors and a Raspberry Pi Microcomputer that captures images from the webcam, processes such images, receives information from the microcontroller, and sends all information to a repository. The Raspberry Pi gives us enough computational power to analyze images from our webcam, at a relatively low cost. Two main processes are run: a neural network for object identification from images, and a routine for uploading data.

Current advances in neural networks allow fast and dependable identification of objects in an image. Neural networks require training; i.e., a set of examples and counter-examples that allow the neural network to "learn" what elements are in an image. After such training the software is capable of identifying elements very fast, depending on the hardware capabilities where such neural network is running. In the Raspberry Pi, there are examples of pre-trained neural networks that could identify several categories such as people, trees, and chairs in less than a second. We decided to reuse TensorFlow models (Google 2019), a very lightweight implementation of neural networks that could run in the Raspberry Pi, and train it with a subset of our own images, in order to achieve very accurate results.

With regard to our repository, we used services from AWS Educate, which allows us to host a database with all the information from sensors, the raw images we collect, and the bounding boxes of the identified objects. Such information is the basis for the visualization methods presented in our Dashboard, described in the following section.

Dashboard

Dashboards are commonly used as tools for visualizing and monitoring a wide variety of systems, including aquaponics. Besides the already mentioned work of Kyaw and Ng (2017), Ulum et al. (2018) developed a smart aquaponic system for mobile devices, which included a dashboard for monitoring. Ulum et al. (2018) were more interested in understanding how efficient a smart system could be, rather than using the dashboard as a learning mechanism to communicate information related to offering access to knowledge of food production processes in urban contexts.

- Interaction Tree
  We have decided to keep a simple navigation tree for our dashboard. This is a design decision based on the various groups and disciplines that are involved in AgroLab. The tree offers three levels of depth to maximize accessibility to information. The splash screen offers an overarching introduction about aquaponics, the second level details general aspects of the state of the system, and the third level is meant to provide in-depth information and visualizations about specific aspects related to each of the sensors that were listed in a previous section. Figure C shows a general view of the interaction tree.

Figure C. Interaction Tree for our Application.
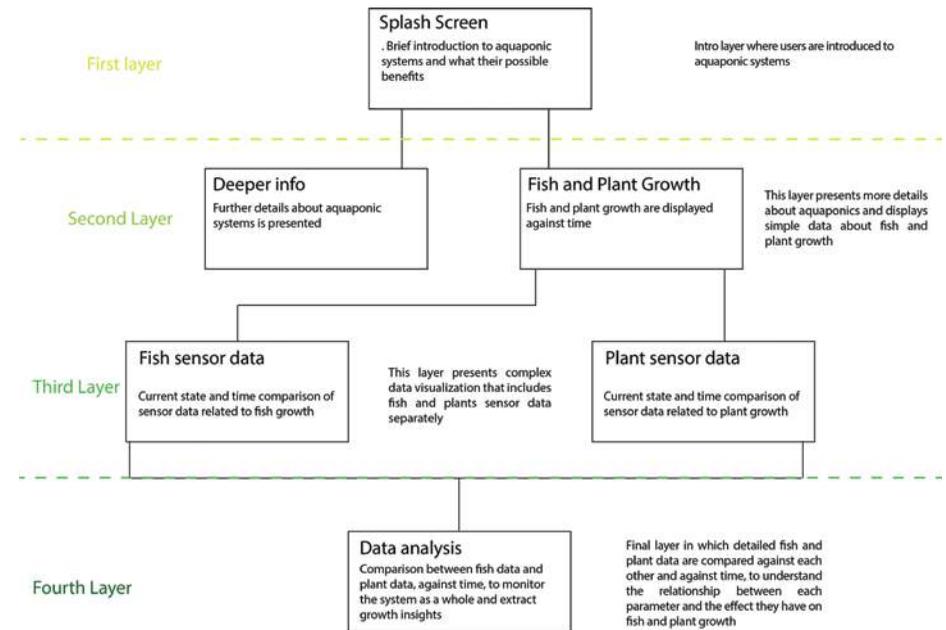
Figure D shows an example of a screen in our fourth layer, when data from several sensors could be compared and analyzed. We plan to show data that share the X axis (i.e., time) but have their own scales in the Y axis. In this way, expert users could question themselves about graphical relationships between data types.

EXPLORATORY DESIGN FOR FUTURE USE

The proposal that we present here is currently in an exploratory stage. The design of the system, the dashboard, and the visualization respond to our need to integrate multiple sensors, a webcam, data processing, and a neural network in a seamless manner. This integration provides access to information related to the immediate state of the aquaponic system, as well as historical data for mid-term and long-term comparative monitoring.

Users

The users include undergraduate and postgraduate students, academic staff, administrative staff, and neighbors that live in the immediate vicinity of the university campus. Within these groups, people might be experts in urban farming, agriculture, zootechnics and other related fields, but they could be people with no background or knowledge in aquaponics, or plant / fish care for food production.

Direct Users

Users that are present in activities at the AgroLab are considered direct users of both the aquaponics system and the dashboard.

We understand direct users as participants that make use of the dashboard whilst being physically present where the aquaponic system is located. This has implications for learning, monitoring, and directly engaging in urban farming practice.

Remote Users

We want to expand the reach and accessibility of our project by making the dashboard available through screens situated around the university, including the buildings of the engineering school and the school of architecture and design. We have considered these sites as possible options for two reasons: 1) both buildings have weather-protected areas in which the screens would not be affected by rain, and; 2) there´s heavy passers-by traffic from multiple disciplines, not just engineering architecture or design; both buildings are placed in strategic sites within the campus.

Benefits

As indicated by Lyle, Choi and Foth (2014), having access to gardening spaces can have a positive impact in peoples' lives, such as improving physical and mental health, improve awareness about food security issues, decrease food miles, as well as helping to develop resilient and situated food systems.

Learning about Food Production Systems

One of the major benefit of AgroLab is associated with the knowledge about how to grow food, and be self-sufficient in a city as Bogotá. We believe that learning about food production systems and how they operate, could provide a valuable platform for enacting change in the city. This change could be associated with various aspects of food production, e.g., best production practices. Leveraging knowledge associated with these two aspects could lead to a deeper, and critical, understanding about how to eat, what to eat, and where to get produce and protein, if people are only capable of producing little or no food.

Food Security

Food security is a key component of the second UN 2030 goal, "end hunger, achieve food security and improved nutrition and promote sustainable agriculture" (UN, nd). By providing a learning platform about food production systems in the city, available through AgroLab and our dashboard, we believe that our work could make a valuable contribution to our city. The application of a real aquaponic system in conjunction with AgroLab´s infrastructure, and our dashboard, provides a platform to explore food security within a large community that has ties to Bogotá not only within the university, but that spills over the boundaries

of the institution. In this respect, we hope that our work can be used as a starting point for members of our community to start producing their own food.

This solution addresses several dimensions in the theory of urban food systems. First, our design facilitates the contemplation of both plants and fish, which has been found positive for the mental health of observers. We have chosen Koi fish in this first version of our solution as they have been identified as suitable species for aquaponic systems (Nuwansi et al., 2016, Bernstein, 2011). For this iteration we chose Koi fish for their visual attributes rather than their potential as protein source and their resistance to various water conditions (Bernstein, 2011). This first exploration will validate the feasibility of our system to grow fish. With the data we will capture, we plan to explore the feasibility of including other types of fish, better suited for food production.

CONCLUSIONS AND FUTURE WORK

We have presented our work around monitoring and visualizing information for an aquaponics system of AgroLab. As part of a larger project, we present here our monitoring system, how it was designed, and how we envision its use. As more data is collected, we expect to expand our understanding of how it can be used, and how we can extract more information through data analytics and visual analytics techniques.

Our dashboard allows users to remotely interact with our aquaponics system, and presents a novel way to interact with this example of urban agriculture. As more data is collected, we plan to analyze how participation evolves around the system, and how we can foster research and businesses around this and other installations of Agro Lab. We envision this dashboard to grow with information from other systems, in order to create novel possibilities for interaction and studies.

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SHANGHAI (1912 -1949): VALUE OF CONSUMER GOODS IN THE URBAN-RURAL INTERACTION RELATIONSHIP

By integrating different means of history deduction, qualitative research, and logic argumentation, this paper studies consumer goods in the Republican Shanghai (1912-1949), to reveal that consumer goods have multiple values in balancing the development of urban and rural areas. On the material stage, the production of consumer goods provided equal chance for resident from either urban or rural areas to enjoy the achievements of modernization. On the cultural stage, the cultural infiltration brought by consumer goods shrank the gap of views between the residents in cities and countries in an implicit and mild way. On the industry stage, the manufacturing of consumer goods drove the moving of the rural surplus labors, which helped stabilize the social order. Therefore, consumer goods became a flexible medium to promote the interactive relationship between the urban and rural areas.

Keywords: the Republican Shanghai, consumer goods, the start of modernization, urban-rural interactive relationship, value

INTRODUCTION

In recent years, the imbalanced urban-rural relationship has been a global issue, let alone China. In the history, due to the partial understanding of "modernization", an urban-rural binary system was established in modern China (1840-1949), which fostered rural areas to sacrifice themselves to become the resource for urban modernization. However, in this process, the rural areas did not receive enough compensation as they deserved. Therefore, in the new round of urbanization, the shortcomings of rural areas had gradually emerged, such as underprivileged conditions, low income, culture deprivation, underdeveloped education and so on, which also brought severe challenges to China's sustainable development.

Under these circumstances, Chinese scholars has devoted to solving the above problem from different perspectives. Yan Yangchu (2014) highlighted mass education to reform rural areas; Liang Shumin (2018) suggested that intellectuals could moralize and lead the coutries; Fei Xiaotong (2013) believed the social organizations could reform countries; Wen Tiejun (2010) analyzed the urban-rural relation in national economy; He Xuefeng (2013) studied profit distribution and balance between cities and countries. Overall, these researches either conducted their discussion in a specific age, which can not apply to current issues, or examined from macroscopic perspectives, while neglecting research value on the microscopic phase.

Therefore, this paper took Shanghai during the Republican Period (1912-1949) as the historic background, and consumer goods as a microscopic breakthrough point, to explore the multiple values of consumer goods in urban-rural relation from three different perspectives as material, cultural and industrial. This study focuses on the functions of consumer goods in the specific time and area, to figure out the values in promoting urban-rural relation, and hope to provide the consequent inspiration for our future development.

SHANGHAI IN THE REPUBLICAN PERIOD (1912-1949)

In the Republican Period, China had undergone tremendous change and the entire society was experiencing a fierce transformation. The conflicts between foreign industry culture and domestic agricultural culture were intense. With the strong impact of western culture, and the domestic revolution in economy and politics, people's lifestyles were also heading for modernization. In this process, Shanghai was no doubt a typical example as it became the largest metropolis in China, which possessed mass production capacity and powerful cultural influence to its surroundings, due to its natural advantages.

Geographically, Shanghai is an important foreign trade city in China, as it locates in the downstream of Yangtze River, east of Pacific Ocean. In the Golden Decade (1927-1937), "Shanghai had been the biggest trade market in Asia-Pacific, and established its regular trade with over 300 port cities of more than 100 countries, which made Shanghai more than half annual revenue in China's foreign trade"(Wang, 2016). As a crucial port that connected inland area with outside world, Shanghai had important influence on the surrounding suburbs. Shanghai's prosperity promoted the development of nearby provinces, such as Jiangsu, Zhejiang, Shandong and Fujian. This fact proved Shanghai's significant effect in driving inland economy. After the Golden Decade, Shanghai surpassed Tokyo, Osaka, Hong Kong and Bombay, and soared to be the largest metropolis in the Orient, in its urban size, population, economic aggregate, production capacity and public facilities (Figure1).

Figure 1. The prosperity of the Bund in the Republican Shanghai.

The rise of Shanghai influenced the surrounding areas in two aspects: on one hand, Shanghai need labors, markets and resource from these places; on the other hand, Shanghai brought new items, cultures and lifestyles to these areas. As illustrated above, Shanghai was not only the first to try foreign imports, but also took the responsibility to promote modern goods to inland suburbs, not to mention its significance in practicing production indigenization.

CHARACTERISTICS OF CONSUMER GOODS IN SHANGHAI IN THE REPUBLICAN PERIOD

Consumer goods refer to the entity of the necessities in daily lives. The detailed categories and types are listed as follows:

No.	CATEGORY	NAME
1	Tableware	Vacuum cups, glass cups, kettles, bowls, chopsticks, fruit plates, etc
2	Suitcases and bags	brief cases, luggage, handbags, woven bags, wallets, etc
3	Furniture	Chairs, sofa, stools, shelves, cabinets, etc
4	Clocks and watches	Pendulums, floor clocks, desk clocks, watches, wall clocks, table clocks, etc
5	Stationery	Writing cases, notebooks, ball pens, pencils, erasers, typewriters, etc
6	Toys	Chinese checkers, kaleidoscopes, harmonica, toy plane, saving box, etc
7	Home machinery	Cameras, fans, sewing machines, bicycles, washing machines, etc
8	Miscellaneous stuffs	Matches, bulbs, flashlights, mirrors, buckets, umbrella, etc

Table 1. Categories of consumer goods in Shanghai 1912-1949.

In the Republican Period, the commodity market of Shanghai had been flooded with new, high-quality, and various kinds of products (Figure2). As an important seaport to foreign trade, Shanghai people had the privileges to enjoy new products ahead of other districts in China. In 1930s, Shanghai was the main cradle land in China for all novelties and fashion. Moreover, after imported, these products had been improved their qualities. Also, as these consumer

Figure 2. Various billboards on the streets in the Republican Shanghai.
Figure 3. Yong'an Department Store in the Republican Shanghai.

goods were designed to meet the needs of different classes, they were featured with local, national or cosmopolitan characteristics. In Shanghai, at that time, a "global department store" industry had formed: specific shops were operated to sell goods from Beijing or Guangdong Province, and foreign-owned department stores, such as Huiluo and Fuli for selling imported items. Till 1930s, four large department stores --Xianshi, Yong'an, Xinxin and Daxin traded more than 5,000 different kinds of goods (Figure3).

MATERIAL VALUE OF CONSUMER GOODS

The analysis above indicates that abundant consumer goods enabled people to enjoy the achievements of modernization. Among them, plentiful modern consumer goods had significant influence on people's lifestyle. As Wang Hu described in *Design and People's Livelihood in the Past Century* (2016), "in the shanty towns, when someone brought back the first enamel basin, the first thermos, the first bulb, the first desk clock, or the first tooth paste, or someone became the first to cook with gas, write with a pen, watch silent movie, or travel with bus, everyone else was shocked. This visual impact was so intense. It is just like the scene when people in Qing Dynasty (1636-1912) first saw matches-- they were startled, astonished, and then immediately tried to imitate invariably". This passage explains how new consumer goods were brought to people's daily lives, and functioned equally to every ordinary people.

In this way, the prevailing of modern consumer goods changed the livelihood of residents in urban and rural areas. In the early Republican Period, peasants no longer needed to sustain themselves on agriculture productions, but could obtain life necessities through trades. This fact shows that countries were no longer closed as before, and villagers were open to foreign items, including modern consumer goods. As Nathanial Pfeffer (1931) observed, when a peasant went to a lighted fair, saw machine-ground rice, canned food in shops, bicycles, machine components,

soaps, socks and tooth paste, his life had already been changed-- actually, rather than his personal life, his society (Figure4).

As to mention the simultaneous changes in both urban and rural areas, the prevailing of thermos could be the best example (Figure5). In *China Cycle* (1946), Richard P. Doboson noted that thermos were ordinary goods in Hunan Province, and they were actually made in China. Innes Jackson (1938), in her travelling book, also stated her intense feeling brought by thermos. She was astonished when seeing thermos in China, and could not even date back to those days when hosts were not able to serve hot tea to guests immediately. In fact, by 1921, thermos had already been a popular commodity, and the sales soared rapidly, which fostered Chinese national capitalists to invest and manufacture. In this year, Shanghai possessed more than 40 thermos factories, and in 1949, the national capacity of thermos was about 6 million (Figure6). These facts and statistics above prove that, thermos, as a kind of consumer goods, had affected people's daily life, by providing them use value equally, no matter where they dwelled in. Consumer goods, in this way, were naturally democratic, as they functioned equally regardless of individual identity, and embraced everyone the chance to enjoy modern civilization.

Figure 5. The popular thermos styles in the Republican period.
Figure 6. The production of Thermos in the Republican period.

Figure 4. Rural commodity stores in the Republican period.

CULTURAL VALUE OF CONSUMER GOODS

Mass consumer goods could not only bring material value, but also affect culture transmission. Chiang Monlin (1886-1964), the present of Peking University in the Republic, witnessed the changes in countries. According to him, the villagers used to strike flint stones with steel knives to make fire, so when a few boxes of matches were brought to his hometown, both children and adults were fascinated by the fire. He also pointed out, though matches were rather rare in villages, it was the kerosene that lighted up the modernization. At that time, kerosene lamps had become daily necessities (Figure7), but few realized that they were the precursor sign for a tremendous change of the society. As consumer goods were introduced to inland regions, the country life had undergone an entire transformation. As illustrated above, the popularity of new consumer goods had not only changed people's lifestyle, but also advocated and publicized modern civilization.

Figure 7. Kerosene lamps used in rural areas in the Republican period.

As matches and kerosene lamps lighted up the darkness, bicycles changed the transportation mode. In 1900, as recorded, Charlie Song (1864-1918) gave his daughter Ailin (1889-1973) a bicycle as a ten-year old gift, and she was one of the first Chinese girls to own a bicycle. After that, she often rode her bicycle with her father to the port. In the next few years, bicycles became prevailing in other regions. In 1909, when Flluerton and Wilson travelled to Shaanxi Province (an inland province in the northwest of China) on a mule carriage, they were surprised to see a local country gentleman riding a bicycle and then passing their carriage. Decades later in 1948, there were more than 230,000 bicycles in Shanghai. Bicycles, as new items, became gradually popular in daily lives, which reflected the willingness of the public to accept changes (Figure8&9).

Another example is the popularity of cameras. In 1860, Qing Emperor sent an ambassador to the west, and that was the first time for a Chinese man to know cameras. Lin Zhen was then the first Chinese to buy a camera in Europe, and he called it "magic mirror". In the last three decades of the 19th century, with the development of techniques and logistics, Shanghai became one

of the first cities in China to own photo studios. As always, the rich people had the privilege to enjoy those new consumer goods. For instance, in 1920s, many rich farmers were rather proud of showing off their clocks, imported soaps and Turkish towels, and they hanged family photos on walls as decorations. However, things changed quickly. In the early 1920s, almost every family in Jiangyin County (a small south county close to Shanghai) were able to display their family picture in frames (Figure10), and in 1930s, many workers in Shanghai could afford to own cameras. More and more photo studios were operated in Shanghai, some of which were quite famous, such as Zhonghua, Zhaofang, Guanlong, Wangkai, Baoji, etc (Figure11). Taking photos was no longer a luxurious entertainment, but a daily and common recreation.

Figure 10. Popular family photos in the Republican period.

In particular, cameras had a strong influence on the urban-rural relationship. With photos, the rituals of ancestor worship were simplified-- family members bowed to their ancestor's pictures to show their respect and reminiscence. Also, at that time, many children were lost during the immigration from suburban to cities, so with the techniques of photographing, policemen were able to post photos of lost children on announcement boards. Besides, the prevailing of cameras indicates that Chinese people were eager to finding and identifying themselves, and knowing more of the outside world, which is obviously important for both urban and rural residents, and also crucial to Chinese modernization.

Actually, the popularity of these new consumer goods encouraged people to refashion their living mode, which stimulated acculturation. This process of acculturation did not differ by location, but were prevailing with the spread of consumer goods. Therefore, to some certain extent, consumer goods could be seen as the best medium of cultural communication, since they strengthened cultural identity and shrank the gap between urban and rural residents.

INDUSTRIAL VALUE OF CONSUMER GOODS

With the development of technology and economy, China was then able to produce consumer goods independently, which created a large amount of jobs in employment market. According to the report of China Customs in 1919, at that time, there were all kinds of western good in China, while most of them were made out of the modern production line in domestic factories (Figure12), and rarely with help from foreigners. These products included: porcelain, silk clothes, cotton underwear, bathroom ware, umbrellas, threads, pearls, bone buttons, chemical medicine, needles, lights, telephones, asbestos products, wine, beer, beet sugar, glasses, and so on.

Figure 12. Modern Commodity Factory in the Republican Shanghai.

No.	PROFESSION	1930	1931	1932	1933	1934	1935
1	Workers	19.10	19.57	20.74	20.60	21.79	22.08
2	Merchants	10.33	10.11	9.50	9.53	9.15	9.15
3	Peasants	9.72	9.28	10.71	10.16	9.83	9.61

Table 2. The Proportions of professions in Shanghai in 1930s.

Till 1949, in Shanghai, there were more than 30 kinds of industries, and 1,975 factories, which altogether provided 60,000 jobs and produced well-known brands. The transformation of industry also reflected in proportion of professions. As shown in table 2, in 1930s, the numbers of workers increased gradually year by year, while the populations of merchants and peasants decreased, which demonstrated the enormous demand of laborers in urban manufacture industries.

Except for Shanghai locals, the newly increased workers were rural immigrant workers. In 1843, when Shanghai became a commercial port, it had a city population of more than 200,000. In 1900, this number soared to more than 1 million. In the next two decades, the number tripled and in 1949, it reached 5,460,000. To be specific, this rapid increase was mainly due to the immigrants rather than the local population growth. With the working immigration waves from the rural to urban, they received simple trainings and became workers, laborers, handymen, or other employees in other industries (Figure13). However, among them,

Figure 13. Some farmers became pickers, rickshaw pullers, and workers in cities in the Republican period.

workers accounted for the largest proportion, their population rose from 50,000 in 1894 to 180,000 in 1919, 464,000 in 1936, and finally 1,225,000 in 1949.

Moreover, in the Republic Shanghai, labor-intensive light industries required low contain of techniques, so they could attract less educated workers. Therefore, many peasants could have the chance to be involved in light industries, like consumer goods productions, in cities, which also released the population pressure in villages by reducing the labor surplus. As Liu Mingkui (1985) said, "those peasants, who were forced to be away from their fields under the agriculture pressure, in fact, could not earn their lives in villages any longer. On the north of Yangtze River in Jiangsu Province, peasants were poor, which means they were the

potential workers that could immigrant to Shanghai, Wuxi, and other industrial cities around Yangtze Estuary" (Figure14). This statement indicates that consumer goods industry could attract agriculture surplus labors, which helped stabilize social order in the rural area, and meanwhile promoted the economy in both cities and countries.

CONCLUSION

To sum up, this paper studies consumer goods' values in shrinking the gap between the urban and rural areas in three aspects. First, the production of consumer goods provided equal opportunity for residents in both urban and rural areas to enjoy the achievements of modernization. Second, the prevailing of consumer goods helped eliminate the differences in thoughts for their function of culture transmission. Third, the manufacturing of consumer goods could stabilize social order and foster the economic development in urban as well as in rural areas.

Under the current circumstances of imbalanced development between the urban and the rural areas, this study can provide a fresh perspective for rural development. The production and consumption of new consumer goods, not only can improve the material conditions, but also promote the rural economy and publicize the modern civilization in the rural areas. More importantly, to these countries under agricultural mechanization, the traditional agricultural production has been disequilibrated. Consequently, many peasants lost their jobs, and the labor surplus became a hidden danger for villages, while developing consumer goods industry can effectively solve this crisis. This is because consumer goods production can provide jobs for village labors, and prosper urban economy, which has great significance to the current rural problems.

This study emphasizes consumer goods' value in rural development, by presenting the point that consumer goods are the flexible medium to negotiate the urban-rural development. In addition, this research highlights villagers' needs in real life when dealing with the real questions in villages, which eventually coordinates the urban-rural development. Yet, the particular social value of each specific type of consumer goods, and their different value in different social contexts are still worthy further exploration.

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INSPIRATIONS FROM JIANGNAN CLASSIC GARDEN TO CITY LANDSCAPE DESIGN REQUIREMENTS

Today, people's yearning for the natural environment and rural life is becoming increasingly intense with the spread of urban areas. And the urban landscape is often difficult to meet this demand, while the classical gardens in the south of the Yangtze River, which we usually called Jiangnan Classical Gardens, provide a reference for solving this problem. The purpose of this study is to explore the building purpose of Jiangnan classical gardens and extract the design elements of it, in order to help us solve the problem that the landscape needs of citizens are difficult to meet. In this study, the methods of interdisciplinary research, comparative research, inductive deduction and field investigation were used. And the emotional design representation in gardening techniques was systematically explained and classified on the basis of in-depth discussion of the construction purpose of Jiangnan classical gardens. The results showed that the construction of Jiangnan classical gardens was aimed at "help mind and body settle down ", "please the eye and the heart" and "comprehend the mysteries of the world". The landscape which can meet the needs of perception, interaction and enlightenment had been formed under the guidance of these gardening purposes and the influence of the culture of the literati in regions south of the Yangtze River. This discovery further formed a PIE (Perception-Interaction-Enlightenment) model for landscape design evaluation. The research confirms that Jiangnan classical gardens have the landscape environment which can be poetically inhabited is closely related to its three elements of perception, interaction and enlightenment. And today's urban landscape design can better meet the needs of residents by drawing lessons from these design elements for creation and evaluation.

Keywords: Jiangnan classical gardens; landscape demand; emotional design; design elements; urban landscape design

INTRODUCTION

In recent years, urbanization is constantly sped up in China, leading to a rapid expansion of urban areas. Urban construction brings people all kinds of troubles while continuously improving their quality of life: although there is no lack of parks and green belts, people still grow flowers and crops on their balcony or even in a bathtub (Figure1&Figure2), play with micro-landscapes on their office table (Figure3), or take their family to the countryside miles away for a sojourn on holidays (Figure4). As the writer Zhao Benfu said, "Flowerpot is a city dweller's remaining memory of soil and ancestral cultivation." People are eager for a living environment similar to nature. This need is worth reckoning with for a landscape designer when designing. Coincidentally, such need is not only contemporary but also that as early as eight hundred years ago, numerous private gardens were built in the south of the Yangtze River, which we called Jiangnan Classic Gardens today, often for satisfying their owners' need of feeling the fun in nature while enjoying the conveniences of urban life. Its high-quality construction of landscape space has enjoyed a high reputation worldwide through the ages, which provides us with an ideal reference.

There are extensive studies on Jiangnan Classic Gardens in the field of design, whose main contents include: 1.Focus on analysis of garden building techniques and modern design application,

Figure 1. Flowers planted on the balcony. Source: author's own photograph.
Figure 2. Rice planted in the bathtub. Adapted from I'm Cuncun, I hope you're happy! (2018). Retrieved from https://yixi.tv/
Figure 3. Microscape on the desk Source: author's own photograph
Figure 4. People pour into the countryside on holidays. Source: author's own photograph.

including architecture, plant and space and other related contents; 2.Perform more scientific and reasonable protection over extant classical gardens by studying and analyzing them and acquiring detailed and adequate information; 3. Analyze and interpret garden building thoughts and artistic conceptions of Jiangnan Classic Gardens and popularize related cultural and historical studies. This study points to the first and the third types of study, and on the basis of the study of gardening thoughts and techniques of classical gardens in the south of the Yangtze River, emotional design theory is introduced and PIE (Perception-Interaction-Enlightenment) model is proposed. Hence, this study extends the study of the scenes of Jiangnan Classic Gardens from a psychological perspective, and it provides a new evaluation method of urban landscape design, which is the contribution and critical value of this study.

This article focuses on studying gardens, which were built in the middle and lower reaches of the Yangtze River before modern times (in 1840). Based on the previous studies on the landscape of Jiangnan Classic Gardens, this paper explores the construction purpose of these gardens, and explains their emotional design characterization, by using interdisciplinary research, comparative research, induction, deduction and field research methods.

LANDSCAPE CONSTRUCTION FOR THE PURPOSE OF POETIC DWELLING

Since ancient times, regions south of the Yangtze River enjoyed a stable political situation, so that its economy and culture maintained an inexhaustible momentum for a rather long time, and men of letters came forth in large numbers. Meanwhile, regions south of the lower reaches of the Yangtze River had an extensive network of watercourses and a mild and humid climate, favorable for flowers and trees to grow. And there boasted sophisticated building craftsmanship among folks and abounded in stones used for building gardens, too. These favorable conditions that help garden construction featuring literati garden constitute a peak in the late phase of the history of Chinese Classical Gardens. After an in-depth exploration, it is found that in ancient times, literati in the southern regions built gardens mainly for the following three reasons:

Help mind and body settle down

Ancient literati studied often for entering politics, yet they had their lives at risk when the political situation was treacherous. Thus, they realized that the pursuit of spiritual freedom is premised on the ability to preserve life. However, in the age of

imperial autocracy, all the territory belonged to the emperor, residing in remote mountains was also not safe, and the attempt to escape calamity by residing in a mountain was in vain. Hence, a writer in the Western Han dynasty, who named Dongfang Shuo proposed the way of surviving of "living a sequestered life in imperial court" in an attempt to "live as a recluse in the palace instead of living in a thatched cottage in a remote mountain". After that, making mind and body settle down were gradually separated, and settling down physically in the imperial court while putting their minds at rest in a landscape became a mainstream mode of life for literati. Moreover, a scenic garden became a place for literati to put disposition at rest. During the Ming and Qing dynasties, men of talent came out in large numbers in regions south of the Yangtze River. Many of those men of insight became important officials in the imperial court and began to build their own "city forest" to live a peaceful in old age after they resigned from office and returned to their native place, while some unsuccessful literati also hoped to abandon themselves to nature and hence got involved in the construction of gardens.

Please the eye and the heart

China began to build gardens during the Qin and Han dynasties, with the original intention of imitating "heaven" or "fairyland" for the rulers and helping them pursue "immortality" and "constant happiness". But subsequent social changes led to the disillusion of the immortality of the nobility and negation against the values of traditional studies of Confucian classics. So they started to pursue a life of pleasure, then there emerged gardens built for "pleasing the eye and heart" purpose like Shi Chong's Garden of Golden Valley built during the period of the Three Kingdoms. As a continuation of southward development of the culture of Central Plains, Jiangnan Gardens were mostly constructed by affluent gentries or wealthy merchants for purposes like "pleasing the eye and heart". So we also see activities such as playing chess, rafting and Kun Opera performance, in subsequent gardens in southern regions (Figure5-7).

Comprehend the mysteries of the world

In ancient China, Chinese ancestors already knew how to observe natural law that "in ancient times when Fu His reined, he would observe the skies and the law of earth, observe the relationship between birds and beasts and places, draw on his experiences and others and then practice divination to convey the will of gods and know the truth of everything by analogy." The ancients probed into the law of things by observing the universe and relationships

between things and between humans and things and understood the truth of the world by consciously being exposed to nature. Sage Confucius said "the wise enjoy the waters, while the benevolent enjoy the mountains", which indicates that ancient intellectuals began to realize that the joy acquired from nature is far more real and lasting than that gained in sensual pleasures. Nonetheless, "mastering the truth" was a prerequisite to gaining such joy, and one needs to look into things around to master it. Rocks, water, flowers, and plants are all manifestations of "truth", and a garden that encompasses these elements became the key to mastering the truth. The purpose and aesthetics of building a garden were for that truth. The notion of realizing the truth in a scenic garden also influenced literati in regions south of the Yangtze River.

MEET PHYSICAL AND SPIRITUAL NEEDS IN A POETIC MANNER

That classical garden in regions south of the Yangtze River is filled with poetic scenes is inseparable to its inner thoughts. The influence of Confucian, Buddhist and Taoist cultures is apparent.

This not only has a direct impact on garden making aesthetics, but also makes Jiangnan classic gardens more perfect in terms of functional needs and cultural connotations, and shows the unique poetry of the scholars in the south of the Yangtze River.

Sensually aesthetic garden environment meets perception needs

The aesthetics of the classical garden in southern regions are manifold. Instinctively speaking, the needs of each sense organ for beauty find expression in them:

Visual aesthetics: classical gardens in southern regions share the same origin with traditional calligraphy and painting (Figure8), and they often imitated the layout of landscape painting and are able to bring people to a picturesque and idyllic situation. Normally, a constructor had an in-depth knowledge of local conditions, reasonably handled various elements like pavilion, plant, and path without prejudice to local natural conditions, and made a harmonious combination of them to achieve the visual effect of a picturesque scene every few steps.

Auditory aesthetics: classical gardens in southern regions focused on creating an environment close to a natural landscape, which is a major cause behind its auditory aesthetics. Their inner space is relatively quiet, and it constitutes an enjoyable environment for ears with whispering trees, murmuring water, twittering birds and chirping insects.

Gustatory aesthetics: Sundry plants often with fruit trees (Figure9) and crops amid them, and the freshness of newly-picked

Figure 8. Lion's Grove map. It reflects the continuity of Jiangnan Classic Gardens and traditional painting.
Figure 9.The fruits of fruit trees in the gardens can be eaten by tourists. Source: author's own photograph.
Figure 10. Han Xizai's Banquet Picture, which reflects a banquet held in the garden. Adapted from Han Xizai's Banquet Picture. (2017). Retired from https://baike.sogou.com/history lemma?lId=120180 &cId=166056887

Figure 11. The pavement of different materials and textures in Jiangnan Gardens.

fruits add a gustatory level to fine views. And in literati garden adept at the judgment of dishes, a delicate banquet was often a part of the garden party (Figure10), which adds significant charm to gustatory beauty.

Tactile aesthetics: Rich scenic contents in southern gardens also offer a beautiful touch. The seemingly simple path under feet displays a rich texture made up of cobble, rubble, tiles, stone and other materials by the garden builder (Figure11). A variety of building materials and the texture made up of the combination of these materials constitute the tactile aesthetics of classical gardens in regions south of the Yangtze River.

Olfactory aesthetics: you may smell all kinds of beautiful aromas from nature after walking into a quasi-nature classical garden in southern regions which is meticulously groomed by its owner: the chilliness of water, the mellowness of earth, the fragrance of flowers and the faint scent of trees. If a visitor is entertained by the host, there will be mingled aromas of tea, liquor, and dishes in the garden, bringing the visitor the enjoyment of beauty.

Diversified landscape functions meet interaction needs

In the Song dynasty, the famous landscape painter Guo Xi said: "A landscape has places to go, to sightsee, to tour and to reside." He believed that landscape painting should meet these four requirements. Southern classical garden, as a 3D representation of landscape painting, meets the requirements too: they are characterized by ingeniously-set sightseeing routes, sightseeing mode integrating motion and quietness, diversified scenic contents and agreeable and convenient living environment. Diverse material constructs in southern gardens lay a foundation for diversified activities (Table. 1).

TYPES OF ACTIVITY	COMMON ACTIVITIES
Sports and games	Strolling, climbing, rafting, playing Cuju, arrow throwing, grass game(Figure12), swinging, flying kite, playing fireworks and guessing lantern riddles
Appreciating and judging	Admiring the beauty of flowers, stone appreciation, admiring lanterns, listening to music, theatergoing, listening to storytellers, admiring the moon, admiring the snow, fish watching(Figure13), bird watching, liquor tasting, tea tasting, dish tasting, appreciating antique
Rest	Lolling, sitting, lying, sleeping
Learning and creating	Reading, writing, drawing, playing a stringed instrument, composing, poetizing
Labor	Cultivating, picking, spinning(Figure14), embroidery, making clothing
Sacrifice	Offer sacrifices to ancestors and gods

Table 1. Types and contents of activity in the Jiangnan Classical Gardens. Source: statistics and generation by the author.

Figure 12. Grass Game Picture. Adapted from Back garden in ancient Chinese gardens. (2018).
Figure 13. Known Fish Sill in Solace-Imbued Garden. Adapted from Back garden in ancient Chinese gardens. (2018).
Figure 14. Female Wave Picture. Adapted from Back garden in ancient Chinese gardens. (2018).

Since ancient times, human activities can be divided into two types: one type must be conducted in a man-made environment; while the other type must be performed in a natural environment. This state not only lasts until today but will continue for eternity. The existence of classical gardens in regions south of the Yangtze River is an effective support to these two types of activities.

Rich cultural connotations meet enlightenment needs

"Classical Chinese gardens are not public places of recreation...It is not a recreational place but a retreat for tranquil contemplation." This is especially true with classical gardens in regions south of the Yangtze River featuring literati gardens. It may arouse association, reminiscence, imagination and contemplation.

First, nearly every detail in the classical garden in southern regions can arouse association. Taking decorative patterns as an example, the selection of them often is related with its master's character or expectations, e.g., plum blossom which can endure severe winter is a symbol of hardworking quality; noble character like lotus which comes out of the mud unstained; have many children and grandchildren like seedy pomegranate; or living a long life like a pine tree (Figure15), and so forth..

Figure 15. The decorative patterns in Jiangnan classical gardens have various implications. Source: author's own photograph.

Second, it arouses reminiscence. Every classical garden in regions south of the Yangtze River has many commemorative landmarks, which may be a plaque, an inscription or a house. For instance, the "With Whom Shall I Sit" Verandah (Figure16) in the Humble Administrator's Garden, which was built in the shape of a fan, to commemorate the past of the owner who feeds his families by selling fans.

Next, it triggers imagination, in other words, one needs to imagine to appreciate classical gardens in regions south of the Yangtze River. For literati, classical Chinese garden is a fantasy in reality and an artificial miniature world, and it can be called as virtual art. Most gardens in southern regions have a narrow entrance concealed by lakeside stones (Figure17) or a wall, which

makes tourists curious and imagine themselves sneak into it; sometimes, partial foot of a hill extended from a wall lures the viewer to imagine that the hill may be stretched to in the other side of the wall (Figure18); sometimes, there is a pagoda above trees at the end of a garden (Figure19), and it often makes people assume the garden is deep in space, though outside the garden.

Last, people tend to think after going through the thinking process of association, reminiscence and imagination. Plaques, scripts, paintings and inscriptions in these classical gardens often contain a summary of the thoughts of the owner or a visitor.

ESTABLISH A LANDSCAPE EVALUATION METHOD WITH "PERCEPTION-INTERACTION-ENLIGHTENMENT" AS THE CORE

The theory of Donald Arthur Norman's emotional design research suggests that the activities of the human brain can be divided into three different levels: the automatic, prewired layer, called the visceral level; the part that contains the brain process that controls everyday behavior, known as the behavioral level; and the contemplative part of the brain, or the reflective level. Based on Norman's theory and the analysis of the construction methods of Jiangnan classical gardens, we can see that it is the full satisfaction of users' perception, interaction and enlightenment that forms the landscape environment of the poetic dwelling. Therefore, based on this theory, this study establishes a PIE (perception-interaction-enlightenment) model (Figure20) for evaluating landscape emotional design needs. The model is divided into three axes, which correspond to three evaluation factors: perception, interaction and enlightenment. The three factors will influence and transform each other in landscape design. Before the evaluation, the specific content of consideration should be set according to the nature of the landscape and user
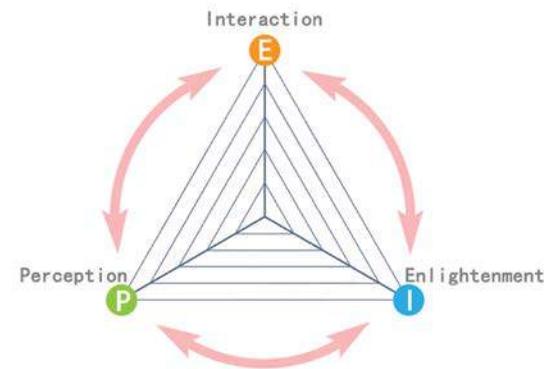
Figure 20. PIE Model. Source: Drawn by the author.

identity. The higher the design evaluation, the longer the distance on the axis, and the closer the length of the three quadrants, which shows that the landscape better balances the design of the three requirements.

In this study, Solace-Imbued Garden in Wuxi (Figure 21) and Humanity Park in Nanjing (Figure 22) are taken as examples to evaluate. The perceptual factors were investigated and evaluated through tourists' questionnaires; in terms of interactive factors, Solace-Imbued Garden makes statistics by setting users as the owners of the gardens, and evaluated according to the scene situation and historical records, while Humanity Park makes direct statistics on the spot; The enlightening factors were scored by field investigation and statistics of memorable landscape factors. The full score of each of the three factors is set to 5 points, which is displayed as 5 unit lengths in the model. The scores exceeding 5 points are calculated as 5 points.

Investigation and statistics show that Solace-Imbued Garden (Figure 23) has achieved a high score in meeting the needs of the owners' perception, interactive and enlightenment. Humanity Park (Figure 24) is done more outstanding in the aspect of

interaction needs. Perception needs may be the lowest because of the relatively single landscape form and the lack of conditions to meet the enlightenment needs due to only the borrowing scenery of the surrounding monumental attractions.

PIE evaluation can help us carry out landscape design or improve the poor use of landscape space better so that more people can more easily enjoy the landscape space that really meets their psychological needs.

RESULTS AND CONCLUSION

Through an in-depth exploration of evolution and cultural background of classical gardens in regions south of the Yangtze River, we found that these gardens were built for "helping mind and body settle down", "pleasing the eye and heart", and "Comprehend the mysteries of the world". Further research found that the construction of Jiangnan classical gardens achieved three main objectives by building an environment with sensually aesthetic, diversified landscape functions and rich cultural connotations, which also realized users' needs at three levels of perception, interaction and enlightenment. On the basis of that, a landscape evaluation model with perception-interaction-enlightenment as the core was established, which can provide an emotional design evaluation for landscape. By comparing the PIE evaluation of Humanity Park and a Solace-Imbued Garden, we can see that as a modern urban Landscape, Humanity Park does better in interaction, but lacks in the design of perception and inspiration needs, while Solace-Imbued Garden has excellent performance in all aspects. Combined with the phenomena mentioned in the introduction, methods such as rice planting in bathtubs and rural tourism, it is not difficult to see that the urban residents' needs for landscape perception and enlightenment are still very urgent. Furthermore, it is suggested that future landscape design should set more design objectives that meet people's needs, and draw on the gardening techniques of Jiangnan classical gardens to make up for the deficiencies in perception and enlightenment, and balance the relationship among perception, interaction and enlightenment of landscape, and realize the poetic dwelling of urban residents in landscape environment. At last, it should be noted that this study initially proposed a landscape emotional needs design model, and further refinement of the evaluation content, score and evaluation criteria need to be explored further in future research.

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SENSE-MAKING STRATEGIES IN ICT ADOPTION FOR RURAL POPULATION IN THE DOMINICAN REPUBLIC

In this paper, we present the use of sensemaking as a strategy to increase population adoption of IC technologies in a rural intervention project. We introduce the use of placemaking and value co-creation as methods that give sense to technology in the rural context. As technological development has been linked to city landscapes and industrial environments, we tend to relate technology for rural development exclusively to an increase in productivity. Nevertheless, the use of technology in everyday activities, as well as of the networks community members work within to live their lives, imply that entertainment and communication play a key role in the adoption of ICT in rural contexts. Besides, both elements seem to improve communities' quality of life. We expose a three step strategy that involves using ICT in the average context of 12 diverse user profiles in rural areas of The Dominican Republic. We show that ICT sensemaking could be achieved through the combination of entertainment, learning, and problem-solving activities that target the specific needs and desires of those user profiles. The result of these activities was a social-impact strategy that enhances four of the seven dimensions of human development (Alkire, 2002) for this rural community.

Keywords: Rural development, technology, value, placemaking, sensemaking

BACKGROUND

The Dominican Republic (DR) is a worldwide tourist destination. Nevertheless, the census "Encuesta Nacional de Hogares de Propósitos Múltiples - 2017" (ONE, 2018) reveals some interesting facts. In the DR, the population perceives key problems in the country related to bad electric energy service, unemployment, drug abuse, and delinquency. The reasons Dominicans give for this complaints are: unemployment, poverty, lack of learning opportunities, lack of sound entertaining and sport activities and, corruption (p. 63).

Reality hits hard when the formal education level of the heads of households is revealed. While 6.3% have a preschool education or none at all, 42.2% have a primary education, and only 21.1% have a university degree (p. 63). The effect of this facts can be felt in the quality of life as well as on the levels of innovation and community empowerment in the country.

Nevertheless, even if information and communication technologies (ICT) play a key role for the Dominicans, they need an innovative ICT approach. The census reveals that the radio, the cellphone, and the TV have between 50% and 80% coverage (ONE, 2018, p. 79), more important than the power inverter (21.4%), a key appliance in a country that has a fluctuating power supply. Still, in 2017 internet only had 30% coverage, and desktop computers 10.4%.

The Centros Tecnológicos Comunitarios (CTCs) are a socially driven entity sponsored by the Vice Presidency of DR. The CTCs promote the access and use of technology in vulnerable territories nationwide. They have 102 technological centers that offer learning services related to ICT. This project emerged from the need to update their social impact strategy. Making

Figure 1. Grandfather and his "son" in a Tuesday morning.

the community the center of the design resulted in a shift in the perspectives of a twenty-year-old strategic approach. The key question was: *How can we generate an experience that combines technology with the life goals of the users so that the CTCs become a center for local development?*

This paper aims to expose the design approach for a roadmap to a version 4.0 of the CTC, in which value and relationship is co-created alongside the needs and desires of the community.

METHODOLOGY

The design was created as an external consulting project for the CTCs, based on design thinking methodology. The execution of the project during a four-month period in Cabral, Barahona, the rural south of the DR, followed this roadmap: user research was led with participatory design principles, while context understanding was established with trend analysis and a conceptual framework. For the analysis, the tools used were user persona and stakeholder's mapping. At the ideation stage, co-design workshops with the community and CTC's staff were performed. Finally, the first prototype was held at La Barquita community in Santo Domingo and a longer prototype at Cabral, Barahona. The final version of the prototype was designed but not all of them were tested because of time restraints.

Conceptual framework

The framework presented above is the basis for decision making in this project because it set the guidelines to design a shift in the social innovation approach in the organization. This shift includes a new perspective for human development, a close relationship between digital competencies and rural citizenship, and the conditions for the Fourth Industrial Revolution to succeed in the rural context.

Development: economical and human

Social innovation

Conceptual framework

Fourth industrial revolution and creative economy

Digital Competences
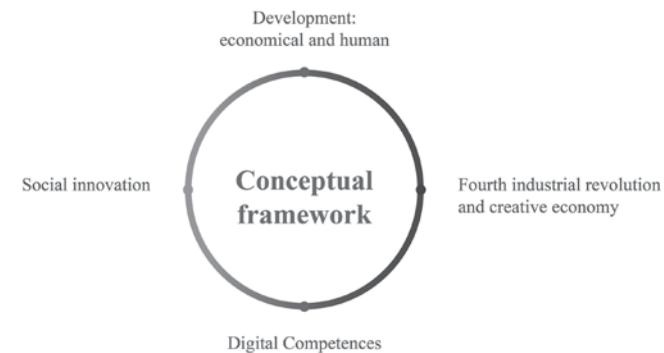
Figure 2. A conceptual framework with key topics for project understanding

To frame the initiative, the social innovation approach shifts from a focus solely on the social end to include the transformation of the human being and his surroundings (European Commission, 2014). In the context of the Fourth Industrial Revolution, social innovation should be concentrating on the constant evolution of thinking and being of communities in their own context (Philbeck, Davis, & Engtoft- Larsen, 2018). That is why creative economies become a source of unexpected yet interesting resources for rural development. Creative economies can provide the resources and networks for a different value creation chain. The condition for this to be a balanced interchange is that any resource allocated is aligned with the local production and cultural traits.

To trigger development[1] within rural DR communities, competences have to be understood from three points of view: productive capabilities, human development dimensions, and digital competences. In this scenario, the combination establishes a groundwork where digital competences become a resource to strengthen the following human development dimensions (Alkire, 2002):

• Knowledge and aesthetic experience
• Excellence at work and play
• Friendship
• Self-expression

Thus, the achievement of agency can occur in two phases. First, through the access and active use of resources[2], and, second, with the utilization of these resources in a community effort, as an expression of community empowerment.

Communities also strengthen their citizenship rights while working on Digital Competences 2.0[3] (DGC), because they help to refine them (Asamblea Nacional, 2015, p. 4). By improving this matter, DGCs increase the access communities have to resources that effectively allow them to achieve each subject's life roadmap timelin. Therefore, a social impact strategy that is committed to promoting life transformation must keep as a priority its alignment with the subjects' daily activities. The impact may come as a result of outlining highly valuable contact points – stages that enable the provision of resources or the establishment of social networks that contribute to increasing participation.

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1   Framed in Kabeer's (1999) approach to empowerment, agency and resources as key elements of human development

2   Understood with Kabeer's (1999) approach to empowerment, agency and resources

3   The framework for Digital Competences 2.0 are defined by the European Union by Vuorikari, Carretero and Van den Brande (2016)

In the rural configurations, these valuable contact points require the digital competences for citizenship to be understood from a collective point of view, as well as to take into account that progress depends on the maturity of the community which will vary according to the interest and the sense of need the population has for technology usage. The FABLABs, or makerspaces, can invest in the strengthening of a healthy social fabric in vulnerable populations. These spaces might even deepen into the "third place" concept (Oldenburg & Brissett, 1982), creating a better space for dialogue and fostering public spaces where communication focuse on exchanging ideas and knowledge.

MERGING WITH USER NEEDS

The project identified twelve initial user profiles that provided an overview of the community. The profiles were organized following the routines to access resources and the timeframe community uses in their daily decision-making process (Kabeer, 1999).

The first group is called short-term planners because they focus on immediate goals. Their daily activities vary from family caretaking to studying. Those roles set the boundaries for what they can experience. Technology-wise users communicate with long-distance family, play digital games, look for recipes, and log into social networks. For this group, technology becomes the mean to complete the short-term goals of their daily activities, thus exposing that community members will learn to use ICT if they perceive its immediate value.

The use of technology is more complex among middle and long-term planners. Their daily goals require deeper epistemological development and a better understanding of ICT functions. Tasks can be to complete university work or to create a community program, both of which can have a longer impact on the local culture.
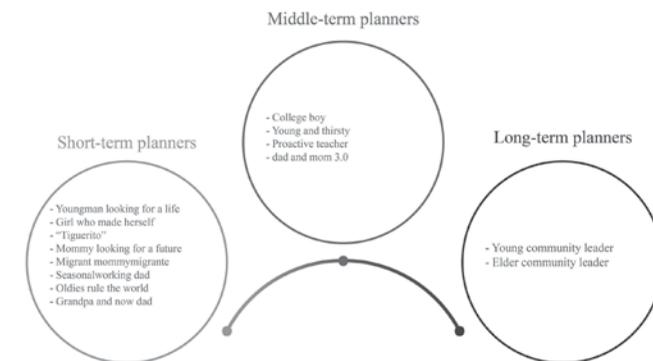
Figure 3. User profiles distribution according to farsightedness degree
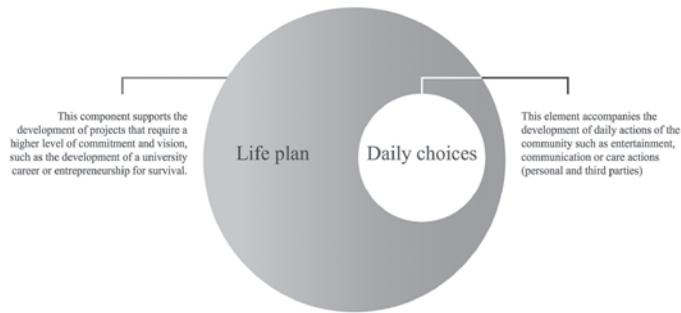
Both groups have a structure to use their resources (content, program, and experiences) and gain better results. For this to occur, participants must have a higher degree of commitment and discipline to attain their goal. In addition, because of the roles they perform, technology is a productive asset in their daily routines, such as when a college student uses a computer to create a PowerPoint presentation or a leader outlines a community document.

This assortment enables the set-up of a value proposition where the CTCs can always be a partner in resource attainment, which is crucial to increasing the impact of technology in the quality of life. Users could connect with services that foster collective empowerment drawing from the value technology can add in daily and individual agency processes.

THE CTC 4.0 – A NEW SOCIAL IMPACT STRATEGY

The CTC 4.0 approach proposes a strategic shift for the organization. The services it can provide are a mean to empower rural and vulnerable communities through the contextualized use of technology. Following three pillars, CTC will enable a first

overview for individuals and their communities to choose which life roadmap they want to live.

Value proposition at CTC 4.0

"A public space to experiment, to create, and to learn, where Dominicans, their families, and local communities can find support for the development of their life strategy through a contextualized offer of services and experiences that incorporate the benefits of digital transformation."

The value production capability of any service offered relies on three actions: to experiment, to create, and to learn. These are *calls to action* that connect with everyday activities and promote individual or community empowerment.

The overall benefits will be distributed amongst stakeholders, from households to local governments. Following CTC 4.0, the organization will offer a public space for the development of a healthy social fabric, especially for members of the vulnerable population who need an environment to freely exercise their citizenship. Value co-creation will be the way to promote active and open participation of the community, in a joint effort to redefine their social meaning of technology. In addition, DGC 2.0 will merge with daily tasks of the population and avoid an increase in inequality related to technological skills and resources.

CTC 4.0 will be able to help the community to capitalize their assets and transform them into tools for constant change, according to each subject's life strategy. This effort fits with the need to integrate technology in the management processes of local governments. To take advantage of this integration can enhance government coverage across the country and impact top-down decision-making within a territory.

CTC 4.0 - Strategy funnel

The three-stage roadmap that will potentiate community empowerment through the use of technology. The first phase is PleiTIC, an awareness stage where technology is seen as a tool for the community's leisure time. People with the appropriate conditions will move to the second stage, Conocimiento^4, where technology will be used to obtain knowledge that will enable individual empowerment through middle-term plans. The third stage -RD 4.0- will be interesting for those members who want to contribute to the general development of their community. This is a creative space for communities to use technology to generate the social transformation themselves.
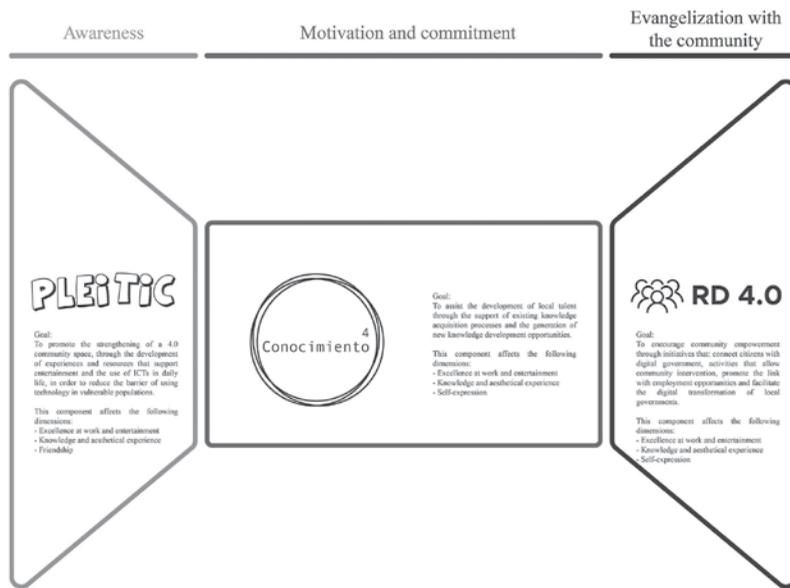
Figure 6. Three-stage funnel for social impact strategy CTC 4.0

PleiTIC

PleiTIC will promote entertainment activities that involve technology for everyone in the community. In this stage, the needs of the *short-term planners* will be answered. The set of activities will eliminate the fear and caution the users have. It will fulfill their need to experience new entertainment spaces that allow them to interact as a family and community, without factors such as alcoholic beverages, a social problem in this community. PleiTIC aims to eliminate prejudice and raise awareness that technology can be fun, easy, and exciting – because, as seen during the process, technology has the capability to gather people around.

This stage has the ability to impact the entire population without a extensive knowledge process. In the context reviewed, most young people use cell phones for fun and entertainment, so technology plays a key role in this scenario. Nevertheless, that role is not positively seen by adults, because the content has not been filtered to provide quality and relevance in the construction of a healthy social fabric. The activities will be appealing aesthetic appreciations of technology, which subsequently allow the entire community to link the devices and their content with positive experiences of technology use. PleiTIC intends to take advantage of this opportunity and provide a set of memorable and easy technological experiences.

In the first prototype of this stage, the community was excited to interact with the technological experiences of VR and AR. Grandmothers with their grandchildren, elders, parents, and kids,

could share an out-of-the-box activity in their daily environment. The facilitators reported that the community was asking for more activities to be held in the same vein.

Conocimiento^4

Conocimiento^4 is the stage where any ongoing or new knowledge process in the community, will be enhanced with technological resources. *Middle-term planners are the target audience* because of their need to access the different technological processes to complete their objectives. This stage will have a series of training and assistance services that will allow users to increase their access to resources that relate their disciplines and knowledge inquires, to technology.

In Conocimiento^4, the CTCs will provide an experience that the users cannot find anywhere else. Logistical and economic difficulties are the source for an scenario full of frustrated motivations. The youth reported that the lack of opportunities to acquire any kind of academic knowledge within the territory. However, taking technology as an interconnector, it serves the role of an engine that can help overcome these obstacles and scale the coverage of knowledge acquisition processes.

Morever technology maintains its capability to induce collective change. The use of technology in Conocimiento^4 reaffirms the capacity of people to consider new and different life possibilities that are within their reach by acquiring knowledge through different means. Furthermore, in this rural landscape, the better the access to and quality of the individuals' assets, the better those will be for the community. These factors all amount to the fact that improving the assets of the individual will improve the assets of the community networks.

The change between stage 1 and 2 can help as an organic funnel for the number of people that find useful to participate inConocimiento^4. The researched showed that there is few people in the community who can perceive the importance and have discipline that will allow them to invest in similar learning experiences as Conocimiento^4. The stage will show results in a middle to long-term range. This should not be considered as an obstacle. Once successful participants accomplish their goals, their success stories will motivate new members of the community to join the CTCs' experiences, as seen in other scenarios.

The makerspace program, a key component of this stage was tested. The objective was to understand how young students could give sense to technology with the purpose of learning hard skills. During a 4-week program that aimed to create an initial group of users for the new CTC, a group of students experienced technology

from a creative point of view. The results show an increase in their interest in technology creation and an improvement in soft skills from high-school students. In addition, the success of the program was related to involving key stakeholders to increase the desire of other students and their relatives to participate in similar programs.

RD 4.0

In the last stage, RD 4.0, empowerment will have a community focus based on social innovation through technology. The activities will promote community integration, the use of technology to solve public problems, and the connection of local government with current development dynamics. The creativity spaces where communities can find the resources to plan, design, and solve certain issues themselves. At this point, participants will be able to assume with greater awareness the role of technological influencers and social leaders to effectively change bad things in their context. Leaders will connect the local scale to the regional scale of action.

RD 4.0 has to be the last stage to be executed and achieved. This stage demands for organization to gather the external resources and integrate the personnel that can manage a structured methodology with which communty can promote the sensemaking approach. Furthermore, it requires the leaders and influencers who are committed to improving their own human capabilities[4] in order to be able to give back to the community.

At prototyping time, the project did not have the maturity to test this stage. Nevertheless, a similar behavior emerged naturally from two community leaders who did not mean to learn anything, but whose interest was planning a strategy that could help to expand the reach of the initiative to a larger number of people within their community. Nonetheless, there is a risk associated with to this behavior. These participants can perceive themselves and be perceived by other community members as the owners of the social transformation. Instead, they should be the drivers and influencers who promote new members to participate in and contribute to the expected result so that it remains a community achievement.

CONCLUSION

The roadmap established by CTC 4.0, navigates different epistemological and technological needs of a community in order to produce daily changes that produce a significant social impact. This approach demonstrates the importance of placing human development dimensions as a key element -alongside productive capabilities and digital competencies- to co-produce change with the community. The community and individual empowerment approach guarantees that the organization's service portfolio is focused on user's needs and living context. Thus, by giving a contextualized role to technology in the everyday life of a community, the CTC will be able to improve in different degrees and areas, the quality of life in the rural and vulnerable Dominican communities.

In the context of the Fourth Industrial Revolution, social innovation must be understood as a value co-creation process that by default generates a determined social impact. The three-stage funnel sums up the importance of adapting the sensemaking process to the epistemological and technological maturity of diverse social structures in a community. It also highlights that the development of the social fabric can add value to the function of appropriating the public space intelligently and supporting the use of technology to transform the local reality. This statement needs to become an organizational principle for social impact organizations in order for it to guide the strategic priorities as well as the daily activities to be developed.

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4   During this stage, the capabilities to be refined should be "excellence at work" and "aesthetic experience"

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RURAL COMMUNITY PARTICIPATION DIGITAL PLATFORM

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In Mexico, rural territory occupies 98% of the country's surface and contains 22% of the population. This territory is where the greatest intensity of poverty occurs. Most communities in the rural territory are sparsely distributed and have low and intermittent connection to the internet. Both aspects complicate communication and participation in decision making processes that affect them. A Biosphere Reserve (BR) is normally located in natural or rural territorial transects. The participation of the community and the stakeholders is necessary for the success of the BR. This community participation requires a broad spectrum of skills and the use of appropriate methods and technology. The "Rural Community Participatory Digital Platform" for the Sierra Gorda BR, México, explores current practices in communication and negotiation, as well as potential motivations, and obstacles that communities encounter to communicate and participate, through ethnography, participatory design and the use of digital technology. In the first stage, the researchers together with the community will co-design and develop a digital platform prototype and an itinerant participation station to improve and foster communication and participation. After that, the digital platform will be developed integrating different open source / GPL components. Among the media that is proposed to be used to gather information and engage people are interactive applications, games, information visualization tools and physical interfaces, adapted to rural contexts. The long term expectation is to create a continuously improved model that could be replicated in the rest of the Sierra Gorda BR and different BRs in Latin America.

Keywords: rural territory, biosphere reserve, community participation

INTRODUCTION

Globally, between 20% and 50% of the rural population occupies between 95% and 99% of the territory. Similarly in Mexico, about 25 million people, 25% of the country's population, currently live in 98% of the territory, which shows a very low territorial density. In 1950, the rural population was 57%, and in 1921, it was close to 10 million inhabitants representing 68% of the total population. The rural territory has large migration flows. Projections made by the National Population Council estimate rural population will decrease from representing 25.1% in the year 2000 to 21.1% in 2030 (Grammont, 2005).

Global issues such as population growth, climate change, renewable energies, water resources, and food supply have greatly affected the agricultural, social, cultural, economic, health and environmental status in rural areas. This is where the strongest changes are taking place such as the most intense concentration of poverty, lack of economic opportunities, shortage of jobs for young people, limited access to information, poor communications and housing, and inadequate health and education services (Thorbeck, 2012).

The current solution to this problem usually results in migration, especially of the young population, to the cities and to other countries such as the United States, abandoning their family, and the possibility of developing their place of origin: an environment rich in resources.
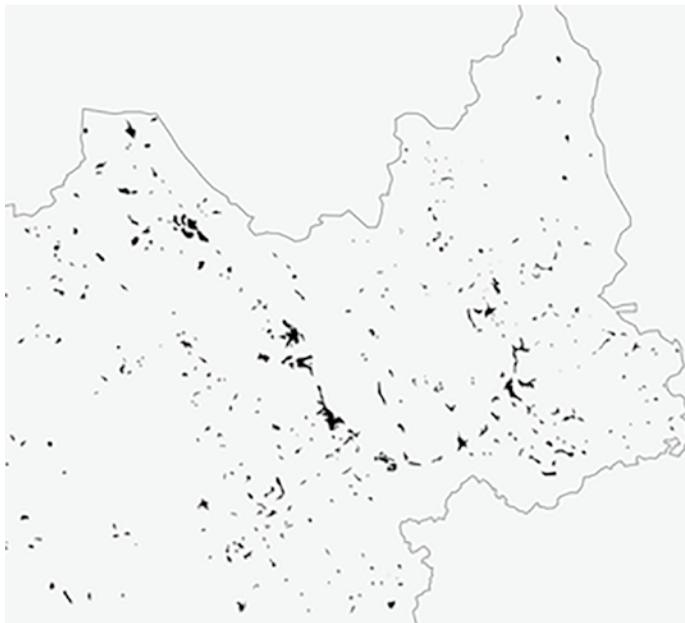
Most communities in the rural territory are sparsely geographically distributed. In addition, they have low and intermittent connection to the internet and telephone services. Both aspects complicate communication and participation in decision making processes that affect them.

The participation of the community and stakeholders is vital for improving the quality of life in rural communities. The designation of a Biosphere Reserve (BR) was designed by UNESCO to balance human responsibility for maintaining nature and the human need to use natural resources to enhance the social and economic well-being. They were explicitly designed to be experimental. One of the main functions of BRs is to be logistic support for demonstration projects, research, monitoring, environmental education, and training in environmental and social issues.

The figure of the BR is normally located in natural or rural territorial transects. In the second case, the participation of the community and the stakeholders is necessary for the success of the BR. If BRs want to become a locally accepted partner, all relevant stakeholders and local people should have the opportunity to have their voices heard. Facilitating high quality community and participation in the management of the BR requires a broad spectrum of skills, as well as the use of appropriate methods and technology.

Design schools and the profession have generally overlooked the rural issue, and few design schools are supporting the rural world in its positive development.

Rural Design (RD), a new design/critical thinking method applied to rural problems and opportunities, applies asset-identification and the problem-solving design process to locations in which a "design" strategy was rarely even thought of. In RD, themes can range from agrarian systems and food sovereignty, to land use in the territory, local landscapes and housing, to the different equipment and services that support the rural territory, a territory that provides food for 6,500 million people today and expected to provide 9,000 million with food by 2050 (Thorbeck, 2012). RD is concerned with issues that involve human beings in the rural environment and their quality of life. It integrates human and natural systems in a sustainable design process and relies on different disciplines to help the communities evolve their view about the spatial configuration of their environment, into a more holistic and systematic point of view, integrating the participatory process in which the community reviews alternative scenarios and multiple solutions (Wilson and Zamberlan, 2015).

Participatory Design

Designers, with different capacities and abilities, approach participatory design based on the reinvention of his relationship with the user, looking for a closer relationship with the community from a co-creation, more appropriate, effective and adaptable perspective. The designer has a fundamental role in collaborative and interdisciplinary teams that contribute to design using the creative design process (Wilson and Zamberlan, 2015). The NL undertakes the participatory design process as a tool for inclusion, the expansion of the collective power (Harvey, 2008) the improvement of governance structures (DiSalvo, 2010), and for the generation of positive social change. It involves a wide variety of stakeholders to reach the "real" needs (Apsan, 2016), applying the use of new information and communication technologies, and facilitating processes of User-Centred Design, generating more responsible results (Manzini E. and Rizzo, 2011). This derives in a more direct relationship between the technical knowledge of the designer and the user's practical knowledge (Shepherd S.K. and Achterberg, 1992), (Manzini E. and Rizzo, 2011).

Participatory design becomes a practice of social mobilization and a response seeking new meanings within social production (Fainstein, 2000) that lead to the utopian and alternative futures, including diversity, multiplicity and asymmetry between the agents with decision-making power, forming relationships of solidarity, alliance and trust, and including the idea of scale to solve local problems. This provides possibilities of adaptation, replicability, and an open-end that responds to the possibility of generating positive change in a sustainable manner over time (Apsan, 2016).

There are particular participation issues determined by the cultural characteristics from the different locations, as for example, different languages, which are difficult to identify. For this reason, it is necessary to discover, through ethnographic methods, participatory design and the use of digital technology, current practices in communication and negotiation, as well as potential motivations and obstacles that communities encounter to communicate and participate. A map of the current available infrastructure in the selected region should be developed as a starting point for a technological gap analysis.

DEVELOPMENT

There is an urgent need to design and develop a replicable model that includes digital and non digital tools to promote participation and communication among community members and relevant stakeholders in decision making processes that affect the BR in its three dimensions: social, economic and environmental. To solve this need it is important to first identify current practices in communication and negotiation among isolated communities and to geo-localize available technological infrastructure including cell phone, satellite and GPS coverage, and electrical supply. At the same time, it is crucial to diagnose potential motivations and obstacles that communities encounter to communicate and participate. Gamification and participative design can be powerful and effective methods to obtain all this information. As a result of a first exploration phase, the researchers together with the community will be able to co-design the appropriate methods and technology to facilitate communication, negotiation and participation platforms and mechanisms that involve all parties. In participative decision making and crowd-sourced design using digital tools to propose not just new uses and new approaches to place-building in the Biosphere Reserve, but new tools and technologies that help make these approaches possible.

Objective of the proposal

Diagnose, design, prototype and test a replicable model including a digital platform and non digital tools to promote participation and communication among community members and relevant stakeholders in decision making processes that affect the BR in its three dimensions: social, economic and environmental.

Methodology

1. Design and develop a methodology, as well as a digital platform prototype and the required technological infrastructure, to facilitate the gathering, sharing, visualization and analysis of the compiled ethnographic data.
2. Identification, through ethnographic research and technological tools, current practices in communication and negotiation among isolated communities in general and related to BRs.
3. Application participative design and gamification to diagnose potential motivations and obstacles that communities encounter to communicate and participate.
4. Identification and geo-localize available technological infrastructure including cell phone, satellite and GPS coverage, as well as electrical supply availability.
5. As a result of the ethnographic research and analysis, a prototype will be co-designed to evolve the digital platform, so that it enables long term knowledge sharing, as well as participation in social and environmental decisions for a sparsely distributed population.

Technological Proposal

To support the interviews, focus groups and participative design sessions that will take place with the community, a first digital platform and an itinerant participation station prototypes will be designed and developed. Both, the digital platform and itinerant station, will be tested directly with the community and will evolve iteratively according to their feedback and ideas. Interactive applications, different types of games, information visualization tools and physical interfaces, adapted to rural contexts within the BR, will be available to gather information.

Digital platform

The digital platform prototype will integrate open source / GPL components with the required new developed ones to perform the following functions:

A. Give support for designing and executing games and participative activities.
B. Gather and organize information resulting from the different research activities: interviews, focus groups and games, using fast and intuitive methods.
C. Visualize the collected data to allow filtering, comparisons, and pattern discovery.
D. Share information among the community and stakeholders.
E. Construct and publish visual narratives, games, artistic audiovisuals and other digital contents that allow sharing experiences and lessons learned, applied to solve the real, social and environmental problems of the rural environment.
F. Analyze compiled information through quantitative and qualitative criteria to support decision making and prioritize actions.
G. Provide tools to visualize and engage the results of different approaches to the design of community-focused places and resources.
H. Provide online / offline contents and synchronization.

As reference and inspiration for our digital platform we selected NVivo, Consul and Local Code. NVivo (http://www.qsrinternational.com/nvivo-spanish) is a digital tool that offers a place to organize, store and retrieve data. Textual, graphical, audio and video data are supported. Since NVivo is a powerful, but expensive platform that requires a lot of computer memory and processing power, we will take some of its characteristics and possibilities as inspiration to create a lighter system that can run in mobile devices. On the other hand, Consul (http://consulproject.org/en/) is an open source software platform that can be modified to suit different entity's requirements. The platform provides support for debates, citizen proposals, voting, among others. It

is considered to be the most complete citizen participation tool available today, so we are considering some of its features, as the voting and debate system, for our own proposal. Finally, Local Code: 3,659 Proposals about Data, Design, and the Nature of Cities (http://www.grahamfoundation.org/grantees/4984-local-code-3659-proposals-about-data-design-and-the-nature-of-cities) is a project that uses data driven, community focused approaches to evaluate and design for the ecological potential of vacant and underutilized land as a public resource. Since we are interested in participatory design and will be working with isolated rural communities related to BRs, the approach of this project will give us valuable insights.

Two of the members of the research team have worked in Story and Play (https://mmelon3.wixsite.com/investigacionarg), a project that explores how to foster participation and motivation through Alternate Reality Games (ARG). Results show that ARGs are immersive experiences that generate disposition for collaborative work. The project offers tools for creating and playing these types of games for the benefit of different types of communities. We plan to improve our web and mobile applications to provide online / offline contents and synchronization to collect community participation data, for further analysis, visualization, sharing results and decision making.

Itinerant participation station

The itinerant participation station will allow the research team to visit sparsely distributed communities, getting closer to people and engaging them to share their experiences and points of view. A combination of digital and non-digital resources will be stored in the station, including mobile tablets with specific software installed, as well as diverse printed materials, physical boards and games to facilitate people participation. The itinerary station will be easily set up, disassembled and transported in a standard pickup. Due to its compact size and design, it will be easily used in public spaces (See Fig. 2). Since electricity and internet are not always available in rural areas, the station will hold energy stand-alone sources for charging mobile devices and an internet access point hub to provide connection and access to the digital platform. If internet access is lost or is not available, information will be saved locally. Synchronization between off-line and on-line contents will be provided as soon as connection to the Internet is restored. A turntable animation of the itinerant station can be seen at https://urlzs.com/B94yZ.

A successful example of this approach is Mobile School (https://www.mobileschool.org/en) where an itinerant artifact for educational purposes is used. This project empowers street kids by using a cart on wheels, with extendable blackboards, that

RESULTS

We hope this research will have a potential impact in the quality of life in the community by allowing participation in spite of different obstacles as long distances, different languages and diverse cultural differences, fostering synchronous and asynchronous participation, while developing a sense of belonging to the BR community.

Furthermore, it is expected that the project will help people share productive initiatives in areas such as agriculture, energy, biodiversity and environment preservation, improve communication among the community and the stakeholders, enable and model a process of co-design and co-creation for shared places and resources in the BR community, at the same time it speeds up decision making.

CONCLUSION

The long term expectation is to create a continuously improved model that could be replicated in different BRs in Mexico, in Latin America, North America and the rest of the planet.

The main opportunities for building on the results of this project are:

Mid term iterative evaluation and improvement of the prototype platform in the pilot community (Valley of Tilaco) to evolve from the prototype to a robust version of the platform and a full transference and appropriation of the platform and itinerant station operation by the community.

Continuous improvement of the platform and expansion of its scope, implementation, transference and appropriation in every community comprised within the BR of Sierra Gorda de Querétaro. From learned lessons of Sierra Gorda BR experience, evolve the model and the platform to be implemented in other BRs in the world.

The opportunity to further develop digital and participative design tools in other communities in the U.S. and Mexico.

The three levels of government (municipal, state and federal) are potential partners for the scope expansion of the project. Resources devoted to the BRs by international organisms as UNESCO could also serve to:

1. Support the project.
2. Fund communities initiatives in areas as agriculture, energy, biodiversity and environment preservation.
3. Generate confidence to promote participation and involvement.

includes educational learning games that can be easily installed. The package covers diverse themes, which makes it possible to offer street children a wide-ranging basic education. This project has been our inspiration because of its success in different cities around the world. We consider it is a feasible model for the rural context, if we guarantee by design its capacities for energy and contents self-sufficiency. As possible solutions for the energy self-sufficiency capacity, we had considered solar panels, rechargeable batteries and electromechanical generators. In terms of digital contents, we have considered the use of applications installed in mobile devices that could work online/offline with synchronization. Combinatory configurable game boards, booklets, card games and diverse printed materials will be used as non digital contents.

To deploy iteratively the platform, the itinerant station and its components, it is proposed to start with a prototype microsmart-grid based in the Valley of Tilaco, a 3x6 km valley with 900 approximate inhabitants in the region of the Biosphere Reserve of La Sierra Gorda de Querétaro, Querétaro state, México. Once the prototype starts working, iterations with the corresponding improvements detected through community interaction, could be replicated and then transferred to the rest of the region of the Biosphere Reserve of La Sierra Gorda de Querétaro.

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INSIGHTS FROM A DESIGN-LED INQUIRY ABOUT RURAL COMMUNITIES IN BRAZIL

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This paper describes the trajectory of an inquiry about rural communities in Brazil that was simultaneously an inquiry about the "research-practice gap". The journey begins in 2014, when the authors carried out an experimental qualitative research project about sustainability in rural communities. Within the field of public policy research, an interdisciplinary team visited six ecovillages and six settlements created by Brazilian agrarian reform (assentamentos), gathered multimedia data through interviews, pictures, observations and documents, and analyzed them by using a constructivist approach. As outputs, besides the usual PDF, the project produced artifacts focused on reaching out audiences beyond academia. It also resulted in the creation of OndaPolitica, a start-up centered on experience design that translated some of the insights into experiments. In this paper, we narrate the first large phase of our journey (from 2014 to 2015) and explore how an academic research project designed to go "beyond a PDF" opened up possibilities to further understand connections between rural and urban spaces.

Keywords: research communication, sustainability, ecovillages, Brazil, constructivism

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HYBRID LANDSCAPES: EXCHANGES BETWEEN ART, DESIGN AND TECHNOLOGY IN THE URBAN INTERFACE

In the complexity of the contemporary scene, there are as many possibilities as there are intersections where art and design, mixed with technology, recall its innate characteristics. These relationships shape hybrid disciplines where designers and artists, as cultural agents, are deeply related during the different stages of any cultural production: the creative process, the methodology, the development, the implementation, the analysis. This research takes an extensive journey through the different interpretations of the urban space: as an "interface", following Scolari's definition (2018), as "territory" (Deleuze, 1997) and, at the same time, as a "non-place" (Augé, 1996). The work of designers-artists, the action of users-observers and the placement of interactive objects in urban experiences and urban interventions create the aesthetic experience of each user-observer (Careri, 2013) and each path taken constitutes in itself a new landscape. At the same time, the study of "fake" and "original" concepts from eastern cultures (Byung-Chul Han, 2016) contributes to explore the evolution of these disciplines and agents. Theories, design projects and artworks analyzed through cartographic methodologies suggest that the evolution of art and design in the contemporary and urban context has developed as a rhizoma. Thus allowing a hybrid definition of the cityscape as part of the cultural heritage of modern cities. This hybrid approach may offer designers and artists a way to find a new and more relevant role in thinking, imagining and designing the societies and the cities of the future.

Keywords: contemporary culture; hybrid landscapes; technology; urban space; art and design

INTRODUCTION

In the complexity of the contemporary scene, in the intersections of art, design and technology, ideas about the future are constantly being revised. In this context, we must identify the passer-by, its environment and journey, in order to understand how art and design, as culture-building disciplines, work together in the urban space.

This research aims to recognize a framework to study contemporary definitions associated with art and design. These definitions diverge and become specialized and, in doing so, the concepts of art and design become indivisible, even more, thanks to the inclusion of technology.

This analysis is feasible when dealing with the historical relationship of the aforementioned disciplines, from the context of urban techno-aesthetic interventions. To do so, we aim to identify and analyze urban techno-aesthetic interventions and experiences that offer a way for contemplation and projection of contemporary social and cultural constructs. These experiences propose ideas for the cities of the future as a way to problematize the urban space (understood in its physical objectivity and its virtual subjectivity) and the way in which passers-by inhabit it.

It can be said that the situationist work "New Babylon" -a proposal of a city built for the homo ludens- of Constant Anton Nieuenhuys (1956) began to explore the construction of situations that established new behaviors of cities based on the Theory of the Dérive (Debord, 1958). It is about the design of a new gamified urban space of a situationist city: an urban artwork, designed. Sixty years later, Carlos Ruiz (2015) weighs in the influence of technology and proposes the idea of a new digital polis in which we can understand virtual space as a globalized space where citizens wander around and, in this way, enable the construction of new societies.

Among these projects, we find several interventions, works and experiences that take place in the urban space. Some of them are: situationist maps of Guy Debord, like "Guide psychogéographique" (1957); happenings of Marta Minujín, such as "Sound Happening" (Washington D.C., 1972); light and hydrokinetic works by Gyula Kosice, such as the "Hydrospatial City" (developed between 50's and 70's); "Aerocene" project by Tomás Saraceno (2015); and experiences built in the spatial duality of real and virtual worlds, like the videogame "Pokémon GO!".

These examples show how complex and diverse art and design interventions are when aimed at questioning contemporary culture and prepared to establish a reflection on our social imaginary. From Scolari's (2018) definition of "interface" we could say that "urban interface" considers urban space as a system capable of dialogically relate different human and technological actors to each other and to their social, economic, political and cultural context.

THEORETICAL APPROACH AND ANALYSIS

Language's hybridization is a concept found in Jacques Derrida (1990), Antoni Mercader (1980) and García Canclini (2001) pieces of work and theories about modernity and its dissolution. Hybridization originates areas of coexistence, encounters and connections. It becomes a powerful concept that promotes relational processes taking advantage of procedures and methodologies created in other areas.

Hybridization theories are more present in the field of art where they have found more fertile ground, given that art lost its auratic character and the idea of uniqueness of the piece of work. In the complexity of the contemporary scene, art and design, mixed with technology create hybrid works.

This research presents a design process that follows a cartographic methodology. It proposes the analysis of different cases of study selected from a survey of urban techno-aesthetic interventions and experiences of the period 2009-2019 in Latin America.

From this approach, we explore hybridization between art and design found on contemporary techno-aesthetics, with the intent of making visible what is hidden and enabling new relationships. This analysis is conducted following four axes:

- art-design relationship as a hybrid approach
- techno-aesthetics interventions and experiences as a way to understand contemporary urban space
- technology as virtuality and resignification
- passers-by as user-spectators in the extended reality setting

Art-design relationship as a hybrid approach

"Aerocene" project by Tomás Saraceno (2015-present day)

Saraceno's project "Aerocene" is a particular case of hybridization. It is a multidisciplinary project that addresses the problem of the environment from an ethical and scientific perspective. It also focuses on how to generate energy without using fossil fuels or other toxic components. His work is scientifically supported and it is feasible as it's designed with an interdisciplinary methodology in mind. The project intends to guide society towards an improvement in its scientific, political and environmental practices.

Figure 1. Performance from Aerocene project at Salinas Grandes (Jujuy, Argentina, 2017).

As Flusser (2002) argues, culture is what man produces beyond nature. While culture is an artifice, nature is given. Art and design are creations, artifices and, therefore, culture.

Flusser states that the division between artifice and nature is justified in the human need to create something that surpasses the natural, shaping its own world, its own cultural universe.

From a contemporary point of view, design exists in complexity and needs an open definition to enable thinking about the future. According to Diego Pimentel (S/F), the contemporary context is characterized by increasing complexity, technological acceleration, globalization and virtualization. "Each culture is built by its way of seeing reality", Pimentel says and states that the dialogue between art and design takes place in every creative process.

According to Terry Smith (2012), it is not feasible to define contemporary art. This is an "open field" concept. Smith's view approaches the study of Rosalind Krauss (1979) on sculpture in the expanded field that defines this art form within its own genesis and not as the difference between what is not-landscape and not-architecture. In addition, concepts such as expanded cinema and expanded video, that gave birth to video art (Alonso, 2005, 2006), follow this same idea.

"Aerocene", a series of prototypes exhibited at different times in different cities around the world, seeks to focus attention on air, the natural environment that seems difficult to understand but is essential for life. This project researches the limits of science at the service of artistic creation. In contrast to the Anthropocene concept, it explores an ethical and sensitive way of addressing global issues such as energy consumption without the use of fuels.

Techno-aesthetics interventions and experiences as a way to understand contemporary urban space

Celebrations of the Argentine Bicentennial by Fuerza Bruta (Argentina, 2010)

Numerous art and design projects question the urban interface and make utopian or dystopian proposals around urban and social constructs. This urban space setting becomes possible by the irruption of digital and electronic technologies in the fields of art and design.

Mariela Yeregui (2013) approaches the idea of territory from a Deleuzian vision: the physical-geography of the terrain in connection with the social, subjective, imaginary, community and symbolic aspect builds agency. This allows the construction of meaning, language and culture. Thus, we can say that artificial defines the territory.

As agents move, they shape the territory they experience, enabling processes of deterritorialization and reterritorialization. These instances modify the perception and appropriation of urban space.

Fuerza Bruta performed a parade at May Revolution Bicentennial's celebrations in Argentina that required the participation of 2,500 performers, accompanied by millions of spectators. This action took place as an experience-journey through urban space. These agents shaped an extremely complex project of impressive articulation that, thanks to the approach of the journey as experience, allowed the resignification of space as a place, for having been developed in spaces usually used for political and cultural demonstrations and the reinforcement in the national identity construct.

Figure 2. Parade float representing "Madres de Plaza de Mayo" for the Argentina Bicentennial celebrations (Buenos Aires, Argentina, 2010).

Urban space aesthetics are defined by passers-by behavior. Marc Augé (1996) introduces the concept of "non-place" to define those spaces without identity, "spaces of anonymity", where there is no appropriation, where relations are exclusively for consumption or transit, such as supermarkets, airports, trains, planes.

According to Careri (2013) "... walking becomes man's first aesthetic act, penetrating the territories of chaos (...). This simple action has given rise to the most important relationships man has established with the land and territory." If we consider that the journey-path is an aesthetic action, walking constitutes its practice; the form of experience and space is culturally modified, whether or not a physical trace is left, and, thus, creating a notion of "place". This somehow updates the relationship between space with each passer-by defying the idea of "non-place" posed by Augé.

Francesco Careri (2013) identifies a difference between land art and other interventions, such as the story of the artist Tony Smith, published in 1966 in the "Artforum" magazine, where he narrates his experience when travelling a highway under construction throughout the night. Unlike land art and other proposals that work on the construction of the architectural space, the author supports the idea that transurbancy forms an aesthetic experience of walking.

Changes in social practices in urban space (given by behavior and conformations modified by technology), inevitably lead to new ways in which societies currently inhabit cities, following the theory that defines "inhabiting" according to Roberto Doberti (2011).

These multiple meanings of urban space can be found in the parade of the Argentine Bicentennial. It consisted of a series of moving scenarios where historical moments were depicted as the journey-path progressed. Scenographic constructions and performative actions supported by technology allowed scenes of great impact even in the apparent austerity of resources. These actions were aimed at changing the experience of the passer-by in a specific space and at a particular time.

Technology as virtuality and resignification

"Suaveciclo" project Ceci Soloaga + Ygor Marotta (Brazil, 2011-present day)

Coming from the design industry, John Maeda (2017) delves into new dimensions of designers. It addresses interdisciplinary work, hybridization, multiple authorship and other concepts that demonstrate the contemporaneity of these disciplines. Boris Groys (2018), from an artistic perspective, explains co-authorship as the idea of project work and the relationship with political and cultural dimensions of these disciplines.

Figure 3. Mapping projection by VJ Suave on São Paulo (Brazil, 2013).

The link between art, science and technology has developed a profound dialogue since its conception in ancient Greek thought. The words art and technique derive from the same word: tekné; science was considered "poiesis": creative thinking (Rodrigo Alonso, 2006). The technological landscape presented by contemporary technopoetics (Claudia Kozak, 2015) recalls the creative meaning of this relationship and transcends the traditional divide given by modern culture. An idea that has also evolved in the field of design.

Contemporary design renews this relationship. Tomás Maldonado (1995) expresses the importance of technology's creative potential, not as a mere representation of reality. Technology takes up its origins of technique and representation to build virtuality as an expanded form of reality that resignifies it at the same time.

One of the projects surveyed and analyzed is the mobile video mapping of "Suaveciclo", a duo of artists that presents their visual imaginary interacting with its urban context. The proposal builds a live audiovisual narrative. This dialogue between the characters and space, based on the obvious visual contrast, explores the scope of virtuality from the technical aspect and from its possibilities of resignification since the image mounted on real scenes can build other mixed imaginaries. In this way, it presents a city built from the conscious intervention of its spaces, mediated by performative action and centered on the experience of the act of travelling as an aesthetic practice in itself.

Passers-by as user-spectators in the extended reality setting

"Sandbox" project by Rafael Lozano-Hemmer (Mexico, 2010)

As described by Alonso (2005), intersections between art, science and technology and the expansion of media to the margins of the semantic and narrative universe, carried out various transformations since the mid-twentieth century.

Yeregui (2008) explains that the plural nature of electronic arts, its approach to discursive and aesthetic hybridity, defines its dialogical and multidirectional character, allowing multiple authorship and user participation, creating a scheme of subjects-makers and subject-spectators who eventually become makers.

Jim Campbell (2000) says that there is a substantial difference between design and art in their relationship with technology. In interactive art, the interface can allow users to experience it in depth or frustrate their experience. The interface that becomes predictable does not allow to connect with the viewer. In contrast, a structure of complex perception could achieve a higher level of interaction and, therefore, a deeper connection with the viewer-user.

"Sandbox" by Rafael Lozano-Hemmer (2010), presented for the first time in 2010 on the Santa Monica beach (USA), is a large-scale interface that connects two separate, but close-by, physical spaces. On one place, one small sandbox within reach of visitors with projected figures as small spots; these are people walking on the beach. Visitors can position their hands on the box and they

Figure 4. People interacting with "Sandbox" (2018).

will be projected on a giant scale on the beach, over the people passing by. The visitors will also be projected in the box.

The role of the spectator becomes crucial since his intervention creates the work's meaning. This dialogue between both spaces makes the user presence indispensable. Without it, the artwork is nothing more than a cluster of illuminated sand.

These interaction ideas represent a way of hybridizing design and art as a strategy, given the relationships of intention and perception between artist-designer, viewer-user, work-project and urban interface. De Certeau (2000) borrows the idea of strategies and tactics originally associated with military forces to define the roles involved in a relationship of power. Strategies allow one of the actors to define a set of possibilities, determine the place and own it, impose guidelines to manage the relationships with other actors. Through tactics, these other actors will explore the possibilities of action on this established environment. They will focus on carrying out the allowed movements at the precise moment and thus, at times, create new possibilities through different strategies.

The strategies offered by Lozano-Hemmer in "Sandbox" reduce the possibilities of interaction by making available only an empty stage to the spectators. Possible user tactics will have to do with the intervention or addition of other elements that become an image and can dialogue with both sides of the artwork. In the large-scale projection on the beach, space is left open to the performative intervention of the spectators. These possibilities contribute to meaning making. Without user and without interaction there is no artwork left.

RESULTS

In this journey through the different conceptions of urban space, we identified intersections between design and art without losing sight of their specifics. In hybridization, it is possible to recognize the tensions among the differences. As we recognize the points in common and the nuances of the disciplines involved we identify multiple lines of flight in their hybridization revealing an evolutionary pattern that works as a rhizome.

In other words, we consider art and design hybridization appears as they approach each other and other disciplines; with each touch, we found not intersections but lines of flight that contribute to an expanded field. This expanded view can be applied to the works and projects analyzed. We can then understand how these proposals modify the role of the passer-by in the urban interface, which works as a global space where citizens (passers-by) wander freely, enabling the construction of

new societies according to Augé (2000) and Ruiz (2015). Passers-by that wander modify flows created by other cultural actors (subject-makers), who in their journeys conceive their own techno-aesthetic experiences and build their own hybrid landscapes.

Regarding the joint, albeit unequal, construction between artist-designer and spectator-user, Scolari (2018) identifies the idea of coevolution as a process formed by both actors and their context and relationships. Adding the ideas of De Certeau about the relationship between strategy and tactics and those of Campbell about the exchanges between artist and spectator-user we determine a dialogical evolution centered on the interdependence of both parties, on the changes in the rules of the interfaces and the deviant uses (or tactics) of the users.

To understand how the rhizome of art and design behaves, we can establish parallelism with certain concepts of eastern cultures. According to Byung Chul-Han (2018), in China, the fake has no less value than its original because it actually presents an opportunity for improvement. A technological object that copies the properties of its predecessors and creates something new is more valuable than the original version. Chul-Han proposes a positive version of the exchange between disciplines as a necessary part of the evolution of products or research projects. In eastern cultures the value of historical objects is replaced by the effort for conservation, renewal and permanent change as part of the object's identity. Change, updates and transformation are more important than preserving an unaltered original.

CONCLUSION

We may say that art and design defined as disciplines in the expanded field draw maps. These maps can be seen in multiple ways but they will never remain the same. Given this framework, we analyzed different works and projects according to the four axes previously described. Contemporary techno-aesthetics, or art forms that highlight the merging between technology and art as defined by Kozak (2015), show the way in which art and design hybridize.

When this hybridization happens, the spectator becomes a user that can modify the artwork in multiple ways or assume the role of the prosumer in a transmedia narrative. These principles of connection and heterogeneity respond to the premises raised by Deleuze (1980) and in this way, it is possible to determine the evolution of the disciplines researched from a rhizomatic perspective. Art and design can be comprehended following the lines of flight of their relationship, identifying the ways in which they overlap and how they relate with other disciplines. In doing

so, they modify the urban space, or urban interface, creating hybrid forms for the passer-by to wander around.

In a technological sense, Deleuze does not consider virtual as opposed to real, but rather as a generative dimension: virtuality produces materialities. We may say that virtuality produces new ways of inhabiting.

In this research, we have tried to find a common framework to analyze art and design as disciplines that propose a constant review of social and urban reality. It does not pretend to be an overarching idea, but an initial proposal to build on. Thus, establishing a way for designers and artists, given their role in the construction of culture, to build new ways of inhabiting the cities of the future.

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Figures

Figure 1. Performance from Aerocene project at Salinas Grandes (Jujuy, Argentina, 2017). Published by Joaquín Ezcurra in https://forum.aerocene.org/t/salinas-grandes-jujuy/47 / CC BY-NC-SA 4.0 https://creativecommons.org/licenses/by-nc-sa/4.0/

Figure 2. Parade float representing "Madres de Plaza de Mayo" for the Argentina Bicentennial celebrations (Buenos Aires, Argentina, 2010). Published by Juan Ignacio Garay in https://www.flickr.com/photos/elsanchoel/4648311577/in/album-72157624032817875/ / CC BY 2.0 https://creativecommons.org/licenses/by/2.0/

Figure 3. Mapping projection by VJ Suave on São Paulo (Brazil, 2013). Published by Markus Dorninger in https://www.flickr.com/photos/mador/8758698345/in/photostream/ / CC BY-NC-SA 2.0 https://creativecommons.org/licenses/by-nc-sa/2.0/

Figure 4. People interacting with "Sandbox" (2018). Published in http://www.lozano-hemmer.com/images.php / CC BY-NC-SA 3.0 ES https://creativecommons.org/licenses/by-nc-sa/3.0/es/

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FINDING A NEW COMMONS: ARCHITECTURE'S ROLE IN CULTURAL SUSTAINABILITY FOR JAPAN'S SHRINKING REGIONS

Media representations of Japan's dynamic cities belie a growing national phenomenon. Urban migration, a declining birthrate and an aging population have transformed Japan's countryside over the past 30 years. These demographic changes have resulted in socio-economic decline, abandoned buildings and loss of regional culture. My Masters thesis explores architecture's role in facilitating cultural sustainability, education, and community connections to landscape.

Despite the negative impacts of depopulation, some rural communities are embracing shrinkage and attempting to preserve their regional cultures. This poses a challenge for architecture, a profession dependent on urban and economic growth. In the unfamiliar context of shrinkage, architects need to leverage existing buildings and resources to design "after" growth. This means refocusing on building re-use, community engagement and program design. As we move towards a future less preoccupied with accelerated productivity, architecture must become more interdisciplinary.

Among the many leftover building in Japan's rural areas, the public school is becoming increasingly prevalent amidst waning fertility rates. These structures are imbued with collective memory, and this history creates interesting opportunities for reuse. Additionally, the architectural flexibility of these schools makes them compelling sites for design interventions. Often central places in their communities, my research studies how the adaptive re-use of the buildings could generate new micro-economies and rural lifestyles. My research focuses on abandoned schools in three geographically unique regions in Japan: Sado Island, Kamocho and Kamiyama.

The research studies the potential outcomes of re-using a building type influenced by its country's social, political and economic forces. The research will present emerging methodologies for designers working in depopulated communities, including ethnographic and participatory strategies. Ultimately, the research questions how architecture can reassemble vanishing communities on the verge of cultural decay.

Keywords: Depopulation, Shrinkage, Rural Landscapes, Material Culture, Adaptive Reuse, Culture, Social Design

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AGROLAB: A LIVING LAB IN COLOMBIA FOR RESEARCH AND EDUCATION IN URBAN AGRICULTURE

An environment for the multidisciplinary interaction is proposed at the Universidad de los Andes in Bogotá for research and education in urban agriculture, and for the wellbeing of the participating people and communities. The illustrated AgroLab implements the Living Lab innovation process in order to maximize the opportunities of collaboration and co-creation with the objective of integrating the traditional knowledge with human and scientific disciplines. Different food production technologies and strategies are compared and investigated within a context of experimentation, exploration and discovery seeking both a local and regional impact. Within this paper, it is shown how the proposed AgroLab allows the generation of both research and educational outcomes, along with the wellbeing of the involved people and communities.

Keywords: Urban Agriculture, Living Lab, Research, Education, Wellbeing

INTRODUCTION

Food security is a fundamental challenge since global population is exceeding 7.2 billion and is continuously increasing. In 2050, population has been estimated to reach 9.6 billion with more than 60% living in urban areas (United Nations, 2014). To meet the growing demand of food, the agricultural sector productivity must increase, as one of the premises of sustainable intensification (Garnett, 2016). It is estimated that in 2050 the productivity will need to be almost 50% more than that of 2012 (World Bank Group, 2016).

In Colombia, the situation is even more extreme. According to the national Rural Agricultural Planning Unit (UPRA), *Colombia* is currently using only about a third of its available agricultural land and agriculture is characterized by low levels of technology. Moreover, a 2017 survey showed that 80.45% of the total population lives in urban areas (Statista, 2017). Along with the increment of the available agricultural land and the improvement of the adopted technology, it is fundamental to develop consolidated practices of urban agriculture. In fact, this activity provides fresh food, generates employment, recycles urban wastes, creates greenbelts, and strengthens cities' resilience to climate change (Thomas, 2014).

Urban agriculture (UA) is defined as "the growing, processing, and distribution of food and other products through intensive plant cultivation and animal husbandry in and around cities" (Brown and Bailkey, 2002). While UA has been around for thousands of years, only during the past century, and especially the past decade, has taken off (Vasey, 2002). The main reason can be identified in the increasing consciousness of people concerning sustainability and health (Tornaghi, 2014).

Progress in *information and communication technology* (ICT) is having a profound effect on modern life (Warschauer and Matuchniak, 2010). These technologies have been responsible for the fourth industrial (Lasi et al., 2014) and knowledge revolution (Harnad, 1991). ICT technology may play a fundamental role in modern UA allowing more efficient cultivation practices and a different human interaction. Therefore, it is fundamental to integrate modern technology into traditional UA systems for the development of efficient and attractive UA practices.

Research and education in UA require a *multidisciplinary approach* through the integration of multiple actors and disciplines (Dawson and Morales, 2017). Food design and production in cities is not a task just for scientists, engineers, technicians and specialists in agriculture. For example, the study of the human behavior from anthropology, sociology, design and business can provide inspiration for the development and validation

of practices such as food production, use and interaction. Innovation and education centers for UA need physical spaces and methodologies for allowing and facilitating multidisciplinary interactions, being one of this approaches the Living Labs.

Living Labs have been used for the investigation of solutions to complex and multidisciplinary problems (Eriksson et al., 2005). A *Living Lab* is a user-center (Beamish et al., 2012), open-innovation ecosystem (Almirall and Wareham, 2011) that integrates concurrent research and innovation processes (Bilgram et al., 2008) within a public-private-people partnership (Etzkowitz and Leydesdorff, 2000). The Living Lab innovation approach uses and integrates the Design Thinking process (Brown, 2008). Living Labs are not just simple testbeds since their philosophy is to turn users, from being observed subjects for testing modules against requirements, into the main actors of the innovation process.

Consolidated systems and practices that integrate modern technology into UA are not available yet. Therefore, the objective of this work is to define an AgroLab for investigating and teaching the role of modern technology into traditional UA production systems. Due to the complexity of the problem, this paper proposes the adoption of the Living Lab multidisciplinary and user-oriented innovation process.

AGROLAB UNIANDES

The mission of the AgroLab Uniandes is to: *"Provide an open-space for the dialog, co-creation and experimentation in which traditional, experience and specific knowledge are integrated for the research, education and awareness raise concerning food production, use and interaction"*. An IDEF0 diagram (Buede, 2009) of the AgroLab Uniandes is shown in Figure 1. The physical system is represented in the middle. Then, its inputs are placed on the left-hand side, while outputs on the right-hand sides. Eventually, the adopted innovation process is positioned at the bottom. Moreover, the

Figure 1. IDEF0 diagram of the AgroLab Uniandes.
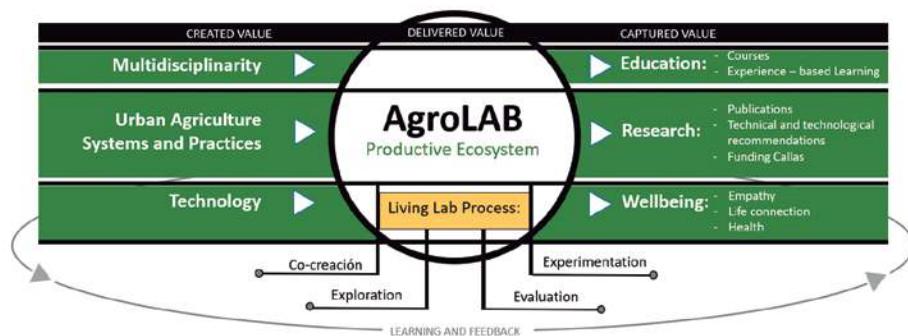
AgroLab Uniandes, and its inputs and outputs can be mapped into the typical elements of a business model showing how the proposed ecosystem creates, delivers, and captures value (Osterwalder and Pigneur, 2010). Next, the different elements of the AgroLab are illustrated.

Inputs

Inputs represent the selected ingredients that are necessary for the AgroLab innovation process. The following inputs can be identified:

- *Multidisciplinarity:* the integration of agriculture and technology needs creative and innovative interactions in which the traditional knowledge is integrated with human and scientific disciplines;
- *Urban agriculture systems and practices:* the foundations of the AgroLab are the traditional UA systems and practices. In fact, these elements constitute the base through which different technical and technological scenarios will be evaluated;
- *Technology:* modern technology triggers the innovation process based on the interest from users and communities to identify its role within UA.

Productive Ecosystem

The productive ecosystem uses two elements for turning inputs into outputs: (i) innovation process; (ii) production systems.

Innovation Process

UA involves different disciplines and actors. Generally, people use a certain innovation only if they completely support and accept it. For this reason, the user-oriented approach of the *Living Lab innovation process* is selected for its ability to involve users throughout the whole innovation process by means of the following activities (Pallot et al., 2010): (i) co-creation; (ii) exploration; (iii) experimentation; (iv) evaluation.

Production Systems

In the last years, agriculture has followed the trends of the industrial domain. In agriculture 1.0, agricultural operations are either manual or actuated through animals/motors and decisions are entirely taken by humans. In the '40s, electro-mechanical devices were introduced allowing on/off control systems. Agriculture 2.0 uses these devices for automating few agricultural tasks as irrigation. In the '70s, the launch of microcontrollers and

servomotors allowed to agriculture 3.0 enhancing the flexibility, the precision and the number of automated tasks. Nowadays, agriculture 4.0 (or precision agriculture) is defined as the integration of agriculture 3.0 with the modern ICT tendencies as machine learning and internet of things (Zhang et al., 2002).

The AgroLab is going to investigate different productive systems for UA and to identify the role of modern technology in the development of consolidated cultivation practices. This is the reason why different types of productive systems have been deployed with different technological support spacing from traditional agriculture 1.0 towards agriculture 4.0 systems. A mapping of the AgroLab production systems and the corresponding agriculture era is presented in Figure 2, while the implemented systems are next illustrated:

- *Traditional Urban Agriculture:* both farming pots and vertical farming are implemented in order to prototype the most widespread UA systems. Agriculture operations are performed manually with the only exception of irrigation that can be controlled through timers;
- *Hydroponics:* plants are grown without soil by instead using mineral nutrient solutions in a water solvent (Jones, 2016). Fertigation is controlled based on signals received from sensors and optimal fertigation strategies may be defined through data-based approaches;
- *Aquaponics:* combination of conventional aquaculture with soilless culture for the generation of a symbiotic environment (Diver and Rinehart, 2000). Water recirculation and oxygenation are controlled by means of sensors and optimal fish-feed strategies may be defined through data-based approaches;
- *FarmBot:* Cartesian coordinate robot farming machine (Aronson, 2019). Sowing, mechanical weed control and watering are automatically controlled and can be optimized through data-based approaches.

The different systems have been designed in order to architecturally integrate within the existing physical space and to generate an emphatic open space in which people can learn and relax by contemplation.

Outputs

Outputs indicate the deliverables that are generated from the planned AgroLab. The following outputs can be identified:

- *Education:* in terms of development of new multidisciplinary courses and of integration of experience-based learning activities within existing courses;
- *Research:* the AgroLab creates new academic knowledge and knowledge for practitioners respectively in the form of research publications, and technical and technological recommendations. Eventually, the novelty and importance of the topic favors the generation of proposals for funding calls;
- *Wellbeing:* in terms of: (i) empathy: people from different scientific and social background interacts showing affective and cognitive empathy (Rothschild, 2006); (ii) life-connection: the activity of growing living beings as plants and fishes brings to different benefits such as wellbeing and serenity (Kingsley et al., 2009); (iii) health: growing their own food raises people awareness concerning food production, use and interaction. It is common for urban farmers to change their eating habits due to this activity (Simon, 2014).

State of the art

In this section, three state of art agriculture laboratories are illustrated in order to identify similarities and differences with respect to the proposed AgroLab.

Agrolab in Madrid

This laboratory is a participatory farming laboratory settled in Madrid and founded in 2015 (García-Llorente et al., 2019):

- *Mission:* reactivating the agriculture sector in rural and periurban areas of Madrid;
- *Inputs:* rural communities are integrated with urban dwellers and local authorities. People present different levels of expertise, and practitioners collaborate with technical specialists such as irrigation and renewable energy experts;
- *Productive ecosystem:*
  - Innovation Process: the living lab conceptual approach is adopted, along with the ecosystem service lens (Duraiappah, 2015);

- *Production Systems:* drip irrigation systems powered through solar energy panels and triggered based on meteorological conditions sensed through a weather station;
- *Outputs:*
- *Research:* development of sustainable agro-ecological practices such as irrigation systems and renewable energy;
- *Education:* one practical training program was designed for the development of specialists in the agriculture sector;
- *Wellbeing:* the principles of the Agrolab are continuity, openness, realism, empowerment, and spontaneity. This shows the positive effects that the initiative has on the participants.

The MIT Media Lab OpenAg™

"The MIT Media Lab Open Agriculture Initiative (OpenAg)" was founded in 2015 (Castelló Ferrer et al., 2019).

- *Mission:* builds open resources to enable a global community to accelerate digital agricultural innovation;
- *Inputs:* (i) technology: state-of-the-art automation and controlled-environment devices; (ii) actor: brings together partners from industry, government, and academia; (iii) community: the open-source model allows the participation of a community of users mainly coming from the technological domain;
- *Productive ecosystem:*
- *Innovation process:* creation of an open-source ecosystem of technologies that enable and promote transparency, networked experimentation, education, and hyper-local production;
- *Production systems:* food computer: personal controlled environment for the implementation of "climate recipes";
- *Output:*
- *Research:* the aim of the research of OpenAg™ is to generate sustainable food systems;
- *Education:* the OpenAg EDU has been piloting Food Computers in classrooms to help students learn STEM skills and engage in a hands-on, citizen science project on the future of agriculture, including work to mitigate its environmental impact;
- *Wellbeing:* Lab OpenAg™ is an open-source project and it relies heavily on the technological community to co-create the future of agriculture.

The Sustainability Innovation Lab at Colorado (SILC)

This laboratory was founded in 2016 (University of Colorado Boulder, 2019):

- *Mission:* to develop the knowledge, capacity, partnerships, technology, and diverse workforce to accelerate the transition to a more sustainable world and educates the next generation of researchers, communicators, and innovators who will lead this change;
- *Inputs:* SILC's impact-oriented research includes engineering, physical and natural sciences, social science, social justice, psychology, humanities, business, law, computer science and other disciplines. This laboratory fosters relationships with researchers, fellows, students, public and external partners;
- *Productive ecosystem:*
- *Innovation process:* developing, testing, and deploying high impact solutions to sustainability challenges;
- *Production systems:* the primary orientation is towards data or technology-supported approaches to complex problems with an emerging capacity in land planning and sustainable food systems;
- *Outputs:*
- *Research:* SILC generates technological recommendations by means of decision-making tools in the field of food security, land restoration, climate change adaptation and biodiversity conservation programs;
- *Education:* SILC trains students in technological and quantitative methods needed in a modern workforce. Its Global Sustainability Scholars (GSS) program brings together undergraduate students and professionals to work with leading scientists on critical sustainability challenges that face communities and environments;
- *Wellbeing:* SILC communicates broadly the issues and solutions to complex societal issues in sustainability and it generates socially conscious advancements in the environment and sustainability for communities at local, regional and global scales.

Comparison

The AgroLab Uniandes presents similarities concerning the research and educational approach with the SILC and the Madrid AgroLab since these laboratories integrate the traditional knowledge of communities with technical expertise. The main difference is that the AgroLab Uniandes focuses on customized UA systems and wants to generate a local but scalable impact that includes the psycho-physical wellbeing of the participants. This is the reason why topics such as empathy, eating habits and sustainability are fundamental within the proposed research and educational approach. Whereas, the Madrid AgroLab and the SILC focus on open-field agriculture seeking respectively a regional and global impact. Eventually, the MIT Media Lab mainly deals with the technological topic applied to protected agriculture without considering the traditional knowledge.

RESULTS

In section 2.3, the expected output of the proposed AgroLab have been illustrated. Within this section, it is demonstrated how the AgroLab achieves the identified outputs.

Even if the different production systems of the AgroLab have been installed in July 2019, the AgroLab concept has been around since 2015 generating different results that can be mapped within the output categories defined in section 2.3:

- *Research:*
  - *Technical and technological recommendation:* (i) ProBoyacá Project Portfolio[1] (2015): initiative led by the Universidad de los Andes for the Boyacá region. Academy, industry, government and local communities collaborated for enhancing agricultural technification, food production and tourism; (ii) bachelor thesis for the design of an aquaponics system powered with solar energy (Figure 3) (Ardila, 2019);
  - *Funding calls:* (i) Alimentos Con-Ciencia (2017): founded proposal for the Uniandes Call for Interdisciplinary Projects[2] in which aquaponics is used as a mean to develop interdisciplinary learning and design processes within the university community concerning food production and food security; (ii) UPAS (2018): founded proposal for Colciencias

Jóvenes investigadores e Innovadores[3] with the objective of modelling and implementing a sustainable aquaponics production unit (UPAS, in Spanish) for a future adoption and acceptance in the Boyacá region; (iii) UPASs (2019): proposal for FONTAGRO Productividad[4] with the objective to implement UPASs in selected regions of Colombia and Peru;

- *Education:*
  - *Courses:* (i) Food and entrepreneurial opportunities[5]: university course with the objective of enhance students' awareness concerning the actual opportunities in Colombia on agriculture and food related businesses (Figure 4); (ii) Colours in all its dimensions[6]: university course in which students identify from a multisensory perspective the influence that colours have on food;
  - *Experience-based Learning:* activities concerning the AgroLab mission and productive systems are implemented within the following courses: (i) Food and entrepreneurial opportunities: each student cultivates a farming pot in order to experience the farming activity; (ii) Colour: experience, culture and industry[7]: students learn to combine colours starting from the

Figure 3. Render of the designed aquaponics solar system.

Figure 4. Different snapchats from the 2019 edition of the course Food and entrepreneurial opportunities.

1   https://uniandes.edu.co/noticias/desarrollo-regional/negociar-para-la-innovacion-colaborativa
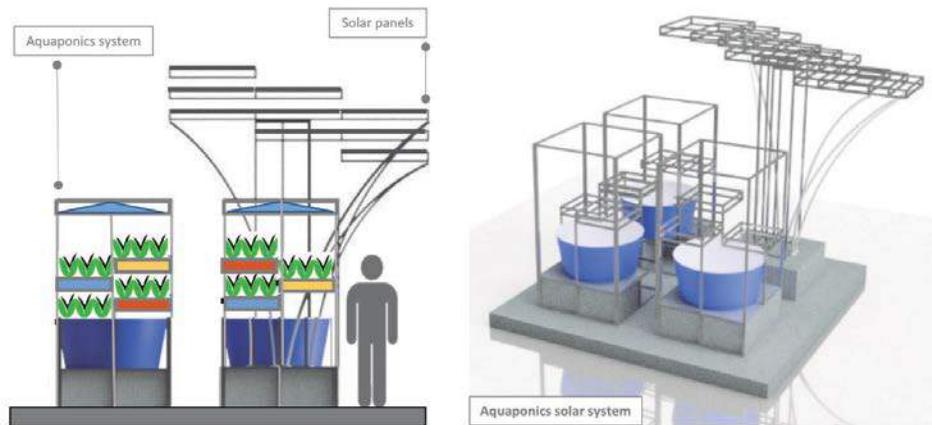
2   https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwin6LvW_9fiAhVkplkKHaKtCGgQFjAAegQIBRAC&url=https%3A%2F%2Finvestigaciones.uniandes.edu.co%2Fwp-content%2Fuploads%2F2017%2F05%2FConvocatoria_Interdisciplinaria_2017.pdf&usg=AOvVaw0oHWwJ0ta7DVfnc7sYMdrD

3   https://www.colciencias.gov.co/convocatorias/mentalidad-y-cultura/jovenes-investigadores-e-innovadores

4   https://www.fontagro.org/type/convocatoria-2019-productividad/

5   https://catalogo.uniandes.edu.co/es-ES/2017/Catalogo/Cursos/DISE/3000/DISE-3207

6   https://catalogo.uniandes.edu.co/es-ES/2018/Catalogo/Cursos/CBCA/1000/CBCA-1062

7   https://catalogo.uniandes.edu.co/es-ES/2015/Catalog/Courses/DISE/3000/DISE-3350

Figure 5. Some of the prototypes developed within the 2019 edition of the course Toy design.

Figure 6. Different snapchats from the bachelor thesis Carpas Sociales.

identification of natural patterns (fish and plants) observed in their production environment (aquaponics and hydroponics); (iii) Toy design[8]: students develop toy and tales concerning the food and its production systems in order to provide children with learning tools about food safety and good eating habits (Figure 5); (iv) Branding[9]: students discuss and propose alternatives of brand identity, and internal and external communication strategy with the objective of visualizing and positioning the mission of the AgroLab; (v) AQUA MATICES (Ardila, 2018): project for K-12 students with the aim of applying the Kolb's learning Model (Konak, et al. 2014) using interactive aquaponics systems as educational tools for STEAM disciplines;

- *Wellbeing:* Carpas Sociales (Figure 6) is a bachelor thesis that proposes a collective and co-creative strategy of UA within the current urban renewal plan of the Fenicia neighborhood (Amaya, 2019). This work identifies a 2030 horizon plan to

8   https://catalogo.uniandes.edu.co/es-ES/2015/Catalog/Courses/DISE/3000/DISE-3425

9   https://catalogo.uniandes.edu.co/es-ES/2015/Catalog/Courses/DISE/3000/DISE-3240

provide the Fenicia community with training programs to grow food in planters and terraces. The mission of the proposed plan is to convert the area into an Urban Agricultural District with high touristic potential due to its location in the historical center of the city of Bogotá. However, the activities developed throughout the thesis demonstrated secondary positive effects on the participants such as food awareness rise, wellbeing due to the growing of living being and empathy.

CONCLUSION

AgroLab Uniandes has been detailed within this work. In summary, the following characteristics can be outlined:

- The AgroLab seeks the wellness of all the people participating in its innovation process from multiple perspectives such as technology, knowledge and experience;
- The AgroLab is a neutral installation inside the University de los Andes that does not belong to any School or innovation center, favoring the collective inclusion;
- The AgroLab targets to a local and small-scale impact since constitutes a mean through which the academic community wants to contribute to the wellness of its neighborhood;
- The AgroLab also targets to a regional and large-scale impact by developing technical and technological recommendations, and scalability models starting from small-scale prototypes.

In Figure 1, it was illustrated how the elements of the AgroLab Uniandes can be mapped into the typical elements of a business model showing how the proposed ecosystem creates, delivers, and captures value within a continuous feedback learning process. This mapping activity will be further investigated in future work and will allow understanding the multiple elements, actors and scenarios concerning food production and its relationship with people. In this way, the AgroLab Uniandes will become a platform able to deliver multiple food business models for research, education, and for the wellness of the participating people and communities.

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DESIGNING RURAL EXPERIENCES THROUGH SERVICE DESIGN METHODS AND STRATEGIC SCENARIOS: TWO CASE STUDIES IN JALISCO, MEXICO

The development of towns which depend on weekend tourism due to its proximity to large cities nowadays is very common. The visitors seek ephemeral experiences and the inhabitants of the locality seek to provide a transcendent service. Through new technologies and design-led innovation initiatives that seek to expand the concept of smart cities to rural areas, it might be possible to improve the quality of life. Experience design projects linked to training partners and the School of Architecture, Art and Design of the Tecnológico de Monterrey at Guadalajara campus were implemented to solve problems that arose in the population of the town of Tequila and the town of Mezcala in the state of Jalisco in western Mexico. By using methods of service design and tools for the mapping of strategic design scenarios two case studies are presented. As an outcome, we describe how high-impact products-services for areas considered as immediate interaction territories and in constant rural development can prompt better experiences.

Keywords: Service Design, Future Scenarios, Smart Cities, Social Innovation, Rural development

INTRODUCTION

Nowadays there are different ways to define a zone or region where the urban and rural interaction happens. The concept of rurban (Kolhe & Dhote, 2016), the bioregion (Thackara, 2019), intermediate space in the territory (Berdegué, Carriazo, Jara, Modrego, & Soloaga, 2015) and other related concepts have been studied from the lens of urbanists, tourism developers and anthropologists. Latin America has vast urbanized regions. About three-quarters of the population reside in cities (UN 2002) and half of the urban dwellers live in cities of less than 100,000 inhabitants (CEPAL 2005). This kind of small and medium-sized cities develops as hubs of economic growth due to their closeness to big cities. Extending beyond the rural-urban fringe, these cities have some key factors: are the perfect escape to spend the weekend, are targets for the implementation of sustainable development programs and are influenced by the agroindustrial landscape that feeds the metropolis.

Small-sized cities articulated by the rurality are between 30,000-50,000 inhabitants and still could be considered as villages. From the scope of design, there is a lack of studies that question the importance of this rural hotspots in terms of igniting or leading innovation.

In this paper, we compare two design initiatives directed by the design department at Tecnológico de Monterrey for the town of Tequila and the village of Mezcala located near the city of Guadalajara in the State of Jalisco Mexico. This two entities in terms of size and distribution have exhibited economic growth and poverty reduction regarding the territorial dynamics, and also the distinctive action of organizations that want to give back to the community.

There are two aspects that we examine through the lens of design-led innovation and these two case study villages: 1. the interrelationship of technology and service design and 2. the influence of future scenarios as a design strategy.

DESIGN-LED INNOVATION AND THE RURAL CONTEXT

The design-led innovation process (DLI) is a transformational process that can bring great value to an organization, especially at a business level (Wrigley, 2016). Beyond productivity, DLI can enrich enterprise action as it integrates a business model and is presented at the product level. It also can be interpreted as a catalyst for social innovation in communities (Martin & Martin, 2009). From an academic perspective, the innovation capacity of design is usually well received by communities. The necessity

of making links with the government, NGOs and interest groups in the rural happens by the hand of student projects or research projects as a means of exploring possibilities to act upon needs (Campbell, Schwier, & Kenny, 2009). In the end, this kind of interventions works as catalysts of design-led innovation.

Rural development in certain point became the adversary in small communities. Changing the business as usual or the rhythm of customs requires a concealed effort. Showing the procedure, the outputs and benefits of implementing any kind of design or new ways of doing things require an empathic strategy. Through methods of intervention and analysis, such as design ethnography (Wood & Mattson, 2019), an insertion of a project in a rural context becomes easier. Dialogue, facilitation, forecasting or testing requires interdisciplinary strategies also. The systematic way to intervening through design-led innovation has a vantage point; other disciplines trust in the design process and the designer skills as it uses various methods. Entrepreneurship, business modelling, product development, place-based or user research are among these vantages, that combined with other communities of practice develop transitions (Poggenpohl, 2015) to improve the quality of life around us.

The variables that historically have conditioned the phenomenon of migration, are still valid today and constantly modify the conditions of the territory and the organization of the communities. From a planning perspective, the saturation of cities has an impact that considers guaranteeing the quality of life of its inhabitants sustainably. In this regard, the tendency of a return to rurality is an alternative way to balance and evolve.

Thus, rural development begins to consolidate government policies and programs called as a New Rurality (Morgan, 2016), set as a vision in which the native communities create new models of development and sustenance.

Self-management, organization, economy and ecology, are some of the characteristics observed in communities that, at present, exhibit a combination of traditional methods with technical innovations that allow an improvement in their terms of trade. Therefore, what is founded is an increase in their standard of living understood in the communities' own terms (Baños-Rosas, 2013).

Considering future scenarios and the variables that will affect the territory, a sustainable and autonomous approach allows the formulation of strategies that, over time, will consolidate and allow the evolution of the community. In this sense, each place is a case and which has diversity and complexity, within the local and the region and their actors. There are a number of operational challenges to be resolved and this situation merits research efforts that contribute to broaden understanding of localized

processes for the promotion of sustainable development (Soto, Beduschi and Falconi 2007).

THE INTERRELATIONSHIP OF TECHNOLOGY AND SERVICE DESIGN IN THE RURALITY

During the last two decades the influence of the internet and related technologies began to reach remote locations around the world. Having access to information not only benefits the population in terms of culture, but also increase the ability to implement businesses and better services in terms of tourism and infrastructure. Our first case study analyses this interrelationship.

Tequila Case study

The course of Design for Experiences is taught for the Industrial Design degree at Tecnológico de Monterrey. In their sixth semester, the students usually are briefed with a project which integrates the integration of technology, user experience (UX) and sponsored by an NGO or company. In this occasion *Fundación Beckmann* was the NGO who partnered the course.

Fundación Beckmann is an NGO supported by Jose Cuervo Group, a world leader company for Tequila production and distribution. Since its insertion back in 1757 in the municipality of Tequila in the State of Jalisco Mexico, the production and distribution of tequila began to impulse the local economy, tourism and development of neighboring villages (Camelo Avedoy & Rodriguez Bautista, 2018). On its compromise they look to offer dignity, service and respect seeking to continuous improvement for the quality of life of the village and beyond (Fundación Beckmann, 2019)

The call from Beckmann Foundation to the design department was seek in order to make an alliance to provide education and training to the community in terms of hospitality and service. As first contact, a workshop on service design was delivered for the staff and business leaders from Tequila. The directors immediately noticed the value of the service design, opening the doors for collaboration.

Defining immediate needs in a smart rural town.

The first step was the creation of t the brief by the design department, which was named: "Destino Tequila: Experiences, Services and Technology". The second step was to define a series of themes to be introduced to design students. These themes were analyzed by the teachers and directors included in the brief as 'priorities' for the community and prompted for the benefit

of businesses supported by the foundation. The list of sixteen priorities were assigned to sixteen teams of students.

A third step was to introduce the brief to the students with the following description: The student will develop a technological product to improve a service for the city of Tequila Jalisco which promotes positive experiences to visitors and inhabitants". The objectives where the following:

- Identify the need that has the service assigned through service design analysis tools.
- Integrate technologies for interaction with intelligent attributes and interfaces.
- Consider the aesthetics and functionality linked to a rewarding experience for visitors and inhabitants.
- Identify the benefits of the different actors and contexts.
- Present a functional prototype.

The concept of smart city was highlighted as a key variable, with various workshops on arduino to integrate sensors and interactive technologies. The fact that smart cities are on the trends to follow by the academy and our society where descry (Lara, 2017). Nevertheless this variable seemed to have a high difficulty influence on the students since the beginning.

The fourth step was a field trip to Tequila to observe directly the needs of the problem assigned by the hand of a client.

Service design methods to improve quality of life

An important ingredient to solve the problems was the use of Service Design methods. Service Design is usually brought to implement productivity (Parasuraman, 2010), but also as a fundamental tool of renovation or innovation in the services. In this case, our design brief was to use it as a generator of better experiences for the visitor, a local client provider of the service and indirect actors (inhabitants of the village). As teachers we facilitated it as a tool "to enrich experiences through technologies". It also served as an ethnographic tool.

The fifth step was to use various tools used in Service Design in this case: personas, customer journey maps and service blueprints (Stickdorn & Schneider, 2012). These tools served as identifiers of needs and as improvers of experiences. An initial (actual) customer journey and a service blueprint were produced to visualize weaknesses and opportunities found. See figure 2.

The sixth step was to integrate concepts and prototypes by using interactive technologies aimed to generate new experiences and solve the need prompted by the local client (provider of the service). See figure 3.
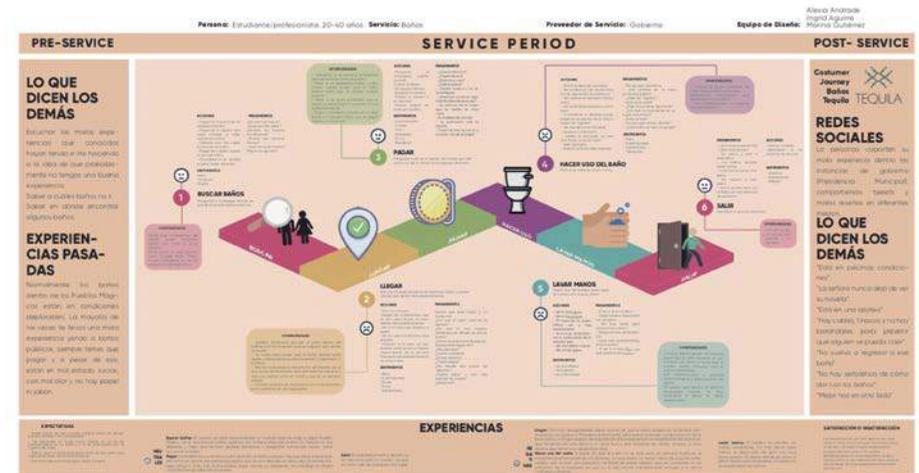
A final step was to present the new journey map and the service blueprint through this product-service and present it to be marked and select some to be funded by investors from the city of Tequila.

We can conclude how the interrelationship of experiences, service design and technology also influences the design process. The visualization tools presented through these examples can be interpreted as triggers of innovation because they analyze, synthetize and provides elements to develop ideas and solutions

Figure 1. Visualization of an "actual" Customer Journey Map of a toilet service (Smartlock team, 2019) Original Size A5 Spanish version.
Figure 2. Visualization of an "actual" Service Blueprint of a toilet service (Smartlock team, 2019). Original Size A5 Spanish version
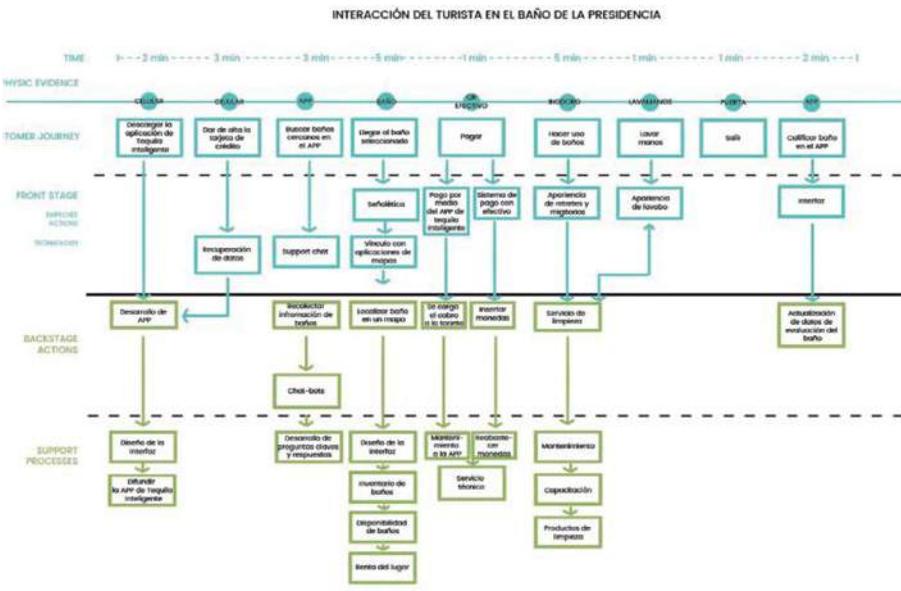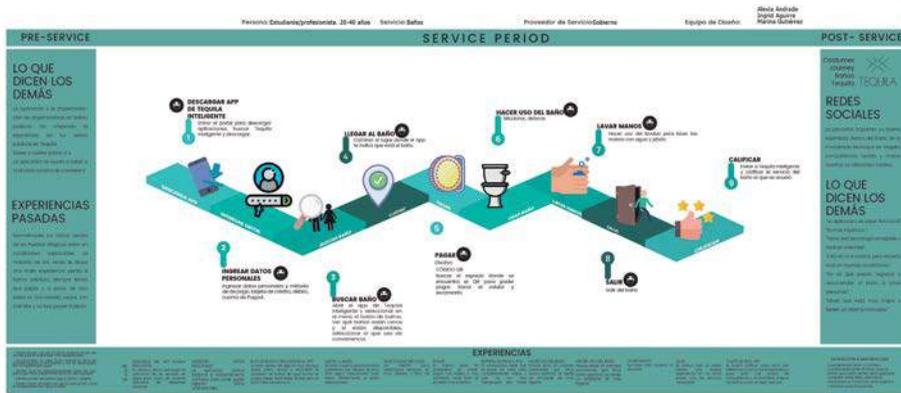
through these seven steps. When it comes to rural innovation these tools are easy to understand and to display.

FUTURE TERRITORIES AND RURAL DEVELOPMENT

The second case is framed as strategic vision of design. In this context, the professional puts into practice skills to manage complex scenarios, reads clues, anticipate trends and visualize opportunities through projects that trigger community development in terms of recreation.

Mezcala Case Study

This project was developed with the collaboration of students and *Senderos de México*, a Mexican civil organization, whose mission is to promote outdoor activities as a way to achieve community development and support the conservation of its natural landscape.

The prime objective of the project was based on taking as a sample a rural reality that is repeated in many parts of the Mexican territory: the inactive potential of the rural villages. This reality was placed as a brief to apply strategic design tools and to present a portfolio of projects framed as main tracks of development for the community. The justification to work with the population of Mezcala was assigned by the organization, due to the fact that, this village is located in one of the most important natural roads by Lake Chapala in the State of Jalisco.

Design-led process in the rural

From there, a methodology of qualitative research was composed of interviews, field studies and documentary research. The phases this study consisted of:

1. Document and exploration of the topic (brief).
2. Meetings with the association and interviews.
3. Visits to the town of Mezcala to collect information.
4. Application of strategic design analysis tools.
5. Team work sessions to prepare proposals.
6. Determination of short-term projects.
7. Development of immediate projects.
8. Determination of long-term projects.
9. Presentation of results to the association.

The guiding scheme of the research consisted on the basis of the following structure (figure 6):
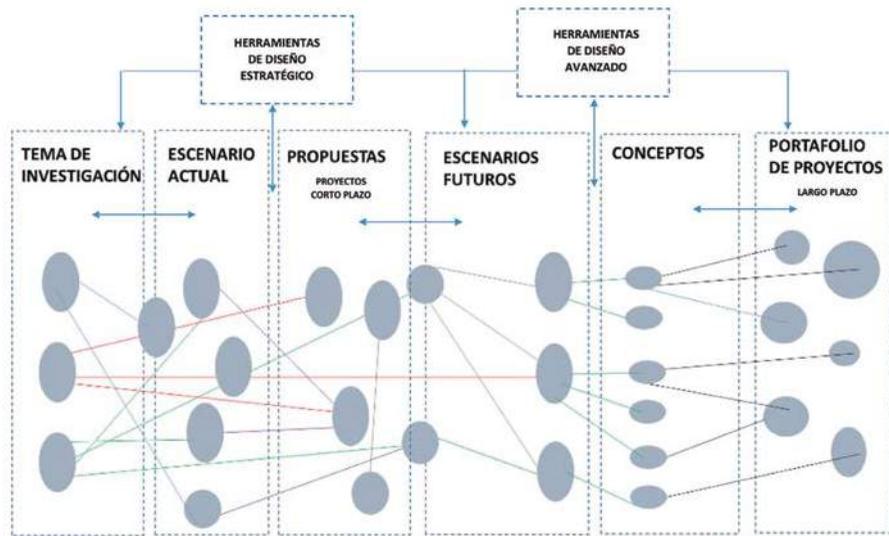
Gigamapping the future

The results obtained from thirty innovation avenues where: ninety proposals for short-term projects, forty proposals developed for immediate implementation and sixty proposals for long-term projects. The physical presentation of the results was made through: printed gigamaps (Sevaldson, 2018) which helped learn a systemic research process; portfolios of community development projects focused on recreational activities and designed to be implemented by the community itself, and a portfolio of specific projects that will currently allow *Sederos de México* to detonate initiatives that will have an impact on economic, social and cultural development in the rural territory.

Below, some samples of the exposed material (Figure 7 and 8)

Mezcala as a pilot of exploration, served to identify variables considered in similar rural populations. The determination of characteristics through the application of strategic design and advanced design tools, allows developing skills in the designer, providing an easy route to visualize the areas of opportunity that will led innovation and development in any organization.

This design approach also prepares the designer to face the challenge of the mutations of the context in a systemic way and as a monitor agent of changes and signals that become spaces for design. In the case of this project, recreation as a trigger for community development also allowed addressing issues that move our contemporary rural society and that are the engine of collective development. Obviously the scheme used is valid for the study of topics in any sector.
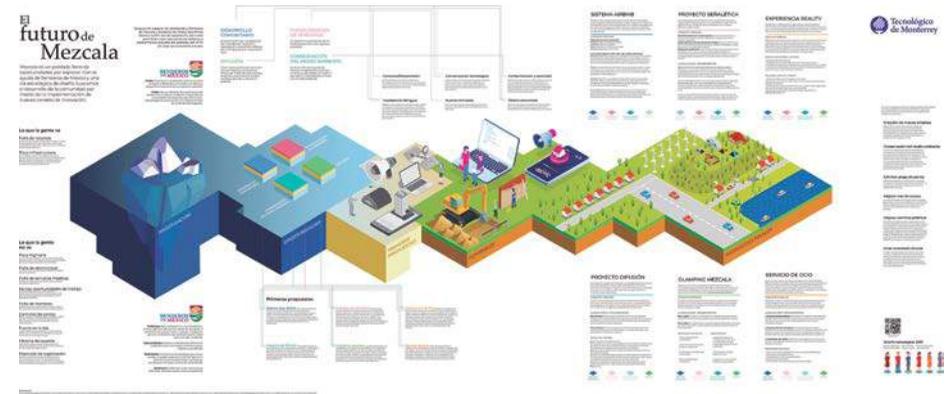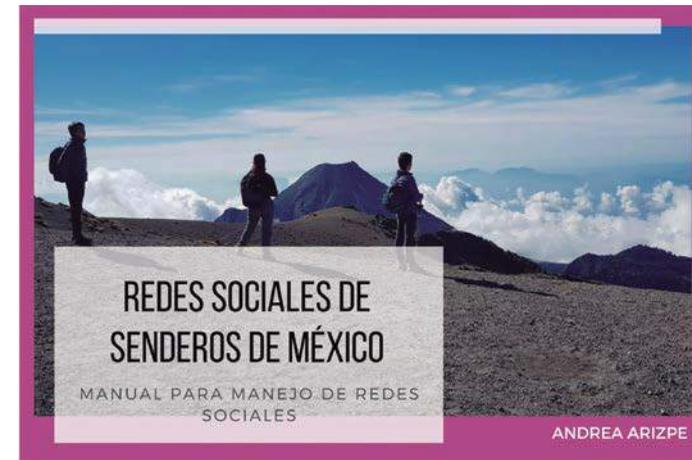
ANALYSIS AND RESULTS

The projects here displayed as case studies demonstrate how design-led innovation happens in a rural context. By the hand of visualization tools derived from service design and strategic design we can articulate narratives which are difficult to track and intervene by students and actors in any design project. If we look closer to the fact that design projects that are inserted in a rural community constantly impulse its development, then we can expose them as valid.

Tequila case study can give us a pattern of steps for the design process:

1. Identify a theme to brief. In this case was: Experience, Technology and Services
2. Convene the clients or stakeholders provide to explore the service. Sixteen themes where selected and "needs" where assigned to students.
3. Provide the tools or methods. We introduced service design tools.
4. Organize field trips. As a way to explore a real context and use the tools
5. Develop the ideation process. Sketches, mock ups and tests in contexts are vital
6. Implement the right techniques to solve the ideas. Technologies, fabrication or rapid prototypes are essential.
7. Reflection on outputs. Using the elements of visualization and prototypes evaluated by stakeholders as means to continuing and adopt the projects on the context.

On the other hand, Mezcala case study demonstrated the following design-led process:

1. Document exploration.
2. Meetings with the stakeholders and interviews.
3. Visits to the town of Mezcala and recording
4. Application of strategic design analysis tools.
5. Team work sessions to prepare proposals.
6. Determination of short-term, immediate or long-term projects.
7. Presentation of results

These case studies provide a different way to visualize the development of a territory from the designer's viewpoint. Both had in common the previous analysis of all contextual variables, the use of exploratory tools and the provision of future scenario in order to propose ways of innovation to improve the quality of life of the community. This can of design practices allow the development of transversal competences (Tecnológico de Monterrey, n.d) in students such as innovative entrepreneurship, social intelligence and ethical and citizen commitment.

CONCLUSIONS

Core strategies to intervene the rural spaces are vital. The countryside-city relationship is now much more complex than the old dichotomous relationship characterized by the unequal exchange and migration of the low-income people from the countryside to the cities to form the industrial reserve army (de Grammont, 2004). In this regard, from the perspective of design and with anticipation tools it is possible to characterize the ways of progress and projects that ensure the balanced and sustainable development of the new rural space.

In the two case studies here presented, we can observe how academic projects framed through the design-led innovation process allow us to access design with different lenses. On one-hand service design projects to improve the rural experience and on the other how strategic design projects provide answers to propose scenarios for short and long term.

Both cases are presented as examples of how the designer's posture is like a satellite whom monitors independent variables or complete systems in order to generate innovation and confirm the tools to trigger it.

The approach to rurality tackled through these case studies displays big challenges: Find ways through technology but also ways to find elements to make comfortable the stakeholders. It also reinforces identity of these localities that are peripheral to big cities.

The general idea of this document is to expose the practice of design in a much more strategic territory, in which the reconfigurations of the future generates visions for society as a whole guided by the practical knowledge of design.

Nowadays, it is essential to see the designer as a professional who addresses and manages complexity and who provides ways that progressively lead to a transformation within organizations (companies, industries, innovation centers, design studios, universities, etc.)

This characteristic of the designer and its transforming role focused on sustainability become a unique and distinctive feature of the new professional role of the discipline.

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PLANT-DRIVEN DESIGN AND PHYTOTECHNOLOGY TO IMPROVE THE BUILT ENVIRONMENT

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In post-industrial cities the quality of built environment is partially affected by the high concentration of chemical pollutants in outdoor and indoor spaces. An increasing number of people spend about 90% of their daily time in indoor environment that often has a higher concentration of pollutants than outdoors. The presence of many chemical compounds and the absence of natural elements contributes to reduce the healthiness of indoor spaces and to trigger the Syndrome of Sick Building in occupants. Many researches support that natural ecosystems have a positive effect on human health and other studies show the benefits provided by the application of phytotechnology. This paper discusses the opportunities offered by the application of plant-based solutions to improve the healthiness of built environment (especially the indoor air quality) and to re-establishing a relationship between man and rural spaces, with positive implication on psychological well-being. Phytotechnology includes many techniques to remediate polluted sites or to mitigate effects of anthropogenic activities using plant's metabolism according with technological solutions. In the paradigm shift toward an ecological view, natural ecosystems are considered as a part human society and plants are good indicators of the quality of the environment. This study focuses on the review of ecosystems services provided by plant-based solutions and it also reflects on the inclusion of phytotechnology in design practice for the well-being of people in indoor spaces and more in general in post-industrial cities.

Keywords: plant-driven innovation, nature and human health, healthiness of built environment, phytotechnology, design for sustainable living

INTRODUCTION

Technological developments have brought a substantive revolution in human society. For the first time in the human history, more than half of global population, approximately 55%, is living in urban areas (UN-Habitat,2011; Carli et al, 2015). Predictions regard the future of human society confirm this trend: the future will be characterized by urbanization (Randers, 2012). Global population is growing fast (United Nations, 2017) and all over the world people are moving from rural areas towards cities with the purpose to find safety and new opportunities for living. The UN-Habitat (2016) estimates that by 2050 about 70% of the population will live in metropolitan areas.

The increasing urbanization affects people's lifestyles and the political agenda that should focus on tackling problems related to the use and consumption of resources and the health of the urban environment. The rapid growth of cities causes environmental degradation, loss of biodiversity and ecosystem services (Harding, 2012). An important aspect of urbanization trend and virtual technology is that people are spending almost 80-90% of their daily time in indoor spaces such as school, home, workplaces and other public spaces (Liu et al., 2019). Outdoor and indoor air quality in the most of cities, with a population more than 1 million, fails to meet World Health Organization guidelines for healthy living (WHO, 2016). Moreover, the concentration of air pollutants in interiors is often higher than in outdoor spaces (Marchland at al., 2006).

In this scenario, the urgency is to undertake a paradigm shift toward an ecological perspective (Capra & Luisi, 2014) of built environment and also of interiors. Benefits provided by parks and green infrastructures in cities are widely discussed in many researches (Suzuki, 2015; Stigsdotter, 2015), while their effectiveness in indoor spaces is still an uncertain topic. This paper focuses on the opportunities provided by technological green, such living wall, to improve indoor air quality. Living

walls are investigated as constructed ecosystems that integrate phytotechnology in interior design practice. The investigation underlines main strengths and problems in applying principles of *nature-centred approach* of phytotechnology in designing not only aesthetically, but also functional indoor green systems. Nature-centred design is a concept recently introduced by Van der Ryn (2013) and Tarazi et al. (2019), that supports the Human-centred design according to the urgencies expressed by the Anthropocene. It adopts a more holistic and ecological view to the design practice and it use design research tools to investigate complex problems.

CHARACTERISTICS OF AIR QUALITY IN INDOOR SPACES AND CONSEQUENCES ON HUMAN HEALTH

In recent year, increasing attention has been focused to improve the *indoor environmental quality* (IEQ) and the comfort of interiors. The IEQ involves a huge set of parameters that includes light intensity, visual and acoustical aspects, thermal comfort and air quality (Bluyssen, 2009a). Indoor air quality (IAQ) is an important aspect of IEQ because it causes complications on human health and it has also consequences on occupant's performances (Ataroldi et al., 2018). IAQ is characterized by the concentration of specific compounds that cause indoor air pollution and it also depends by the features of buildings and by the habits of occupants. It can be distinguished in chemical and biological pollution based on the emission source. This investigation considers only chemical compounds that influences indoor air pollution and interaction of plants with them. Bluyssen (2009b) asserts that IAQ can be integrative approached from three perspective: indoor air of the space, sources that releases harmful compounds and human point of view. In addition to these, the outdoor air pollution has a serious influence on increasing the concentration of specific compounds in indoor air. Moreover, the aim to reduce the energy consumption for mechanical air ventilation systems encourages to investigate alternative solutions to improve IAQ and IEQ.

Indoor air perspective and sources of emission: regulations and recommendations

Indoor air is often expressed in terms of ventilation rate and concentration of specific compounds. The World Health Organization (WHO) (2009; 2010) selected a list of chemical compounds and defined general guidelines for their concentration limits and their effects on human health (Table 1). In addition to these, Ozone (O_3), Carbon dioxide (CO_2) from human metabolism, Particulate matter (PM_{10} and $PM_{2.5}$) from ambient pollution and Total Volatile Organic Compounds (TVOC) can affect indoor air

Figure 1. The first graph shows urban (red line) and rural (green line) population in Italy as a percentage of the total population, 1950 to 2050. The second graph shows proportion of urban population in Italy (red line) as compared to the Southern Europe (green line) and Europe (blue line). The proportion is expressed as a percentage of the total population, 1950 to 2050. Data from the United Nation DESA Urbanization Prospects (2018).
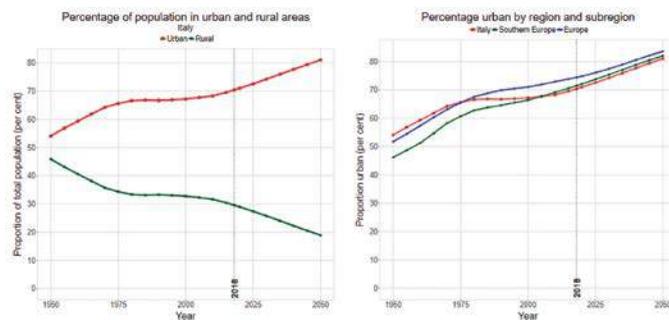
quality. In many countries official regulation regards the presence of air chemical pollutants is still missing and general standards are not enough to meet the satisfaction of occupants (Ferrero, 2018). Many of these compounds can be registered in the most of indoor environment because they are released by furniture, paints, cleaning products, electronic device, building materials (Yangpen et al., 2018) and their concentration also depends by human activities, such as cooking. The evaluation of outgassing rate is a complex process because it depends by many factors such as the content of volatile compounds and solvents in the indoor air, and by the age and status of materials.

CHEMICAL COMPOUND	CONCENTRATION LIMITS	SOURCE OF EMISSION AND UTILIZATION	CANCEROUS FOR HUMANS
Benzene (C_6H_6)	6×10^{-6} µg/m^3 (UR/lifetime)	Paints, building materials, tobacco, heating and furniture	Group 1
Carbon monoxide (CO)	10 mg/m^3 (8 hours)	Combustion in O_2 deficit condition	-
Nitrogen dioxide (NO_2)	40 µg/m^3 (year)	Combustion	-
Formaldehyde (CH_2O)	0.1 mg/m3 (30 minutes)	Furniture in chipboard, household cleaning products, paints, heating and electronic components	Group 1
PAHs and $C_{20}H_{12}$	8.7×10^{-5} ng/m^3 (UR/lifetime)	Petroleum refining	Group 1
Trichloroethylene (TCE)	4.3×10^{-7} µg/m^3 (UR/lifetime)	Industrial solvent	Group 1

Table 1. List of some indoor air pollutants, their concentration limits (WHO, 2010), main sources of emission and levels of carcinogenicity for humans (WHO, IARC, 2018).

The issue concerns the release of harmful chemical compounds by adhesive in plywood, fiberboard and particleboard furniture and by many other household products, such as textiles, is very relevant in residential-typical conditions (Salthammer, 2019). For potential hazards on human health due to high concentrations of formaldehyde, many important furniture companies are moving toward the use of glue, adhesive, resins, painting and finishing without harmful chemical compound (IKEA, 2018). Synthetic filters of Heating, Ventilation and Air Conditioning systems can also release formaldehyde at the room temperature of 20°C and 80% of relative humidity.

Human health implications

Human perspective regards IAQ reflects the effect on health and wellbeing of exposure to chemical pollutants in indoor air. In comparison to the great importance that ambient (outdoor) air pollution in urban areas has reached in last decades, IAQ does not have the same relevance in political and environmental agendas. Even though, the WHO (2018) established that 3.8 million people a year die prematurely because of exposure to harmful compounds in indoor environments. High concentrations of chemical pollutants and of VOCs contribute to causing the *Sick Building Syndrome* (SBS) and the *Multiple Chemical Sensitivity Syndrome* in occupants. They occur with a set of health problems, firstly respiratory problems, that affect working and learning performances especially in young people and children (Kishi et al., 2018).

PHYTOTECHNOLOGY: FROM ENVIRONMENTAL APPLICATIONS TO INTERIOR OPPORTUNITIES

Concerning environmental issues, the concept of phytotechnology means a huge set of techniques and applications that use plant for providing non-invasive solutions, including phytoremediation and bioremediation processes. It is the use of vegetation to remediate, contain or prevent contaminants, and add nutrients, porosity and organic matter (Kennen & Kirkwood, 2015). Phytotechnology is based on ecological principles and living systems mechanism and it is included in *ecotechnology* techniques (Aida, 1995). It is an interdisciplinary field of study that involves discipline as engineering, planning, design and botany to implement on-site solutions. Phytotechnology applications are successfully tested on soil, groundwater and wastewater management, while in the treatment of air, especially for indoor applications, development of phytotechnologies to remove airborne pollutants is just beginning (Henry et al., 2013).

It is necessary to make a distinction between the term *phytoremediation* and *phytotechnology*. The first concept describes the degradation and/or removal of a contaminant from a polluted site by a specific plant or group of plants. While phytotechnology also includes all plant-based solutions, such as green walls,

PHYTO-TECHNOLOGY provide solutions to environmental issues involving plants and vegetation

Improve the adaptive capacity of natural systems

Prevent pollutants releases and environmental degradation

Control environmental processes to minimizing degradation

Remediate and restore degraded ecosystems

Incorporate indicators of ecosystem health in monitoring

Figure 2. Main phytotechnology application.

green roofs, bioswales and constructed wetlands, to remediate or mitigate an ecological problem (Kennen & Kirkwood, 2015). Phytotechnology can be described as nature-centred approach to manage environmental issues which considers living systems as fundamental part of human society, including cultural aspects, and public health.

Phytotechnology uses opportunities provided by plants' mechanisms contributing in remediating contaminants from soil, water and air medium. Generally, the use of plants in contrasting effects of pollutants involves more than one of following physiological processes (Table 2) that are complementary for the entire phytoremediation. In case of low levels of contaminants concentration, these mechanisms are spontaneously used by vegetation in the process of *natural attenuation*.

Table 2. Plants' mechanisms and their principal applications in the treatment of soil, water and air.

NAME OF PLANT MECHANISM	ORGANIC/INORGANIC CONTAMINANTS	MECHANISM DESCRIPTION	APPLICATION
Phytodegradation	Organic	Plant uptakes contaminants and breaks into non-toxic metabolites	Soil, Water, Air
Rhizodegradation (plant assisted bioremediation/ degradation)	Organic	Roots exudates and/or the soil microbiology in the root zone break down contaminants	Soil, Water, Air
Phytovolatilization	Organic/Inorganic	Plant uptakes pollutants and release them into the atmosphere as gas	Soil, Water, Air
Phytometabolism (or phytotransformation)	Organic/Inorganic	Inorganic elements (as N, P, K) and organic metabolites produced by phytodegradation are metabolized and incorporated in plant's biomass	Soil, Water, Air
Phytoextraction	Organic/Inorganic	Plant uptakes pollutants and move them into plant parts. For organics, it is coupled to phytodegradation process	Soil, Water, Air
Phytohydraulics	Organic/Inorganic	Plant's roots ability to stop migrating plumes	Water
Phytostabilization (or phytosequestration/ phytoaccumulation)	Organic/Inorganic	Plant holds contaminants in place, and it does not move off site. Contaminants are made less bioavailable.	Soil, Air, Water
Rhizofiltration	Organic/Inorganic	Roots filter out pollutant from water	Water & Soil

In the application of phytotechnology for the treatment of air contaminant, plants take advantage of the characteristic of being a *colony* for microbes. Phyllosphere (Wei et al., 2017; Bringel & Couée, 2015) and rhizosphere (Dela Cruz et al., 2014; Moya et al., 2018), plant's leaves (cuticle and stomata) and roots structure and their associated microbiota, cover an important role in the interaction with chemical compounds (Agarwal, 2019). Phytotechnology air for organic pollutants treatment provides great opportunities in terms of *field applications* and *relative remediation time* (Kennen & Kirkwood, 2015).

General overview on laboratory and field testing of indoor air phytoremediation ability

The attention paid to the capacity of plants to uptake and degrade contaminants from indoor air raised in the 1980s with pioneer studies succesfully conducted by NASA on benzene, formaldehyde and trichloroethylene (Wolverton et al., 1989). Afterwards, many other studies were conducted to test in laboratory potted plants' phytoremediation ability and their efficiency (Righetto, 2018; Yang et al., 2009). Based on studies of Wolverton et al. regard plants selection, many species of plants were tested and compared in controlled and sealed chamber experiments. In this condition, parameters such as duration of testing, light intensity, humidity, temperature and concentration of the contaminants are strictly controlled and monitored, unlike what happens in real context. Plants degrade chemical compounds through respiration and photosynthesis by leaf surface absorption and relevant results were also obtained analysing rhizosphere (plant's roots and microorganisms) phytoremediation ability. Significant results are achieved in the phytoremediation of indoor airborne particulates, PM_{10} in particular, (Pegas et al., 2012; Soreanu et al., 2013); of VOCs (Dela Cruz et al., 2014), and of NO_2 and CO.

In on-site testing, the main problems regard the great variability of above parameters in real context conditions. The efficiency of plant-based applications depends by indoor environmental features, also regard the number of occupants and their habits, by the plant's specie, by total plant's leaf area and by plant's physiology in relation to the condition of surrounding environment. Moreover, limited spaces available in interiors is a main driver that limits an effective application of plants with air remediation purpose. In recent investigations (Pérez-Urrestarazu et al., 2016; Tudiwer & Korjenic, 2017; Abdo et al., 2019) indoor vertical green systems are tested with the purpose to evaluate their performance in improving IAQ and IEQ, especially regard CO_2 sequestration and regulation of relative humidity and temperature. Green wall system is a consolidated technology for outdoor application, but its benefits as functional
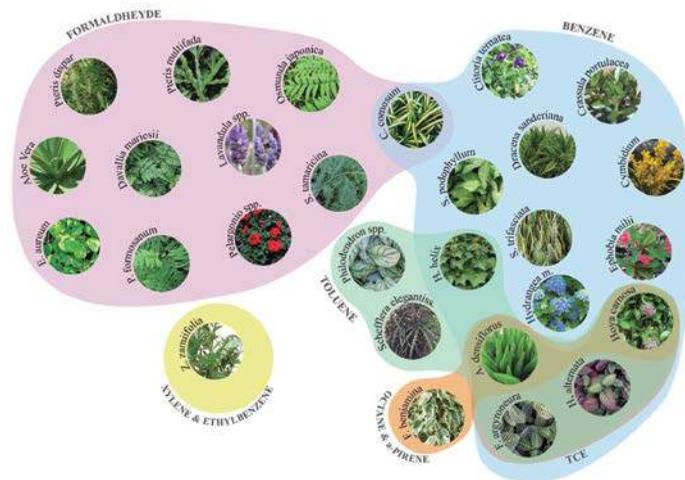
green technology for indoor environment are almost unknown. Vertical green system (also known as living wall system) is a valid solution to increase the number of plants and the total leaf area in indoor spaces. Many studies (Pérez-Urrestarazu et al., 2016; Moya et al., 2018; Petit et al., 2018; Abdo et al., 2019) are testing the performances of active living wall systems (biofilter green wall systems) to investigate air bioremediation ability of plant's rhizosphere (especially regard VOCs treatment).

Functional living wall systems, not only aesthetically, can be interesting applied in public and shared spaces, such as schools, offices and co-working spaces. Positive effects on occupant's education, awareness, comfort satisfaction, psychological wellbeing, working productivity and learning skills of indoor greenery practice are well documented, while indications to improve IAQ are still uncertain, especially for traditional living wall systems. However, studies conducted on indoor phytoremediation published lists of plant species that have achieved good performances (Figure 3). The most of ornamental plant species analysed are shade-loving and with rich foliage (green leafy part) that produce less pollen and bloom to avoid the risk of allergic or negative response in occupants.

Opportunities and constrains in applying phytotechnology to real context

Complexity in the nature and sources of air pollutants and of other environmental features requires that plant-based solutions are site-specific design processes. There is not a unique definition of a clear methodology for designing living wall systems that is valid for all indoor environment: plant species, substrate of cultivation, microbe and structure that support the entire

OPPORTUNITIES

- Natural, passive, solar energy-driven and methods to regenerate and clean up built environment
- Non-invasive solution and adaptable for specific site
- Possible application for treating a wide range of contaminants
- Multidisciplinar approach that combine chemistry, physic and biology with design and technical disciplines
- Well-accepted technologies for aesthetical and visual value
- Pollution prevention and mitigation effect
- Plant species for monitoring and assessing the ecosystem health

SECONDARY OPPORTUNITIES

Community use: involvement of stakeholders and people in planning stages
Educational use: classroom and living-lab experiences for increasing awareness and knowledge of plant world

CONSTRAINTS

- Some contaminants cannot be remediated by phytotechnologies
- Contaminant's level is too high for plant-base solutions application
- The elongated timescale to be effective (especially in soil and water)
- Fluctuation and vulnerability of natural systems (reactions to environmental and climate conditions)
- Context-based application: it depends by the characteristics of that specific site
- Some application are quite expensive to be really effective and to maintain them (range cost for 1m² of green wall: 250 - 600 euro)
- Boundaries of systems are not well defined, especially in case of atmosphere (outdoor air) in urban areas

living wall should be quite different for each environment. The selection of plant and design method occurs after a specific characterization of the context and of users/occupants. This step is particularly relevant to identify users' needs, their habits and expectations regards the usability and interactions level with the vertical green system. Needs expressed in school environments are different from co-working spaces, private offices and healthcare buildings: some technical measures are essential in specific context to maintain the safety of users. The application of phytotechnology mechanism in indoor environment through the design of living wall systems presents interesting

opportunities but constrains are also prominent (Figure 4). For example, costs for the entire life cycle of living walls, including costs for maintenance, could affect decision making especially in public buildings (e.g. schools). Some companies, such as Terapia Urbana (Sevilla, Spain), Naava (Helsinki, Finland) and Junglefy (Banksmeadow, Australia), offer design solutions and products to build aesthetically efficient living walls applying different technologies. The ongoing and future challenges investigate ways and technologies to increase the effectiveness of indoor living walls for the improvement of air quality and indoor environment. It is possible by investigating plant configurations, cultivation substrates and low energy solutions to improve the phytoremediation ability of indoor living walls and to reduce costs for operations, installation and maintenance. Living wall technology is an open research field investigated in collaboration with research groups and universities.

DESIGN WITHIN LIVING SYSTEMS: TOWARDS AN INTEGRATIVE APPROACH IN DESIGN PRACTICE

The increasing attention on sustainability requires a paradigm change in design practice towards an ecoculture thinking that focuses on designing living spaces looking at nature as a model (Benyus, 1998). In recent year, the cross-disciplinary approach of *Biodesign*, the practice of design with biology, ecology and engineering, and the *Biophilic Design* (Kellert et al., 2008, Sanchez et al., 2018, Xue at al. 2019, Abdelaal, 2019) that improves health and well-being in built environment have become relevant in the panorama of design. Biodesign goes beyond *biomimicry* and it refers specifically to the involvement of living organisms and their principles as an essential component for functioning (Myers, 2018). Phytotechnology can be defined as a nature-centred approach that consider plants as partners in improving build environment and containing or remediating harmful impacts caused by human activities. Opportunities provided by plants for the improvement of IAQ should be involved in the practice of biophilic design supported by technical and scientific knowledge. The nature-centred design strategy must consider also to sustain and support plants' life in unusual indoor context for growing, far from natural environment. This aspect and the necessity of reducing the energy for lighting and for mechanical air ventilation, often used in biofilter green walls, are main challenges in phyto-design for improving the IAQ. In order to achieve good air phytoremediation performance, plants must be in good health and design must support and promote flourishing growth providing proper technical equipment. Living wall systems can be described as constructed ecosystem, integrated in urban environment, which must support plant.

CONCLUSIONS

The urgency to improve the environmental quality and sustainability in urban areas encourage to take into consideration natural systems and their properties. The main challenge is to define technical and ecological indications for including nature ecosystems in the design of built environment towards a *regenerative* approach. Humans depend completely from the presence of plants on the Earth's surface for food, soil regeneration, provision of oxygen and more in general for the mitigation of climate conditions. Plants are essential for human life and they should be considered as strong partners in development processes. It requires to move from an anthropocentric view of life towards a systemic perspective and a long term attitude understanding the important role of living systems in restorative design practice. In many cases, they have already solved issues to improve resources efficiency and their regenerative ability (Mancuso & Viola, 2015; Bruni, 2015). Taking into consideration the strong increase in urban population, plants are essential partners to reestablish the important relationship between humans and natural environment in metropolitan areas.

Plant-driven design and nature-centred design that includes phytotechnology's opportunities show interesting way to improve the quality of built environment. As dynamic systems and living organisms, plants interacts with the surrounding and intelligently responds to its stimulations, adapting themselves to the context. Although plants are among the oldest organisms in the world, they remain largely unknown. For an effective and functional application of plants' intelligence and of their living mechanism in indoor spaces, phyto-design practice should promote the transfer of knowledge between disciplines to define the best site-specific solutions.

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SOCIAL DESIGN FOR TECHNOLOGY TRANSFER: AN EXPERIENCE IN RURAL COLOMBIA

In Colombia, more than 70.000 families in rural areas depend economically on the cultivation, transformation, distribution, and production of fique (Furcraea spp) and fique-based products (Peinado et al., 2006). Historically, this crop has been cultivated in regions affected by Colombia's conflict, including extensive areas in the departments of Nariño and Cauca, where fique producers have suffered from violence, displacement, and economic lag. Additionally, the process to extract the fibers from the fique leaves—which are used for most of the fique-based products—is extremely inefficient and dangerous for workers (upper-limb amputations are common among this population). The fibers that are recovered through this process represent just 4% of the leaves, while 96% of the plant is discarded despite its potential uses for various industries. To address these challenges, since 2014 a group of researchers from a private university and a governmental research institution in Colombia partnered to study and develop solutions to enhance the production and transformation of fique and improve the situation of rural families. An important outcome of this collaboration is the design of a semi-automatic system to separate the fibers, juice, and bagasse of fique leaves (España & Barbosa, 2017). This paper presents the methodology intended to transfer this technology to rural communities so that they adopt it, contribute to refine it and involve it in their practices. The methodology has been developed from a social design approach focused on involving rural communities as co-designers of the system and as adopters of this technology.

Keywords: technology transfer, rural, social design, vegetal fibers, *Furcraea* spp

INTRODUCTION

Technology transfer processes refer to transforming inventions created in academia into commercial applications, which is a critical factor for innovation and for creating value for society and organizations (Apax, 2005). This paper presents the methodology developed by the researchers intended to transfer a technological innovation to rural communities in Colombia. The methodology herein presented, was developed from a social design approach focused on involving rural communities as co-designers of the system and as adopters of this technology.

The technological innovation that is in the process of being transferred to rural communities is a semi-automatic system to separate the fibers, juice, and bagasse of fique leaves (*Furcraea* spp). Fique is a type of Agave native of the Andean region that is widely cultivated in Colombia and Ecuador since it adapts well to different climates and different heights, ranging from 0 to 3000 meters above sea level. It has been found that prehispanic cultures used fibers obtained from fique leaves to make everyday products such as footwear, clothing, packaging, ropes, and containers. This tradition persisted in Colombia until the 1950s when industrial products made of plastic and other synthetic materials entered into the mass market. Currently, fique fibers are still used for making coffee sacks and, in some regions, handcrafts. In Colombia, the livelihood of more than 70,000 rural families depends on fique, especially in areas that have been historically affected by the country's violent conflict such as Nariño and Cauca.

Given the cultural, historical, social, and economic importance of fique, there are multiple actors, such as producers, producers associations, governmental agencies, and NGOs, interested in increasing the production and consumption of fique fibers and fique-made products. It is against this background that in

Figure 1. Fique plants cultivated in the Colombian Andean region (Image: Authors).
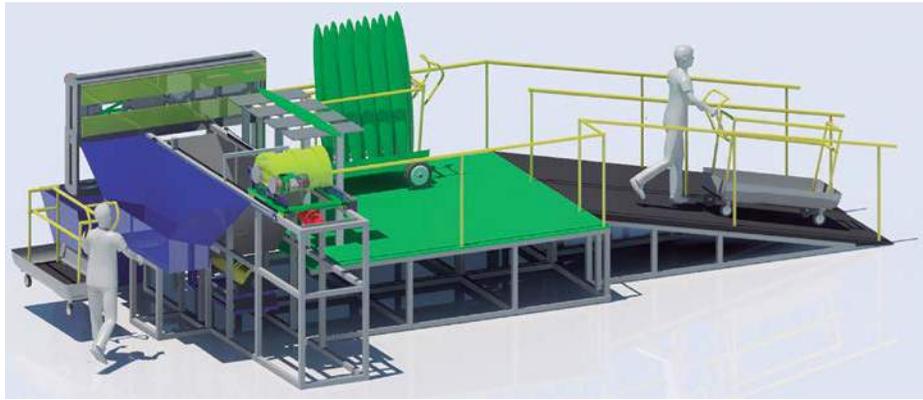
Figure 2. Render of the fique separation system designed and developed by the researchers (Image: Authors).

Figure 3. Traditional separation methods represent a safety hazards for producers who usually suffer of finger amputations.

2014 researchers from Universidad Jorge Tadeo Lozano —a Colombian private university—and Agrosavia—a Colombian governmental organization that conducts agricultural research— partnered to identify and address the most pressing issues facing fique producers and the communities involved with fique transformation, especially those regarding the development of technologies for this sector and the integral use of the fique plant.

As a result of this partnership—and based on the needs expressed by fique producers—a group of researchers from both institutions designed and produced a semi-automatic system to separate the fibers, juice, and bagasse of fique leaves. Currently, some components of the separation system are being patented and the prototype is being tested and improved so that this technology can be transferred to fique producers. As a consequence, the technology transfer methodology presented in this paper was developed by the researchers and is being implemented progressively and rigorously to achieve a successful transfer process.

THE NEED FOR A SEMI-AUTOMATIC FIQUE SEPARATION SYSTEM

One of the motivating factors for designing and developing the fique separation system seen in Figure 2 is that by using traditional separation methods, producers are taking advantage of just 4% of the fique leaf that corresponds to the fibers used for coffee sacks and handcrafts while the remaining 96% of the leaf— which corresponds to juice and bagasse—is currently discarded. Besides representing an environmental issue, discarding this portion of the plant represents a missed opportunity for fique producers since the juice and bagasse have numerous potential applications in several industries (e.g., the fique juice can be used to produce natural soaps, fertilizers, and chemical precursors for the pharmaceutic industry).

Another factor that motivated the development of the semi-automatic separation system is the safety hazards that traditional systems, developed more than 50 years ago, represent for fique producers. The mill that is traditionally used to obtain fique fibers frequently causes finger amputations among workers given its poor safety measures and its high-speed motor. Additionally, this system is heavy and hard to operate, which takes a toll on the health and occupational safety of fique producers.

From a socio-economic perspective, the development of the semi-automatic system represents an opportunity for fique producers to increase their productivity, make a more integral use of the fique plant, and explore the development of new products and applications with higher added value. Additionally, since the separation systems is designed to be used by a community rather than by individuals, the system fosters the creation of new associations that might work under the precepts of a solidarity economy which, in turn, strengthen the position of fique producers when they are negotiating their products with large, corporate buyers.

Given the difficulties that the semi-automatic separation system solves for fique producers, its adoption by this community becomes necessary to improve their socio-economic situation, their work conditions, and the strength of their community.

STATE OF THE PROJECT

Currently, the semi-automatic separation system is being tested and adjusted by the researchers so that it can be deployed in the community. Our intention is that this system becomes the first of a new generation of products that will help rural farmers in making an integral use of fique and many other crops. Once the tests are completed, the prototype will be installed

in a fique-production region to perform new tests under real operational conditions and continue with the technology transfer process. However, we are in front of a crossroads in which the research team needs to decide the best location for the system among three options: Cauca, Guajira, or Antioquia. Cauca is the Colombian department that produces the most fique in the country, it has the largest indigenous population in the country, but it has been critically affected by the its longstanding armed conflict. Guajira is a department that offers ideal geographical conditions to grow fique, for which fique crops are around twice as productive as their counterparts in other parts of the country, but, at the same time, is a department that suffers of extreme political corruption and in which many rural communities live in extreme poverty. Antioquia is a department in which producers have been pioneers in the use of fique juice and bagasse for new applications with higher added value; however, compared to other departments, Antioquia has less areas cultivated with fique, for which its production volumes are relatively low. This decision will determine at what extent the local community of fique producers will adopt the separation system, for which a rigorous and robust strategy for technology transfer is necessary. The strategy that we have developed, and we are in the process of implementing with fique producers is described in the next section.

TECHNOLOGY TRANSFER STRATEGY

According to Rodriguez (2012), technology transfer processes require a holistic approach that considers both its social and economic benefits for rural communities. For Rodriguez, these processes should promote not just the economic growth, but also the strengthening of the social fabric among the beneficiary communities, and their cultural and political empowerment. Espinosa et al. (2016) argue that it is fundamental to identify the factors that might influence the adoption—or rejection—of a technological innovation such as the social dynamics within the community and the interactions between stakeholders in the supply chain. Additionally, Espinosa and colleagues argue that the success of technology transfer processes with rural communities also depend on the type of relationship established between the researchers and the community. For the authors, it is key that researchers establish a horizontal and inclusive relationship with the producers (Espinosa et al., 2016) and acknowledge their expertise and contextual knowledge (Clavijo, 2008), which subverts the traditional relationship characterized by being paternalistic and hierarchical.

As a consequence of the recommendations of the cited authors and our prior experience, the transferring of the semi-automatic

separation system to the community of fique producers has been gradual and rigorous to avoid the common pitfalls that usually affect this kind of processes. The strategy that we have applied presents the following characteristics:

Continuous communication with the community: Since the project's inception, the voice of the fique producers was heard and taken into consideration to identify the needs of this economic sector. The need for a "machine" that helped fique producers to separate the components of the leaf was communicated by themselves to the researchers and representatives of the Colombian government during a national fique conference. Likewise, throughout the development process, the researchers have been in contact with the producers to consult with them different aspects of the system, present them the progress made in the project, and collect critical information about the context and the fique production process.

Use of participatory design methods: Throughout the development of the separation system, the researchers acknowledged the expertise of fique producers and involved them at crucial times in the design of the system. Initially, researchers involved representatives of the fique producers in the decision-making process in which the characteristics and features of the separation system were determined. Likewise, the participation of producers was crucial to help researchers solve technical difficulties that they found in the initial prototypes of the separation system. Additionally, their participation was instrumental to define the properties and the quality of the fique fibers that were obtained using the separation system.

Consideration of the community's fears and concerns: Due to the continuous communication that the researchers had with the community of fique producers, we became aware of their fears and concerns regarding the project and the deployment of the system. For instance, one of the main concerns that they had was that by introducing a semi-automatic system to the fique separation process, a good number of the workers would lose their jobs which would have a profound negative impact on the community and the project. To address this concern in particular, we adjusted the initial design of the system so that it was less automated, and it would still require human labor but eliminating the hazards and difficulties of the traditional separation process. Another major concern expressed by the community is that younger generations are less interested in producing or transforming fique due to the hazards that the traditional systems entail, the hard labor that is required to operate these systems, and the razor-thin margins of the fique production business. To address these concerns expressed by the community, we designed the semi-automatic system to mitigate at maximum the hazards for the operators,

reduce the labor required to extract the fibers from the leaves, and increase the efficiency of the process to increase the margins and reduce the investment of time and effort. Additionally, once the system is installed in rural areas, we have foreseen the need to communicate these features of the semi-automatic system to younger generations to motivate them in getting involved into the fique production and transformation community and business.

Technology transfer throughout the project's lifecycle: Different from traditional approaches to technology transfer that occur at the end of the development process, in our case, we started the transferring since the beginning of the project. Besides consulting and co-designing with the community, the researchers also shared information and knowledge with them as the project progressed. This approach was motivated by the researchers' intention to include the community as a partner of the project as a result of learning from previous experiences in which other teams developed technological innovations that could be useful for fique producers but that ultimately were not adopted by the community as a result of inadequate or inexistent plans for technology transfer. Likewise, it is projected that the technology transfer process continues after the separation system is implemented and until the community completely appropriates it. Besides involving the community throughout the process, a lifecycle approach to technology transfer might increase the adoption of the system by the community and the long-term viability of the initiative.

Holistic approach to technology transfer: Besides deploying the separation system in the community, the researchers have considered the implications and the potential impacts that the introduction of the system could have on the community, the environment, and the local economy. Based on this analysis, we concluded that we—and other teams of researchers—need to develop new applications that use the fique juice and bagasse to minimize the environmental impact of these by-products and maximize the margins for producers. We calculated that for each ton of fique fiber that the system separates, it produces 19 tons of juice and bagasse. Considering the potential uses of these by-products, the harm that these might cause in the environment, and the potential gains for the community, we proposed a new phase for the project to explore potential uses of fique juice and bagasse. As an example of other applications of these by-products, in the past, the researchers and a group of students developed a collection of soaps and detergents that used fique juice as a significant ingredient since it behaves as a saponin.

CONCLUSIONS

- Traditional fique (*Furcraea* spp) separation methods are inefficient (just 4% of the leaf is used while the juice and the bagasse are discarded) and represent occupational hazards for rural producers. For these reasons, the development and implementation of the semi-automatic separation system is crucial to improve the working and economic conditions of producers and their communities.

- The strategy for transferring the fique separation system to rural areas will depend on the characteristics of the communities, the local conditions, and the region where the system will be implemented. Adjusting the strategy to these conditions—which the research team needs to explore in further detail—is fundamental so that the selected community adopts the new technology and reaps its benefits.

- The use of participatory design methods that involve fique producers in the development of the separation system has been crucial in creating a solution that responds to the needs and conditions of rural communities. In the next steps of the project, the use of this type of methods will be instrumental in reconciling and articulating the diverse approaches brought by governmental researchers who come from the STEM disciplines, and academic researchers who have a design background.

- Keeping a continuous conversation with the community and considering their concerns throughout the development process has created a receptive environment among fique producers towards the semi-automatic separation system. Likewise, it has kept the community engaged and has created realistic expectations for the upcoming introduction of the system into the rural context.

- As part of the technology transfer process that we are conducting, we have understood that it is fundamental to uncover and address the implications of introducing the separation system into the rural context. For this purpose, new solutions that we did not conceive at the beginning of the project are projected to be developed in its future phases to improve the adoption of the system by the community and reducing negative impacts on them and the environment.

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SOMEWHERE, NOWHERE, ANYONE, EVERYONE

One of the dominant design narratives since the mid-nineteenth century has to do with its centrality in fostering consumerism. However, in the second half of the same century, behavioural researchers started thinking about alternatives to market economies and the emergence of new ecologies. Contemporary design is still looking for different ways to establish a more responsible, long-term and healthy relationship with the environment and its context. From consumption and individualism, the design has transcended to promote a strong consciousness on the scarcity of resources and the importance of environmentally mindful local communities. Is it possible for designers to learn and design along with small communities? Can social sciences and design work together in providing ways of thinking and methodologies to empower communities instead of finished products? Can design reach beyond the framework of market-driven economies? Can design methodologies help tackle wicked problems?

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CITIZENSHIP IN DESIGN EDUCATION AS A TRANSFORMATIVE LEARNING PROCESS. ID 11

This paper reflects on the concept of citizenship in design education with a specific case study of the design course Together 2019: A Platform for Citizenship Education held at the Iceland University of the Arts in Reykjavik. The concept of citizenship in design education is explored in the Icelandic context as a way of establishing more caring and engaging relationships between design professionals and their communities. If design wants to be more environmentally and socially responsible, it has to focus less on individuality and more on cooperation among its stakeholders. The need to rebuild and protect the communal is imperative in order to face current ecological and social emergencies. Citizenship design education is illustrated as a transformative learning process that helps designers acquire power by developing strong social awareness and collaboration skills within their communities. A powerful designer is a powerful citizen. This paper promotes the idea that universities should encourage students, the next generation of citizens, to cultivate not just factual knowledge but social skills and values to become responsible citizens. Education for citizenship advocates the need for a radical shift from content-based education to active learning by engaging with real case experiences. By doing so, education creates the condition for transformative learning, that is promoting awareness and engagement to operate politically in our local community by initiating forms of activism and participation aimed at solving local and global emergencies.

Keywords: citizenship, design education, social awareness, activism

INTRODUCTION

In October 2018 the director of a nursing home called Droplaugarstaðir in Reykjavik, contacted me to explore possibilities for involving architecture students from the school where I teach, the Iceland University of the Arts IUA to redesign their lobby. I viewed this proposal as a great opportunity to establish a much-needed dialogue between our school and the community. I suggested that we expand the task to involve all the students at IUA to work on projects to meet the complex needs of a burgeoning aging population in Iceland. By 2050 more than 30% of Icelanders be over 60 years old. The idea was accepted by the director and unconditional support and trust was offered throughout the project.

What started as a "simple" design task expanded into a social project based on people's needs and experiences, as a result of dialogue among all the parties involved: fifty second-year students in architecture, fashion, graphic and product design, six teachers from the above mentioned disciplines, and the people at Droplaugarstaðir. So began the design course Together 2019 a Platform for Citizenship Education T19.

RESEARCH METHOD

The aim of this paper is to illustrate the outcomes of T19 and promote citizenship in design education CDE as a transformative learning process. This statement is both a vision of what education ought to be in order to face real issues, and also a reflection of the outcomes of the course based on a student questionnaire, feedback from the teachers and the people at Droplaugarstaðir, together with some personal considerations from the author. The outcomes of the course show that the notion of CDE has contributed to support a transformative learning process in which students and teachers develop strong social awareness and activism through collaborative work. A powerful designer is a powerful citizen capable of being part of the world and contributing to urgent community issues (Heller and Vienne, 2003). A transformative learning process is based on trust among the parties involved and involves students, teachers, and stakeholders in continuous dialogue to challenge and transform the status quo.

CITIZENSHIP DESIGN EDUCATION AS A TRANSFORMATIVE LEARNING PROCESS

The two fundamental pillars of CDE are social awareness and social action (Giroux, 1980; Guðjohnsen, 2017). Social awareness

is based on creating platforms for dialogue for different people to meet and converse about community issues. In this case students and teachers from IUA, residents, caretakers, and visitors at Droplaugarstaðir participated in reflecting on the issue of aging at this nursing home. The aim was to develop shared consciousness and empathy.

Social action is based on establishing collaborative participation among all the stakeholders of the project finalised to create more environmentally and socially responsible design outcomes, which focus less on students' individual creativity in favour of dialogical engagement. Promoting citizenship in design education continues the Icelandic higher education's scope that is to "develop systematically the knowledge, skills, and attitudes that strengthen the individuals' future ability to be critical, active and competent participants in a society based on equality and democracy" (Guðjohnsen, 2016, p.169).

CDE is a call for action to jointly fight a condition that was already highlighted by John Dewey in 1908 known as Kodak Fixation that is the "photographic attitude that reduces the citizen's role to that of a spectator, detached from that which is experienced" (Thackara, 2015, p. 161). Today we still suffer from the same condition (Colomina & Wigley, 2016) but we are also aware that Icelandic youth want to actively participate in and contribute to the life of our community, to be full-fledged citizens (Guðjohnsen, 2016). To help students achieve this, educators need to do more than inform students, educators ought to create conditions for engagement and action capable of connecting students and their teachers to their community. (Sontag, 2004; Manzini, 2015; Resnick, 2016; Heller & Vienne 2003; Guðjohnsen, 2017).

Inspired by the words of Milton Glaser: "good design is good citizenship" (Heller & Vienne, 2003, p. ix) we educators at IUA believe that by stimulating our civic consciousness, the desire to engage with our community, our citizenship, we can enrich both teachers' and students' design skills. At the core of CDE is the concept that creativity is a social not an individual virtue (Sergison, 2018; Cuff, 1991). CDE shifts the design process from individualism to cooperation and reciprocity, from abstract thinking to real life experience, through empathic collaboration and actions to redesign how we live together and therefore our meaning of democracy (Klein, 2014; Giroux 1980; Guðjohnsen, 2016). By doing so CDE becomes a transformative learning process for all the parties involved.

THE NEED FOR CITIZENSHIP DESIGN EDUCATION

> When anyone asked him where he came from, he said, "I am a citizen of the world."
>
> Diogenes Laertius, Life of Diogenes the Cynic

Education matters. The way teachers, students, and our communities shape and construct the process of education influences not only students' future practice but the experience of what education is or can be for all the parties involved. Transformative learning is a process whereby teachers and students together with their community, develop awareness, self-confidence, and action to intervene in their world. Education should create the condition that allows us to see, feel, understand, criticise, change, and be part of the world; in other words, education should empower us to be active citizens (Boyer, 1990; p. 65).

Even though citizenship education has long been recognized as central in education (Lee, 2010) its definition in this paper needs to be clarified. The type of citizenship education that is advocated here is not one that promotes indoctrination into conformity, unquestioned respect for the status quo, or loyalty towards established political parties but rather is intended as a critical tool to develop social awareness and action. The seminal work of Henry Giroux: "Critical Theory and Rationality in Citizenship Education" has been one of the sources of inspiration for elaborating the concept of citizenship in design education. Giroux states the following:

> In the classical Greek definition of citizenship education, a model of rationality can be recognized that is explicitly political, normative, and visionary. Within this model, education was seen as intrinsically political, designed to educate the citizen for intelligent and active participation in the civic community. Moreover, intelligence was viewed as an extension of ethics, a manifestation and demonstration of the doctrine of the good and just life. Thus, in this perspective, education was not meant to train. Its purpose was to cultivate the formation of virtuous character in the ongoing quest for freedom. Therefore, freedom was always something to be created, and the dynamic that informed the relationship between the individual and the society was based on a continuing struggle for a more just and decent political community (1980, p. 329).

I believe these words are still valid today. We need to criticize what is "restrictive and oppressive while at the same time supporting action in the service of individual freedom and well-being" (Giroux, 1980, p. 347).

Social awareness is ignited with dialogues between academics and their communities. To do so teachers need to be socially engaged and capable of exposing students to real life experiences (Giroux, 1980; Boyer, 1990; hooks, 1994; Freire 1970). When students work on relevant issues and explore them with the people directly affected, then an emotional empathic bond between all parties is forged. This social bond creates the necessary condition and motivation for social innovation that is the journey to reach a more socially and environmentally fair world (Schindel Dimick, 2015; Giroux, 1980; Resnick, 2016; Manzini, 2015; Duhigg, 2012). A designer therefore must always be aware of the consequences that his or her design have on citizenry and our environment (Heller &Vienne, 2003, p. x).

Design schools must act as political agents for socialization to activate the multitudinous, rich, and complex system of connections and interrelationships present in our community (Hollis, 2013, p. 127; Meadows, 2008). Academic research is never neutral, it is always socially, politically, and culturally embedded in our community and therefore the world (Tuhiwai Smith, 2012, p. 5). Students and teachers need to be aware that design is about making choices, the impact of which can reverberate globally. CDE has to integrate historical critique, critical reflection, and social action in order to become relevant and life transformative (Giroux 1980, p. 350). This requires a pedagogical shift from education that encourages individual knowledge accumulation to education based on experiential knowledge and collaborative exploration on real life issues (Persov et al, 2017; hooks, 1994; Freire, 1970).

Today everything is designed: objects; artefacts, flows of capital, resources, people, information, climate change, fast urbanization, and the refugee crisis are all matters of design (Colomina & Wigley, 2016; Cross, 2006). These urgent situations are man-made and represent our failure to feel and understand the essential connectedness of everything (Farrelly, 2008, p.11). Citizenship education is defined as a force to challenge the status quo, to understand the consequences of our choices, and be an active contributor to our society, in order to repair its many designed faults. If designers are to find effective solutions to the most pressing problems of the 21st century they need to learn to cooperate with their communities. Socially active students are the genesis to develop socially responsible designers (Lorentsen & Torp, 2018; Guðjohnsen, 2017).

John F. Kennedy in his famous speech *Ich bin ein Berliner*, on June 26th, 1963, urged the world to empathize with the citizens of Berlin in order to solve its problems. Today we are confronted with global social and environmental emergencies that require the same attitude: to stand together. I believe the centre of this shift is the notion of citizenship. Martha Nussbaum explains the concept

of cosmopolitanism, as the person whose primary allegiance is to the community of human beings in the entire world. Today we must all state: "I am a citizen of the world": a cosmopolitan citizen. Education for cosmopolitan citizenship is fundamental to facing the problems of the world because citizenship is about caring for the global common good. It is about engagement and participation of all in political life for the greater good.

CITIZENSHIP DESIGN EDUCATION IN TOGETHER 2019

This part of the paper translates the CDE paradigms into the course T19, by illustrating its structure and main findings. The fundamental requirement of the course was that its outcomes had to be real events. The essence of T19 was to promote activism by engaging students with real life experiences by relating to life at the Droplaugarstaðir nursing home. The concept of citizenship education was used throughout the course with lectures, readings, and was constantly referred to in daily dialogues between students and teachers.

T 19 Course Structure

T19 was a full-time design studio course that ran for six weeks, five days a week (Monday to Friday from 13.00 to 16:40) from April 1st till May 9th, 2019. Fifty second year students took part: 72% from the IUA and 28% from other European countries. 20% of the students were fashion designers, 36% visual communicators, 24% product designers, and 20% architects. The six teachers involved represented the above-mentioned disciplines. At the beginning of the course students self-organized in six teams with the constraints that each had to be gender and discipline mixed. Each team was assigned a specific person from Droplaugarstaðir to work with. Two teams were matched with two residents of the home, two teams were matched with two caretakers, and two teams worked closely with two usual visitors.

The social dynamics of Droplaugarstaðir consist of strong interactions among 82 residents, 153 caretakers, and a variable number of daily visitors. Students began interacting with the world of Droplaugarstaðir by observing and taking part in established activities which led them to develop empathy and awareness. Dialogues were the essential tool of interaction. With dialogues, people become jointly responsible for a process in which all grow (Freire, 1993, p.53). Dialogues are profound, wise, insightful conversations; they are processes that create and recreate multiple understandings and help developing mutual trust (Wink, 2000, p.48). For Paulo Freire, a real dialogue exists only in the presence of love for the world and for the people: "without dialogue there is no

communication, and without communication there can be no true education." (Freire, 1993, p.66).

For six weeks students, teachers, and people from the nursing home worked intensely together. What started as a simple task of indoor refurbishment became a life changing experience. In the words of a caretaker: "The students showed us that people matter. In the end we are all human bond together". The final presentation took place in the main room at Droplaugarstaðir. This was attended by most of the people at the home along with a local journalist who wrote an article https://reykjavik.is/frettir/honnunarnemar-droplaugarstodum.

The projects

Students have shown that designers are not isolated individuals secluded in a studio but active citizens. The six final projects: Senses, Vor (Us), Plöntu Hótelið Dropi (Plants' Hotel), Lífsleið (Life's Path), Fiskisaga (Fishtales), and Nánd (Intimacy) are a healthy mix of idealism, determination, expertise, and endless dialogues conducted among stakeholders. T19's projects can be viewed at http://cargocollective.com/together_lhi.

The following three projects have received an outstanding feedback.

Vor (Us) 2019. This project is an awareness campaign designed to draw the attention of Icelandic youth to the rewards of working in a nursing home and to open people's eyes to the importance of caring for the aging population. With the slogan "Do you want to find love?" students construct a call for action via social media and invite young people to apply for jobs as social caregivers.

Nánd (Intimacy) 2019. This project is a conversational tool designed for stimulating dialogues among staff, visitors, and the residents in the home. A series of carefully developed questions are printed on cards kept in a wooden box near the entrance of the home and available to everyone. Through continuous testing the project shows its validity in creating intimate dialogues especially when promoted by people trusted by the elderly.

Fiskisaga (Fishtales) 2019. Iceland is a nation inextricably linked to the sea. This project is a book of maritime stories collected from the residents of Droplaugarstaðir. The result is a 20-page book of 7 tales. The Reykjavik Museum of Photography sponsored this project and applications for grants are taking place to continue it. This project has been submitted for presentation at the Dutch Design Week in Eindhoven together with the 20 best students positive impact projects in the world.

T19 celebrates people from Droplaugarstaðir (caretakers and patients) by showing our community what it means to be in a nursing home, the work done by caretakers, and the value of communal historical memories preserved by its residents.

FINDINGS

These findings are based on the teachers' experience, the examination of the course's outcomes, the analysis of answers to the course's questionnaire, and on the continuous dialogues conducted by the teachers with students and the people at Droplaugarstaðir.

In our vision of education citizenship has to be practiced not only studied (Guðjohnsen, 2016). We are aware that promoting citizenship takes time and joint efforts throughout society and within the IUA. This is not just a matter of a six-week university course. It can be difficult to replicate such a course as total commitment is required by all parties involved. The quality of the T19's outcomes varies among the six groups, but all projects are remarkable examples of real collaboration and engagement among teachers, students, and members of the community. T19 has allowed students to touch people's lives in a personal way and to suppress individual cravings in favour of collaborative research. Very few courses within IUA are capable of doing this so in this respect the course T19 was unique.

The staff at Droplaugarstaðir who were involved in the project expressed great satisfaction and appreciation for the students' work and presence in the home which transformed the daily life of residents and caretakers very positively and brought real joy to everyone. The director of the house said the experience provided them with a platform to promote dialogue within society about the condition of the elderly and their caretakers, and the social value of nursing homes.

The results of an anonymous questionnaire of 15 questions, distributed at the end of the course, are as follows: 27 answers were collected from the 50 students which is 54%. The first four questions: "Design and the World" show that 78% of the respondents think the course T19 expanded their notion of design and what it can achieve. There is a large consensus in seeing design as political (96%) and believing that "good design is good citizenship" (84%). The majority of the students' state that the concept of citizenship has enriched and encouraged their design skills and ability (67%). When asked to explain this answer only thirteen students responded. The most common answers were: "it helped me to believe in collaboration", "it gave me the courage to make the project real", and "it helped me to feel part of society". On the other hand, there was also this comment: "T19 left me indifferent" and another one was "it is very difficult to evaluate it".

Please position yourself within the following statements:
The design course Together 2019 A Platform for Citizenship Education has contributed in:
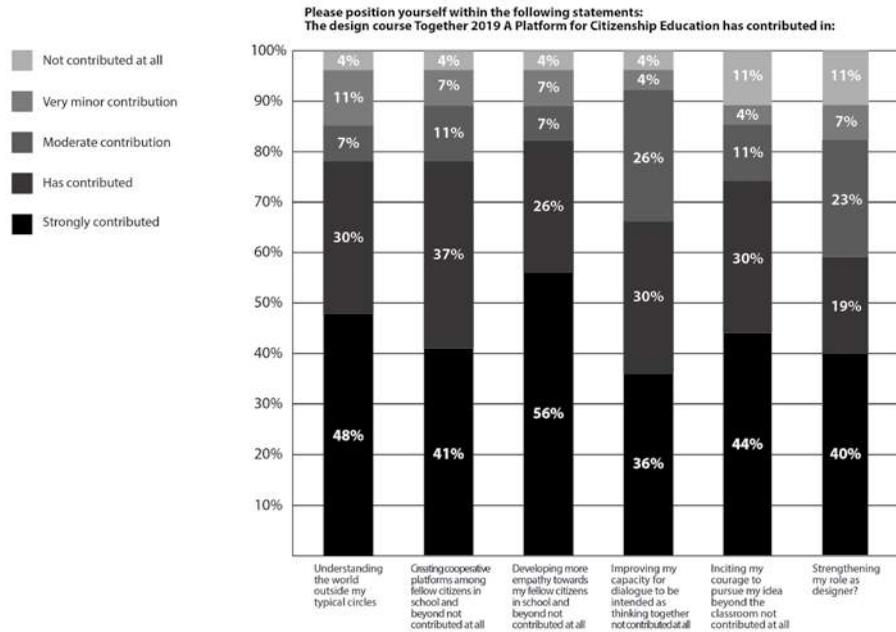
Figure 1. Diagram from the Questionnaire

technical such as long working days, groups were too big, whilst one student wrote: "this is simply not working for me!"

It has to be noted that transformative learning is not something teachers do "on" students but something that students, teachers, and their community experience together, in an intimate way. I personally feel transformed by this experience. I feel strong emotional bonds have been forged among the stakeholders. I feel more empathic and willing to collaborate with other teachers from different disciplines, jointly developing pedagogies for engagement, putting aside stereotypes associated with each individual profession in the search for ways of evolving and developing projects. T19 is an indelible experience that has changed and transformed our lives as teachers, making us feel more connected with one another than ever before. Will these feelings last? That remains to be seen.

These findings are positive signs that the course, at least for some students and teachers, has been truly transformative, has helped designers acquire power by developing stronger social awareness and collaborative skills to pursue their work beyond the classroom, within the community.

Students either agreed or strongly agreed with the following six statements: The design course Together 2019 A Platform for Citizenship Education has contributed to:

- Understanding the world outside my typical circles 78%
- Creating cooperative platforms among fellow citizens in school and beyond 78%
- Developing more empathy towards my fellow citizens in school and beyond 82%
- Improving my capacity for dialogue to be intended as thinking together 66%
- Inciting my courage to pursue my idea beyond the classroom 74%
- Strengthening my role as designer 59%

Developing empathy and collaboration appear to be the most agreed upon statements, whilst the capacity for dialogue and strengthening their role as designers received less agreement.

When it comes to interdisciplinarity and working with a real case 80% of the students agreed that the course was beneficial for expanding their understanding of the subject. 74% of the students believed that their work had an impact on the people at Droplaugarstaðir or Icelandic society. However, only 52% of the respondents would like to attend more courses like this one in school. Overall the most positive remarks from the students were that the course was life changing. Liabilities appear to be more

CONCLUSION

When teachers and students understand that design is not a private matter but a social one that relates to the potential capacity of a group then the work becomes the result of a communal learning process which involves designers and their community. To be a designer, one needs to feel connected to the world and bound to its people: this is the essence of CDE and its transformative value.

CDE encourages social awareness and social action (Giroux, 1980). Social awareness is based on critical thinking to challenge the status quo, the belief that design has a political agency, and systems thinking to understand that our decisions' impacts can reverberate globally. Social action is based on establishing an active dialogical collaborative participation among all the stakeholders. Through their collaboration and engagement with real case studies, students and teachers learn to become active citizens or at least to feel such during the length of T19.

Education is about social awareness. It is about cultivating and developing not only scientific factual knowledge, but empathy, emotional intelligence, social and design skills to face and solve challenges. Students believe that through real engagement their projects are not only academic exercises but have real impact to change people's lives. This belief was the basis of the course and was then confirmed by T19's findings.

We at the IUA have always believed that our role as educators is to help students see the world, understand it, criticize it, and find a way to be part of it. Designers are more than architects, visual communicators, product and fashion designers; we are leaders, and as such we need to have the intellectual and moral ability to respond to the important issues of our time.

ACKNOWLEDGEMENTS

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CONTROVERSIAL-ORIENTED STORYTELLING AS A METHOD FOR DEALING WITH WICKED PROBLEMS

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In search of solutions to face the challenges of the contemporary ecosystem crisis, as well as to promote collective well-being, design is increasingly directed towards projects that deal with wicked problems and vary according to the beliefs and values of the social actors involved in these processes. However, most methods and tools are observed to be unable to deal or constructively consider the possible conflicts and divergences, which arise during these design processes. In this paper, we introduce the process of creation and experimentation of the COS (Controversial-Oriented Storytelling), which is a method that emphasizes the plurality and diversity of opinions, and associates the technique of storytelling and the bias of controversies in the understanding of STS (Science and Technology Studies) in order to deal with wicked problems. In the pursuance of understanding the potentials of this tool, the COS was applied in several workshops sessions that addressed the wicked problem "woman" regarding work and entrepreneurship. In this scenario, the data were collected through focus groups with project teams and, subsequently, treated through content analysis. As a consequence, the results show that the COS (a) triggers different perspectives of reality, (b) makes historical perspectives sensitive, (c) initiates new dialogues, (d) provokes defiance, (e) stimulates empathy, (f) promotes transformation, (g) instigates questions, (h) stimulates the identification of opportunities, and (i) helps in the imagination of future scenarios. In this sense, the COS helps to produce new ideas in a critical and reflexive way, as well as it reveals itself as a method with the potential to make the range of a wicked problem more sensitive, to stimulate controversy, and to promote transformation.

Keywords: *Storytelling*, Controversies, *Wicked Problems*, STS, Design Methods.

INTRODUCTION

Conflicts of interest, which are common in situations marked by a plurality of points of view, are frequent in projects that deal with *wicked problems*[1]. (BUCHANAN, 1992; RITTEL AND WEBBER, 1972). In projects that seek collective well-being these peculiarities are even more evident. It happens due to the search of the creation of shared value, which affects and influences all of those who are involved in the ecosystem, namely individuals, organizations, and society. (BISTAGNINO, 2011; OUDEN, 2011). In these contexts, design tends to foster new dialogues and conversations between different audiences (MANZINI, 2017; ZURLO, 2010). Thus, through tools that facilitate the articulation between heterogeneous groups (MANZINI, 2017, OSTERWALDER AND PIGNEUR, 2011), i.e., the visualization of images, maps, drawings, and graphic elements, and the actors of these processes are encouraged to discuss, have new ideas, co-create, and define design paths.

Notwithstanding the fact that these projects locate multidisciplinary as a central and strategic aspect of research (BROWN, 2008; SANDERS and STAPPERS, 2008), it is important to notice that many of them do not deal constructively with the plurality and diversity of points of view. For instance, some authors such as Brown (2008), Manzini (2017), and Osterwalder and Pigneur (2011) suggest that the convergence of visions and interests among designers should be sought and mitigated, thus reducing conflicts and tensions during the process of these projects. In this scenario, the tools tend to be oriented towards a process of reduction of the complexity of reality (BERTOLLOTI *et al.*, 2015), which may affect the decrease of creative potential as well. (DE DREU & WEINGART, 2003; JEHN, 1995).

Therefore, coming from a perspective that values the multiplicity of points of view, a couple of questions arise: (i) How could design help preserve the different perspectives of a wicked problem?, and (ii) What would be the effects of taking plurality and conflict into consideration in projects? Thus, considering this scenario, this paper presents the process of creation and experimentation of a new tool, the COS (Controversial-Oriented Storytelling). This tool applies the concepts of storytelling, as well as the bias of controversies, in the understanding of STS (Science

and Technology Studies) for exploring the diversity of wicked problems during design processes.

STORYTELLING

Storytelling means telling a story to someone. In the design field, marketing, and communication, stories represent a way of involving people by establishing connections among users, target audience, interested parties, and community; thus, stimulating empathy, as well as influencing the way these people perceive reality (GALBIATI, 2015). According to Manzini (2017), the potential of the storytelling tool is due to the type of visualization, emotion, and engagement that it evokes. The author believes that stories may help people rethink and redefine their ways of being and doing in the world. To achieve this goal, people primarily need to be "able to see from their own point of view" (2017, p. 137), which depends on how one interprets the state of things and the opportunities recognized.

In raising questions that people may never have thought before, storytelling may cause reality to be seen from a different point of view (GALBIATI, 2015) and function as an "engine of change" (MANZINI, 2017, p.137). In this scenario, the key element is to design a variety of different elements that can guarantee individual reflection (MANZINI, 2015).

For Manzini (2017), *storytelling* helps facilitate and promote new dialogues, as it might make a problem tangible for people, and help them see the complexity of the design themes clearly and attractively. Additionally, through this tool, the interested parties approach and talk about problems and their possible solutions. But how to do so? Is it possible to portray the complexity of the world? In order to deal with this question, Manzini (2017, p.137) asks: "How can we make sense of the complexity of the present and of the dynamics that guide them? How can we make points of view and desires explicit?" (MANZINI, 2017, p.137).[2]

According to Bertolloti et al. (2015, p.11) the major part of storytelling projects which deal with wicked problems, as social innovation projects, for example, seems to not present the reality and variety of points of view. They suggest, for instance, that

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1   *Wicked problems* are defined as a "class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing." (BUCHANAN, 1992, p. 15). Design problems are indeterminate and wicked, as there is no special subject of its own to be addressed beyond what a designer might have perceived and expected. Thus, the subject of design is potentially universal in its own scope for being capable of being applied in any field of human experience. (BUCHANAN, 1992). In this sense, in order to create what does not exist, a designer must establish a principle of relevance between knowledge of the arts and sciences. (BUCHANAN, 1992).

2   Author's translation.

when the tool is used in projects in which there are complex combinations of people, objects, and environment, the stories do not seem to respect the plurality and diversity of these elements. On the contrary, they tend to portray naive positivity and eliminate any narrative conflict, which means removing the "dark side" of the issue. In this sense, consequently, these stories seem to be overly reductive and deny the complexity of the problem. It means that lacks understanding about how to do so and hence it needs to be further studied.

CONTROVERSIES

The controversies are situations of disagreements, debates, conflicts, and discussions (LATOUR, 2005; NELKING, 1992; VENTURINI, 2010). The studies about controversies have been one of the approaches of the interdisciplinary studies of STS (VENTURINI, 2010). For Latour (2005), one of the main authors among this topic, the directed look at the controversies shows the plurality of relationships that are formed among the social actors (LATOUR, 2005). By its visualization, different actors can understand the different structures and interactions of social phenomena (VENTURINI, 2010), and, in this way, the controversies can help to promote democracy and social debates (LATOUR, 2019).

For Venturini (2010, p. 3) states that there is no specific approach or methodology to be followed in order to identify controversies. The author quotes Latour: "just look at controversies and tell what you see." (VENTURINI, 2010, p.259). "Controversies begin when actors discover that they cannot ignore each other and controversies end when actors manage to work out a solid compromise to live together. Anything between these two extremes can be called a controversy." (VENTURINI, 2010, p.6).

In other words, the mapping of controversies depends, primarily, on the researcher's creative ability to explore, feel, and observe; furthermore, it may include different forms of data collection.

However, some aspects must be respected, such as the impartiality of the researchers during the development of their projects. They must seek objectivity through the inclusion of new accounts and perspectives, which may multiply the points of observation. The more numerous and partial are the perspectives from which a phenomenon is considered, the more objective and impartial will be their observation (VENTURINI, 2010). It is a slow, laborious, and often complex approach. In this sense, though maps, graphs, drawings and connections, the Cartography of Controversies emerges as a method to explore these issues and make them visible to different audiences (LATOUR, 2008; VENTURINI, 2011).
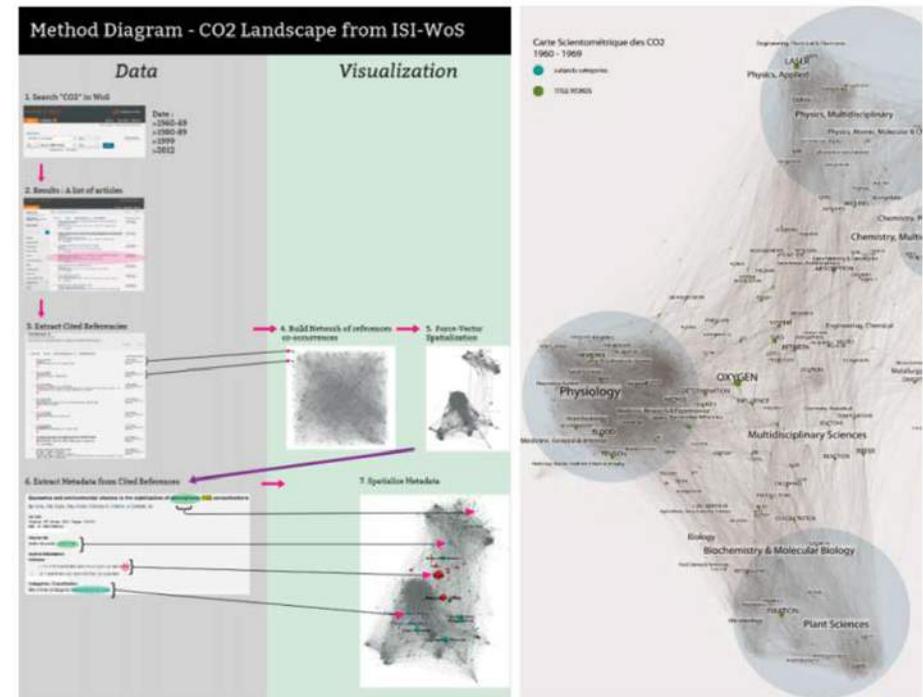
To illustrates a Cartography of Controversies, Boechat and Venturini (2016, p.9) presents figures 1, which shows the controversies of the problems related to the CO$_2$ emission.

As we can see, there are an infinity of connections and maps that can appear in a Cartography of the Controversies, which makes complex and difficult to make people visualize and understand. So, how this kind of map could promote democracy and social debate?

In fact, Boechat and Venturini (2016) affirms that the challenge about Controversy Cartography is to find the balance to represent the controversies in a simplified and accessible way to different audiences, as the present forms of communicating them are extremely difficult and complex to be visualized and understood. Also, this topic has been discussed by Latour (2008). At a design event the author questioned: "Where are the visualization tools that allow the contradictory and controversial nature of the issues of interest to be represented?".

Taking into account the notes of Latour (2008), Boechat and Venturini (2016) we understand that studies are necessary to make the visuality of the controversies and their cartography more attractive and accessible to different audiences.

Moved by these questions, this paper identifies a significant potential, in the concept of storytelling and controversy, as a way

to bring more diversity to design projects and to promote more clarity to wicked problems.

METHOD

This study was developed in four stages: (1) The COS's creation, (2) the COS's experiment, (3) focus groups, and (4) content analysis.

The COS's creation main objective was to develop a narrative to tell the story of a wicked problem. The audiovisual (video) feature was chosen as one of the most powerful ways to engage and thrill through stories. In addition, because COS is a material for project use, we would be able to collect material, the controversies and various stories and points of view on the subject through the internet. Youtube was selected because it is the main video sharing network and also because were able to download these videos free of charge using free resources.

The preliminary stage was to identify the main themes and themes that corresponded to the controversies of our theme: "women" in relation to work and entrepreneurship. We perform bibliographical and documentary research to immerse ourselves in the wicked problem and identify the main themes that should be addressed in our history. During content analysis, we noticed that some themes were more prominent and were related to three main issues: women's individual decisions, women's social decisions, women's economics decisions. Our story should touch all this points. Regarding the individual, for example, there are themes as motherhood, abortion, marriage, gender, etc.

In the end, these three main categories results in 10 other categories that served as a guide to create our sequence of the story and also for data collection: (1) Women, history, feminism; (2) Women, vote, work; (3) Women, education, work; (4) Women, work, family; (5) Women, men, social standards; (6) Women, social roles, work; (7) Women, maternity, work; (8) Women, work; (9) Women, work, entrepreneurship; (10) Women, work, prejudice.

For each category we define a variety of keywords, essential feature optimize research on Youtube. To search Category 1 videos, for example, we search for "woman, history and feminism," "women's history," "history of feminism", "feminism", "machism", "anti-feminism", and so on. More than 500 videos were analyzed and 147 selected and edited using a free video editing program called Adobe Première.

The result was a 30-minute video[3] that represented the controversies through the plurality of the actors and opinions

3   The complete material can be accessed at: <http://bit.ly/SOPC_>.

about the wicked problem. Among those videos, there were reports of unknown people, interviews with personalities and experts from multidisciplinary areas, research data, news reports, as well as video clips that gained popularity and generated discussions on the issues.

We also tried to select videos that had extreme opinions, so that they could share the opinions of the designers. For example, we use a verbalization by current President Jair Bolsonaro to talk about the wage gap between women. Also, we used an excerpt from the video "Vai Malandra", by singer Anitta, which generated many discussions regarding women's freedom and body expression.

As we had anticipated 4 hours of workshop, we estimated that 30 minutes would be an ideal time to address the 10 categories of storytelling and also for the teams to project on CO'S experiment.

For the COS's experiment, the first step was selecting the participants and to form heterogeneous project teams. The criteria used concerned the points of view regarding the wicked problem, as well as the personal and professional profile. In the end, we selected 18 participants who were divided into four project teams. In order to the workshops happened in two different days and were composed of two teams per day.

Initially, in the workshops, the COS was first introduced. During COS's presentation it was already possible to see people reaction. Smiling, getting angry, taking notes from important topic, etc.

Then the groups got together to create projects that answered the following question: "How can design help create desirable realities for women regarding work and entrepreneurship?".

By the end of the activity period, the participants took part in a focus group held by the researcher. The objective of this focus group was to try and understand the perceptions of the designers in relation to the activity and to the COS tool.

Figure 2 – Designers watching the COS and taking notes.
Source: Created by the author.

Figure 3. Designers during
the workshops.
Source: Created by the author.

Figure 4. Designers in the
focus group.
Source: Created by the author.

Regarding the data and results obtained from the focus groups, those are presented in the next section together with the Content Analysis of this research.

RESULTS

Table 1 shows the categories constructed from the content analysis technique and reveals participants' perceptions about the COS.

1. TRIGGERS DIFFERENT PERSPECTIVES OF REALITY	The COS presents a variety of realities and encourages participants to present other realities, such as their personal experiences and worldviews.
2. MAKES HISTORICAL PERSPECTIVES SENSITIVE	The participants manifest to visualize the past and to understand the present from the contents presented in the COS.
3. INITIATES NEW DIALOGUES	For the participants, the contents covered in the COS start new conversations and dialogues, as they guide the discussion.
4. PROVOKES DEFIANCE	The COS has the potential to provoke reactions among group members who feel uncomfortable agreeing and disagreeing with the statements.
5. STIMULATES EMPATHY	The COS has the potential to stimulate empathy, as the participants mention putting themselves in the other's shoes during the project activity.
6. PROMOTES TRANSFORMATION	The COS has the potential to transform the way participants see the wicked problem.
7. INSTIGATES QUESTIONS	The COS generates reflection amongst the participants. Those who ask questions related to the COS themes during and after the project activity.
8. STIMULATES THE IDENTIFICATION OF OPPORTUNITIES	The participants identify opportunities and new demands from the COS' extracts.
9. HELPS IN THE IMAGINATION OF FUTURE SCENARIOS	The COS has the potential to help imagine future scenarios regarding the wicked problem

Table 1. Categories that
portray the designers'
perception of the COS
Source: Created by the author.

From the categories constructed during the content analysis, we reached the main topics of discussion, which problematize how

the tool can treat wicked problems. Those topics are: the COS (i) helps produce new ideas in a critical and reflexive way, as it reveals itself as a method with the potential to make the range of a wicked problem more sensitive, (ii) stimulates controversy, and (iii) promotes transformation.

The COS makes the range of a wicked problem more sensitive

Differently from the ideas presented by Brown (2008) or Manzini (2017), which suggest that design methods should reduce conflicts and seek convergence of ideas to facilitate problem visualization and also decisions in projects dealing with wicked problems, the COS does the opposite, as we see on interviewee Lucas's verbalization: "(COS presents) very extreme points ... (...) But of things that still exist. There will be men who will like women who want to stay at home, take care of their children, ... they will have men who will want entrepreneurial women ... and vice versa. "

The COS makes the range of the wicked problem sensitive and empowers a fragmented and multifaceted view of reality, as it "translates" the diversity of wicked problems through the presentation of the different perspectives, positions, and points of view regarding them. Besides, the range of the wicked problem is expanded as participants bring new perspectives and versions of the problem from their stories, experiences, and worldviews.

We can see this argumentation in Helena's verbalization: "For me these numbers (shown in SOPC) are all freaks. In my reality, in my company, this does not exist. There are men and women, those who work well earn more, those who do not work well earn less".

It is also important to note that the COS has a particular effect to engage the participants, as it creates a favorable environment for starting new dialogues and engaging project teams. These teams talk, they have something in common to converse, and various reasons to agree and disagree with each other.

Thus, this technique is relevant for short-term activities, such as codesign workshops, which involve multidisciplinary teams that, in addition to having different levels and types of knowledge about the problem, often feel intimidated to start new conversations.

The COS stimulates controversy

By making the range of the wicked problem sensible, the COS presents opposing positions to those the participants have and this helps stimulate the generation of new controversies. In this sense, the effects created by the project are conflict and contradiction. It presents a different kind of projecting, dialoguing and exploring the exchange of ideas, as the tool does not stimulate participants to have a single idea or convergence of ideas, but

rather a plurality of opinions, questions, and divergences. This ideia can be seen in Pedro's verbalization: "You get upset and even when you're going to argue with people you're already bothered with some things and defending your opinions, you start to see that people are upside down (upset and defending other opinions)".

The creative process constantly deals with criticism, with the presentation of new perspectives, and with reflection. In this scenario, the reflection impacts in order to stimulate transformation in the way designers deal with problems.

The COS promotes transformation

The fact that the COS raises various issues that participants may have never thought causes designers to visualize the wicked problem in a different way, from different points of view, and hence transform their way of dealing with the problem. In this sense, they discover new realities, accept new paths, look at the problem from the bias of the other, and reflect their ways of thinking. Therefore, the COS has the potential to transform and this idea is related to the new meanings that designers give to the wicked problem, which can contribute to innovation processes.

CONCLUSION

This paper focused on how the COS can be used to deal with wicked problems. According to the results obtained from the tool experiment and the content analysis, it is possible to state that the COS is a unique design tool for dealing with wicked problems. By representing the plurality of points of view, it has the potential to transform the way designers deal with wicked problems, as it broadens the knowledge and visualization of the different perspectives of a problem, stimulates new debates and controversies, as well as it promotes reflections on them. These effects generated by the COS are issues that impact on the creative process, as they engage audiences with diverse characteristics and cause designers to produce new ideas in a critical and reflective way.

It is important to highlight that the construction of the tool was audiovisual and this type of resource showed that it has the power to influence the result achieved by the tool. During the focus groups, participants mentioned that the video brought truth to the exposition of the problem.

When the participants visualized the multiplicity of stories told by different profiles of people who experienced the problem - unknown people, experts, and personalities -, they gave more credibility to what was shown and also got excited, skeptic, and

involved with the material presented. In fact, "audiovisual design thinking" has already been studied by authors such as Piredda (2019) and Ciancia e Mattana (2012), as an original approach to transmedia narrative based on design practice, in order to engage diverse audiences in participatory processes. In this sense, the COS reveals itself as a tool to be tested on these types of projects.

Finally, as a limitation, it is important to note that the researcher's bias in the construction of COS might emerge. There is an unlimited variety of stories to tell and a diversity of people, objects, and environments that may and need to be considered during the identification of controversies. These decisions have consequences, as they interfere with the message content of the storytelling. In addition, the way the researcher decides to edit, what to put in the foreground and what to disregard might influence the outcome and partiality of the COS and the type of effect it generates in the participants during the design process.

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MOVEMENT AND PLACE-MAKING IN A MONSOON TERRAIN

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The territorialization of the Western Ghats, India, is an act of colonial power that either settled or marginalized particular peoples, practices, and ecologies, privileging a wet-dry binary and spatializing a monsoon landscape. The environment of the Western Ghats, in particular, has been politicized and polarized. Today, indigenous peoples and other 'forest dwellers' have been compromised through the inherited colonial framework; they are excluded by conservation action as is their knowledge that is based on dynamic everyday relationships with place. Efforts to be inclusive are fraught with inadequacies of colonial imaging and use the language that continue to objectify and spatialize nature and culture, which, in turn, propagates the wet-dry divide. The disciplining of the Western Ghats is perpetuated through environmental laws: from the Indian Forest Act, 1865, guarding the land for production, to the Forest Rights Act, 2006, which gives rights to forest dwellers to protect it. Despite these laws, conflicts over access to land and resources continue as the lives of these inhabitants and their relationship with the ground, or world, were never considered on their own terms. How can design unravel how these inhabitants lived prior to colonialism? There is the possibility that they understand place by moving, occupying, and temporally appropriating dynamic conditions of 'wetness' in their ordinary everyday lives. What can be assembled from existing clues, and from a new imagination, to design futures that correspond (Ingold 2011) to a changing environment? This paper will reveal the possibility of a local/indigenous 'wet ontology' (Steinberg and Peters 2015) which privileges everyday practices across time and continually 'makes home' in this monsoon terrain.

Keywords: colonialism, Western Ghats, environmentalism, design research, imagination.

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PARTICIPATORY DESIGN THROUGH JEWELLERY PROTOTYPES: SCANDINAVIAN DESIGNERS AND ZIMBABWEAN VILLAGE ARTISANS

This paper explores participatory design through the use of prototypes as boundary objects. Empowering underprivileged Zimbabwean village women through design, based on the woman's own local craftsmanship and finding tools for the women to help themselves is the main goal of the project. Jewellery design prototypes created in Scandinavia has been brought to Zimbabwe and presented to the artisan women who respond designing prototypes with the materials they have available. This way, communication is proceeded without words, via the designed objects.

The jewellery products will be used in Scandinavia and by the many international visitors in the area around the Niagara Falls. Potential user´s preferences are explored during the process.

Keywords: boundary objects, local ownership, participatory design, product design, Scandinavian design, UN Development Goals

INTRODUCTION

The first UN Development Goal (UN, 2015); The wicked problem of poverty is the starting point for this project. The first stages of a multi-stakeholder jewellery-project, between Sabona, Scandinavian Design Group, Kristiania University College in Norway and Zimbabwean artisan women of the Dopota village is explored. The project is initiated by Sabona, a Norwegian Non-Governmental Organization (NGO), specializing in Zimbabwe.

Empowering underprivileged Zimbabwean village women through design, based on the woman's own local craftsmanship, finding tools for the women to help themselves is the main goal of this participatory project. The aim is to develop jewellery products as a participatory process using environmentally mindful, inexpensive, local materials from local seeds and from the ilala palm tree, regularly used in basket-making. However, some additional materials may have to be bought in order to achieve the desired designs.

Involving locals to promote ownership is an important part of the project as the power-balance between the stakeholders are uneven. Bunch (1991) explains pitfalls Westerners trying to help developing communities are confronting. Paternalism, where the local participants don´t get the ownership, is a common problem. He claims the only possible method for developing projects in underprivileged villages, is to acquire enthusiasm and that early recognizable success is crucial. Involving the Dopota village woman, developing tools so that they can take control of their own situation, and gain ownership to the project is an important part of this project. Unlike other design projects involving developing countries, the designed products are not going to be used by Africans nor does it involve any Western company commercially interested in making low-cost production in a developing country. The only commercial interest in the project belongs to the Dopota women of Zimbabwe. The design of the jewellery bears the mark of both African and Scandinavian design traditions. The jewellery products will be used in Scandinavia and by the many international visitors in the area around the Niagara Falls. Knowledge about potential users and tests with users are essential for the products to be sold.

A participatory design process traditionally involves the future users in the design-process. This project is different as the most important participants are not the end-users. Ehn (2008) draws on Star´s (1989) theory of boundary objects describing a method in which material non-human designed *prototypes* are considered as partakers in a participatory design process. In our design process, designed prototypes have been used as a mean of communication between the participants. Design prototypes created in Scandinavia has been brought to Zimbabwe and presented to the Dopota women who respond designing prototypes with the materials they have available. This is a new and extended way of performing a participatory design-process. Several participatory design studies have been investigated with communities in developing countries (Winschiers-Theophilus, Chivuno-Kuria, Kapuire, Bidwell, & Blake, 2010; Drain, Shekar, & Grigg, 2017; Hussain, Sander, & Steinert, 2012). However, the use of prototypes as boundary objects and communication between Western designers and African community women has not been widely investigated. The paper asks: *How can a participatory multi-stakeholder design process empower underprivileged Zimbabwean village women?*

AFRICAN AND SCANDINAVIAN DESIGN AND CRAFTING

African and European design originate from dissimilar traditions of creating. Campbell (2003, p.25) states that African products traditionally derive from crafting, and that traces of handcraft is still often apparent in African designs. Whereas European or Western products are more likely to be mass-manufactured with the smooth finish of machines. The mark of the hand in objects is an unselfconscious part of traditions for Africans (Campbell, 2003). For Westerners the handmade finish may engage a sense of exclusivity or nostalgia and lost innocence. (Dormer, 1990). African visual art and crafts are often divided into three key periods: pre-colonialism, colonialism and post-colonialism where the pre-colonial era has been the most appreciated by Westerners (Matsinde, 2015, p. 10). African creativity today is influenced by its entire history and shows a thriving diversity based on local craft traditions and also of modern production methods (Matsinde, 2015). Tribal affiliation and its visual characteristics give identity to artisans in African villages, while the African nation state has a less unifying power (Clay, 1985). The Dopota village are part of the Ndbele people of Matabeleland, well known for their artistic traditions (Itebu, 2016).

Scandinavian design reflects the Scandinavians socially inclusive culture, aiming to create affordable and useful, often machine-made objects, where the designed objects are recognized as an integral part of daily life (Fiell & Fiell, 2017). However, handcrafting also has deep roots in Scandinavian culture, as industrialization came relatively late to Scandinavia (Fiell & Fiell, 2017, p.14). Lately, there has been a recurring interest in craftsmanship among young Scandinavian designers as a counter-reaction to the ever-increasing personal digitality most Western people are surrounded by (Friedman, 2007; Van Raemdonck, 2016; Rynning, 2018). The link to crafted products may bring Zimbabwean and Scandinavian culture closer together.

Creating enthusiasm

Western designers, unfamiliar with poverty and foreign culture, may be facing difficulties designing for, or co-designing with underprivileged Africans. Mattson and Wood (2014) describe nine principles of effective design for the developed world. Their top priority principle is co-designing and involving locals in order to promote ownership. Testing of the designs with the users is another important principle of theirs. In our case, the testing involves test-making the jewellery with the Dopota women's local materials to see if they can make the products. Bunch (1991) explains thoroughly some of the pitfalls Westerners trying to help developing countries are confronting, based on agricultural projects. However, most of these pitfalls are also adaptable to design projects (Campbell, 2013). Paternalism, where the local participants don´t get the ownership, is a problem. The paternalism of free give-aways or also of doing free favours is useless in the long run as projects started by outsiders has proven to fail when the outsiders leave. On the other hand, humans do care for what they have worked hard to obtain. Bunch claims the only possible method for developing projects in underprivileged villages is to acquire enthusiasm (Bunch, 1991, p. 27). Enthusiasm is the driving force that make people willing to experiment and cooperate with others. "Early recognizable success is a crucial ingredient in making participation constructive" (Bunch, 1991, p. 32). Projects must start small and simple, that way it is easier to quickly reach the first success and the successful innovation creates enthusiasm which pushes people to innovate more (Bunch, 1991, p. 39). Participatory design and involvement may have the power to face some of the challenges of cultural differences and possible paternal approaches of western designers.

Participatory design and boundary objects

«*Participatory design is a constellation of design initiatives aiming at the construction of socio-material assemblies where open and participated processes can take place*»

(Manzini & Rizzo, 2011).

Participatory design dates back to the 1970´s in Scandinavia, where the collective resource approach developed strategies and techniques for workers to engage in developing new systems for their workplace, building on their own experiences, providing them with resources to be able to act in their current situation (Bødker, 1996; Sandler & Stappers, 2008). Participatory design today is the approach of involving users in the design process (Björgvinsson, Ehn, & Hillgren, 2012; Bødker, 1996; Ehn, 2008; Manzini & Rizzo, 2011; Sandler & Stappers, 2008, Sundblad, 2011). The aim is to gradually refine the designed object to suit the user. This process is different from user-centered design where

the user is a passive object of study by professionals to gain insight (Sandler and Stappers, 2008). In Participatory design non-professional partakers contribute with different creativity according to the contributor's abilities. The role of the designer in the creative process is to facilitate and let people participate in their own way, informing the design development. Ehn (2008) also explores the participation of material "non-humans" elements, such as prototypes performing as boundary objects.

> "Boundary objects are objects which are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual-site use. They may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. The creation and management of boundary objects is key in developing and maintaining coherence across intersecting social worlds"
>
> (Star & Griesemer, 1989 p. 393).

The boundary objects are adaptable across multiple viewpoints, and still maintain continuity of identity (Star, 1989). The objects may help people from different communities build a mutual understanding. Participatory design between people from different socio-cultural systems may experience unforeseen contradictions. For example; rural African communities are often hierarchical structured, and lower ranking people are not expected to openly express opinions (Winschiers-Theophilus et al., 2010). Women are normally considered lower ranking, which is not the case in Scandinavia. Communication through boundary objects may help overcome this tradition as it is the women creating the objects. Also, in rural African communities participation is an established practice and allowing the established group to participate in its own way and within its own timeframe is important rather than actively facilitating participation (Winschiers-Theophilus et al., 2010).

METHODS, FINDINGS AND THE DESIGN PROCESS

Our project started out in Scandinavia. Design students of Kristiania University College worked on a jewellery-project for six weeks together with Scandinavian Design Group. Three meetings for adjustments were arranged between the NGO Sabona, Scandinavian Design Group, the design students and their tutor. In the design-process Scandinavian visual culture and African, Ndbele visual culture were juxtaposed. Visual elements of both cultures were to be expressed. Scandinavian visual preferences for jewelleries were

investigated through a digital questionnaire. The questionnaire got 113 responses, mostly from Scandinavian women aged 25-30 years. The most important finding revealed Scandinavians prefer simple and functional jewellery. However, some also preferred larger, more expressive accessories. Preferences for African jewellery were not asked specifically but were incorporated into the questions in order to avoid "politically correct answers".
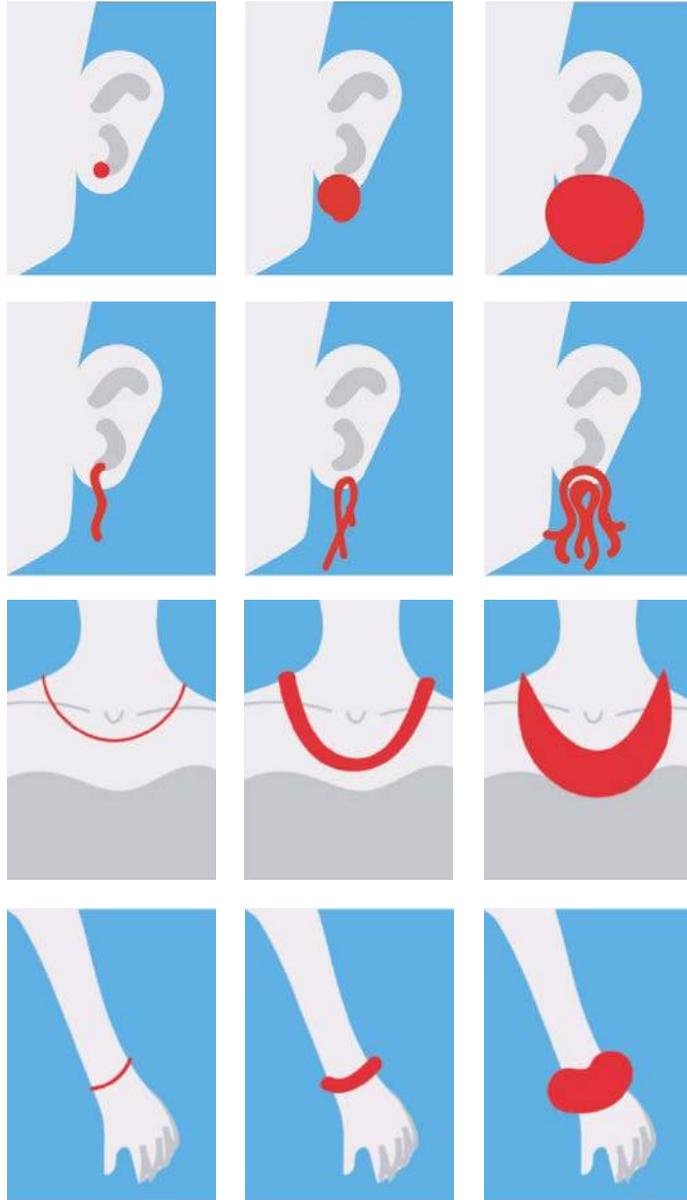
Figure 1. Visuals from the questionnaire.

Based on the knowledge that involving locals at an early stage when working with the developing world (Bunch, 1991; Campbell, 2013; Mattson & Wood, 2014), the first interaction between the Scandinavian designers and the Zimbabwean Dopota village was arranged already after two weeks of research through a Skype meeting. The communication was in English which needed to be translated to the Dopota woman. The Skype-meeting discussed the importance of the tribal affiliation. The first suggested brand name of the jewellery had to be changed, as it was associated with another Zimbabwean tribe, the Shonas, and not the Ndbele. In a mail, the Dopota community suggested new names, Kulipeda or Maboko, which sounded too foreign in Scandinavian ears. The designers, doing their research far away from where the products were to be made, had found Ndbele jewellery using glass pearls and elephant hair in addition to the material from the local ilala palm tree made for weaving baskets. However, the only material the villagers did not have to purchase externally were local seeds and the Ilala, as the palm grew in their village. The designers changed both their jewellery designs and the branding designs completely. Now there was another story to be told, relating to the ilala palm tree.

The Skype-meeting was a very important first dialog between the different participants and improved the Scandinavian designs in order to adapt to the abilities and the culture of the Dopota women. During the six weeks the Scandinavian designers created several products to be tested by the Dopota women group and also visual identity branding design to be tested in the Scandinavian market.

Figure 2. Ilala baskets made by the Dopota women group.

Figure 3. Prototypes and visual identity branding made by Scandinavian Design Group and students of Kristiania University College.
Figure 4. The prototypes are being examined by the Dopota women groups representatives.

Figure 5. The prototypes created by the Dopota women group.

Mail-input from Dopota confirmed they had seen the prototypes and were eager to test the designs. They would use ilala and also seeds to make the jewellery. In order to get the right colours, they would use dye from several plant seeds. The Scandinavian-made prototypes were brought to Zimbabwe by the Sabona representatives to be analysed by the Dopota artisan women.

The first design tests by the Dopota women revealed that although the Ilala material was available in the village, the dimensions of the earring prototypes where not easy to achieve using *only* the Ilala palm and local materials. Instead the Dopota women designed jewellery based on another of the Scandinavian prototypes using local seeds available in several colours and shapes. The next step will be for the Scandinavian designers to adapt these designs and test them with potential Scandinavian users.

DISCUSSION

Wicked problems are problems not easily solved. Poverty is considered a wicked problem linked with other problems such as political situations, equality and education (Kolko, 2012). The first of the UN´s sustainable development goal is to end poverty in all its forms everywhere. UN´s Sustainable Goal No. 1. elaborates: Economic growth must be inclusive to provide sustainable jobs and promote equality (UN, 2015). Our multi-stakeholder project is not trying to solve the vast problem of poverty, but rather co-create products that are easily made and popular with potential users, and which may help a few underprivileged people giving them a tool to help themselves.

Manzini and Rizzo´s (2011) article "Small projects/large chances: Participatory design as an open participated process", examine the need for large-scale, sustainable changes and explain how participatory design may realize such changes through small projects: A small-scale project like our participatory designing jewellery project. Manzini and Rizzo conclude that the traditional notion of participatory design needs extending and suggest social innovation. The use of designed prototypes as boundary objects and communication between Scandinavian designers and Zimbabwean artisan women may represent an extension of the participatory design process.

In our participatory design process, the designers are not being present in the community as facilitators designing with local participants to find a better solution for the community (Ehn, 2008; Kolko, 2012; Sanders, 2008). Instead, the designing partakers are placed in different continents working separately, but for the same goal: to create easily made products which may give income to the Dopota community. Working on different

continents and representing very different cultures may lead to confusions and the process certainly takes more time, but it may also be a strength. The communication through prototypes as boundary objects may avoid misinterpretations through words and local hierarchy, where lower ranking women are not expected to express opinions (Winschiers-Theophilus et al., 2010). Not having to work in the same place at the same time may give the participants more space to safely explore options and may also make the unfortunate power balances between the uneven participants less pressing. However, the power-relationship will always be an issue and the feeling of paternalism may be experienced when there are differences between the parties involved. Creating ownership of the project is the most important thing to achieve in order to avoid paternalism (Bunch, 1991). A feeling of success along the way is important. The experience of designed prototypes contributing to the development of the finished result may be the feeling of success needed to retain ownership in the process. Communicating through prototypes and helping each other developing the final design may help ease some of the power-differences. We really need each other in the design process to arrive at products that are easy to make, use local materials of Dopota and will appeal to Western consumers.

In order to appeal to Scandinavian users, the jewellery must balance between exotic novelty and familiarity (Hekkert, Snelders, & Van Wieringen, 2003). Campbell (2003, p. 28) claim there is the otherness of African artefacts that are appealing to Westerners and that exploration of materials and finishes help attaining this. However, the otherness must not take over the overall impression of the designs. Scandinavians enjoy handcrafted, exotic products, but they also enjoy their familiar Scandinavian styles.

CONCLUSION

In this jewellery design development, the possibilities within design is explored in two continents by people with completely different backgrounds communicating through prototypes as boundary objects. The project demonstrate how design can be a tool that connects people and cultures. The project demonstrates how design can be a tool that connects people and cultures. Our project explores a new approach of helping underprivileged Zimbabwean villagers through an extended participatory design approach performed without being co-located, using prototypes as boundary objects. Participatory design, involving the Dopota women in the design process may create ownership and hopefully avoid the feeling of being paternalized. Having a shared process, but on different continents allows participants to work at their own pace and do the necessary tests with materials. The final

result is important, but so is also the process.

By investigating a possible market for the jewelleries in Scandinavia and utilising both product design and visual identity branding design in order to reach the market, products are more likely to gain popularity in Scandinavia.

As this paper only explains the first stages of the project, further investigations and tests, both in Zimbabwe and in Scandinavia must be conducted before the project is completed. The communication between different cultures through prototypes as boundary objects has so far been successful and may also be further explored in other cultures.

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PEDAGOGICAL STRATEGIES FOR SOCIAL IMPACT DESIGN, DESIGNING WITH THE POPRUA

Reflecting on the conference theme, "the after design" raises questions of design education. Students are our future; what they learn and how they learn to practice design will affect our policies, systems, and societies. "Improving peoples' lives ... is one of the goals of social impact design education. The question is, are we giving students enough depth ... in this field to make them viable when they hit the street?" (Palleroni 2012). In response, the authors present a case study showcasing an innovative teaching framework based on theory U that facilitates social justice by extending design activities to an underserved population. The pedagogical framework is flexible and provides ways to envision and develop social impact design education.

This paper describes Design Matters in Brazil (DMB), an international studio-based program that engages directly with the National Movement of the Street Population (MNPR), a socio-economically marginalized group of people in São Paulo, Brazil to build capacity —through design build activities— and teaches students principles and practices of social justice design through participatory action. DMB brings students from Ohio State University together with Mackenzie Presbyterian University students to provide significant transformations to the physical space of CISARTE (Center for Social Inclusion through Art, Work and Education), and the lives of the homeless population at the Center. The study illustrates how principles and practices of theory U inform social impact design curriculum. Design pedagogy for social impact is learning at the (institutional) margins with marginalized populations; engaging everyone, turning nowhere into somewhere.

Keywords: social impact pedagogy, theory U, social justice design, participatory methods, co-design

INTRODUCTION

Critically considering the challenges we face today of injustice, social inequity, and human rights violations, the authors examine how design education can be an instrument toward social change. Students are our future; what they learn and *how they learn to practice design* will affect our ever-changing policies, systems, and societies. In this paper, we examine how community-engaged design education and co-learning at the margins with underserved populations expands social awareness, transforms student learning, and facilitates systems thinking —a critical aspect to addressing wicked problems and creating sustained societal change. Our case study is an international studio-based program that engages directly with the National Movement of the Street Population (PopRua), a marginalized group of people living on the streets in São Paulo, Brazil. Our intent is to engage with them through design build pedagogy and teach students principles and practices of social justice design through participatory action. Specifically, Design Matters in Brazil (DMB) brings students from Ohio State University together with Mackenzie Presbyterian University students to co-create with the PopRua and provide significant transformations to the physical space of CISARTE (Center for Social Inclusion through Art, Work and Education), and the lives of the homeless population seeking refuge at the Center and resources from the non-profit.

"Improving peoples' lives ... is one of the goals of social impact design education. The question is, are we giving students enough depth ... in this field to make them viable when they hit the street?" (Palleroni 2012). As educators, we plan educational experiences and develop partners in the field for social impact; yet it is equally significant to keep at the forefront of our teaching and engagement "the difficult questions of agency and power relationships easily overlooked in our desire to do good" (Conrado 2017). Therefore, we must be explicit in our teaching approach; we must challenge our students to see themselves not as saviors, but as part of a network system that can act against policies and systems that perpetuate social inequities, ethnic discrimination, and human rights injustices. To foster these conversations, my colleagues and I ask: What educational experiences in the field are required for students to approach social design with an ethical grounding? What transformative learning is necessary beyond the classroom for students to shift from an ego-centric to eco-centric mindset to become authentic leaders for change? How might we best prepare students to *design with* communities that are marginalized, disenfranchised, or differently abled?

To begin to answer these questions, we have integrated into our place-based, social impact design courses principles and practices of theory U, a socially innovative technology.

Heralded as a methodology for systems change, it leverages an inner journey of self-discovery with collaborative creativity and collective wisdom (Senge 2009). Specifically, we share a pedagogical framework adapted from theory U to offer a curriculum roadmap that 1) engages the head, heart, and hand, 2) elevates transformative learning and, 3) facilitates collaboration through its stages of intersubjective inquiry and reflective practices. Although context specific, the framework is intended to be flexible providing ways for educators to envision, create and develop education for social impact.

WORDS AND TERMINOLOGY MATTER

As educators our primary responsibility is to train students in the disciplinary rigors of design; yet as social design practitioners we are additionally responsible for setting a moral tone, identifying ethical expectations, and modeling ways to engage with others, including non-designers, government officials, NGO's, and marginalized populations. As Paulo Freire reminds us: words have basic and contextual meaning (Freire 2013). Therefore, we emphasize the community-engagement aspect of the service-learning course as it elevates dialogic exchange and co-creation of knowledge with students and community partners over *service*. Deliberate word choice helps frame our approach and the mindset we aspire to model and practice. To engage our students in these ethical considerations, we stimulate classroom dialogue prior to all social interactions; collectively we unpack our implicit biases. We ask students to be mindful and listen attentively to community members as they share their lived experiences on critical issues. Learning to listen and understanding the issues from another's perspective is a critical practice in social impact design.

DESIGN MATTERS IN BRAZIL COURSE, PARTNERS IN LEARNING, AND CONTEXT

The development of the international course, Design Matters in Brazil is based on my experiences growing up in São Paulo and my professional experiences working with local non-profits to engage urban youth in design build activities for urban revitalization. These academic efforts resulted in a generous teaching award and resources that enabled me to initiate the DMB course. Over several months and many visits, I met with administrators and faculty from different universities in São Paulo and presented the idea of co-developing and co-teaching a social impact design course with American and Brazilian students to engage a community in need. Three challenges presented themselves during this pre-planning

phase: first was the language barrier; second was the alignment of academic calendars, and third was finding faculty willing to co-teach across tremendous geographical expanse, committed to social justice design.

Partners in Learning

Luck changed when I was introduced to Professor Juliana Bertolini who graciously accepted the invitation to co-instruct the social impact course with me. After two years of teaching the course, we humbly report on creating a dynamic experiential learning opportunity for our students, developing meaningful partnerships with NGO's and non-profits across São Paulo, and contributing positively to the members of PopRua through direct interactions and the design build projects. Although the course continues to evolve, our preliminary outcomes, resultant of the applied theory and co-design methods, are worthy to share to garner feedback and improve social impact design education.

First it must be said: building relationships, gaining trust, and developing partnerships is probably the most significant aspect of community-engaged design projects. They must be *co-developed* with all the stakeholders involved, those directly affected by the social interactions and design, and those indirectly involved. For the DMB course, the members directly involved include the PopRua (National Movement for the Street Situation) and GAMB, a non-profit cooperative that assisted with construction. The indirect partners include university administrators and the Brazilian NGO, Design Possível, who serve as an advocacy agency for the PopRua population. Figure 1 illustrates the network of
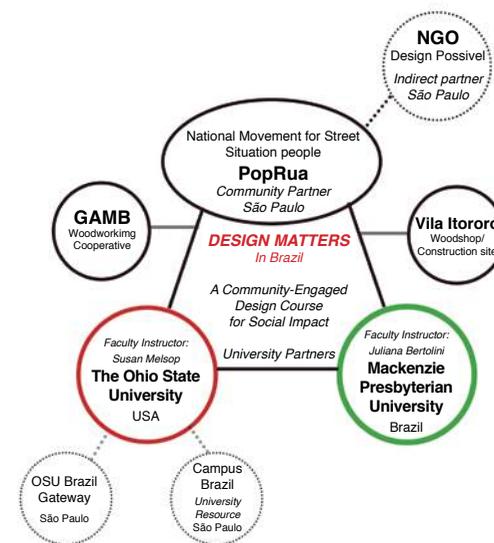
partnerships of this course. Dash lines indicate indirect partners; solid lines denote partners directly involved with the social impact course. Any success we have had can be attributed to our conscientious efforts communicating frequently and openly with each partner.

Context: Opportunities for situated learning

In São Paulo, Brazil approximately 1.2 million people are either homeless or live without proper shelter (Rueckert 2017). This number is based on *documented accounts only*. With a population density over 12 million, this means that for every 10 residents there is one homeless. Homelessness is caused by many contributing factors, too many to adequately address here. What is significant to know is that the founding of the National Movement for the Street Situation population (PopRua) was a reactionary uprising to the heinous crimes against people living on the streets.

In the aftermath of terror and death in 2006, a group of homeless men banded together to collectively resist the violence against them and demand their full constitutional rights. Their societal marginalization from civic life, economic participation, and scarcity of human rights motivated them to mobilize the PopRua movement. Today, it is a national movement that aims to bring advocacy to the plight of the street situation population and resources to assist people to "exit from the street" and lead lives that contribute to society.

In 2016, the São Paulo municipality granted a site to the PopRua, (Figure 2). They call it CISARTE, Centro de Inclusão Social Pela Arte, Cultura, Trabalho e Educação (Center for Social Inclusion for Art, Culture, Work and Education). In short this describes their mission: to create an inclusive center with educational programming, workshops, and events for work development, hands-on training, and cultural gatherings. The founding members have articulated how critical it is for those living on the streets to have conversations and opportunities to build relationships with others beyond street living. They lament that labeling people as homeless leads to further social and economic isolation and perpetuates discrimination and marginalization.

Yet while the PopRua have a space, they have few resources to develop the space into a place supportive of their vision. In fact, when we visited the site what we found was a vast unadorned interior space with approximately 1500 square meters divided into large and medium size rooms. No furniture or comfortable infrastructure existed to support any of the programs they envisioned. The interior space, literally sandwiched between a 4-lane road above and an 8-lane highway below, is loud and

unwelcoming. The condition of the space as well as PopRua's desire to have college students engage with them to work with its members became an ideal site for us to practice social impact design.

As we engaged with this vulnerable group of people, we were highly conscientious of our approach and types of interactions we would have. Each interaction and activity we planned presented a set of ethical considerations for us. During the course of our work, five engagement principles emerged, each guided our teaching intentions. They include: connecting, communicating, collaborating, co-creating, and changing. Together, the principles positioned us for an ethically-oriented community-engaged design pedagogy and aligned well with theory U.

THEORY U AS PEDAGOGICAL STRATEGY AND FRAMEWORK

In *Theory U, Leading from the Future as it Emerges*, Otto Scharmer offers catalytic inspiration for participatory design action. We find this method particularly suitable for educating designers to be ambassadors for social inclusion, cultural diversity, and positive impact. The method described in theory U aligns well with community-engaged design pedagogy as it enhances student learning, advances intersubjective inquiry, benefits a community in need, and puts social justice design into action. In this paper, we demonstrate how the adaptation of the socially innovative methodology into design pedagogy lends itself to 1) transformative student learning, 2) authentic community engagement and, 3) a praxis of democratic design.

Understanding the visual literacy of the U model is significant to its applicability, (Figure 3). First, the diagram reads left to right, departing from a typical way of proceeding (grey line) to enter a learning journey. The shape of the U signifies a deep dive of

letting go of preconceived notions, including fear, judgement, and cynicism, and letting come a future as it emerges (Scharmer 2009). (This may sound abstract, but in practice the method works well). Second, the U model offers a 3-tier level of engagement: open mind, open heart, and open will. Engaging head, heart, and hand underscores the principles of the transformative student learning model (Sipos, Battisti, and Grimm 2008) that we find invaluable to community-engaged design coursework. The five movements along the U are learning journey stages (Scharmer 2009). The dashed arch indicates a return to any previous stage that may require more investigatory work. We offer a pedagogical framework based on the U methodology as we find it to be an invaluable tool in shaping curriculum for social impact.

Based on a 16-week semester, the Design Matters in Brazil program brings two diverse groups of students together to work virtually on impact design projects. During each week, students from Ohio State University and Mackenzie Presbyterian University collect data, gather relevant information, co-design projects, and share information virtually until they work side-by-side during spring break in Brazil. Stages of the U model provided us a way to create a pedagogical framework for social impact design (Table 1). In the right-hand column, we paraphrase the five stages of the U as described by Scharmer. In the left-hand column, we describe our translation of these as they inform our educational instructions and learning activities over the semester. Employed as an overlay to conventional design phases, the U methodology emphasizes human-centered design approaches and the development of "soft skills" necessary for authentic collaboration, trust building, and empathy development —all significant to community engagement activities in social impact design.
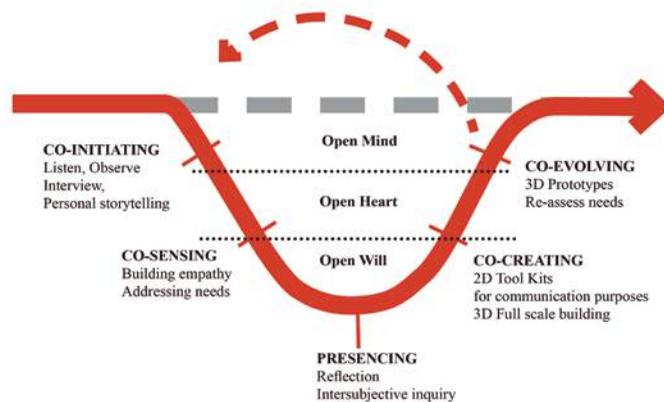
Figure 3. Diagram adapted from Theory U model illustrating each major movement of the U and 3-tiers of engagement Diagram credit: Susan Melsop

1. CO-INITIATING "The first step of the U engages cognition and calls for observation and "attentive listening to others, to ourselves, and to what emerges from constellations or circles of people that we help bring together."	**EDUCATIONAL ACTIVITIES INCLUDE:** *(for Mackenzie Presbyterian University students)* • Visiting the site and observing • Conducting informal interviews at CISARTE • Listening to the "critical issues to help clarify the unique priorities, needs, and desires of PopRua members *(for Ohio State University)* • Studying co-design methodologies • Analyzing case studies of social design practices
2. CO-SENSING "The movement of the U that helps us connect with and tune in to the contexts that matter; moving into a state of seeing in which the boundary between observer and observed begins to collapse and in which the system begins to see itself."	**EDUCATIONAL ACTIVITIES INCLUDE:** *(for Mackenzie Presbyterian University students)* • Visiting the site and engaging in participatory design to garner feedback from members of PopRua *(for Ohio State University)* • Mapping the problem from a systems perspective • Visiting a homeless shelter, listening
3. CO-PRESENCING – getting in touch with oneself for deeper sense of feeling the crisis "The movement of the U that helps us connect to our deepest sources of inspiration and stillness –and to the place from which the future possibility begins to arise. This movement merges three different types of presence: the future, the past, and the authentic self. It shifts the place from which the self emerges to the highest future possibility–to our Self.	**EDUCATIONAL ACTIVITIES INCLUDE:** *(Both universities, working remotely)* • Team-based project development; negotiating design decisions, exploring materials, building study models, sharing images of prototypes • Instructor-led visualization meditation combined with breathing technique (using Facebook as communication platform) • Reflective writing exercises
4. CO-CREATING "The movement of the U that enables us to explore the future by doing; enacting prototypes of the future by linking the intelligences of the head, heart, and hand and by iterating through the guidance of fast-cycle feedback from all stakeholders in real time."	On-Site **EDUCATIONAL ACTIVITIES:** *(Both universities, working collaboratively on-site)* • Finalizing team-based design projects • Building projects • Installing projects • Supporting the mission of the PopRua by engaging members directly in design build activities
5. CO-EVOLVING Co-visioning today for an improved situation tomorrow;	**EDUCATIONAL ACTIVITIES INCLUDE:** *(Both universities, working remotely)* • Advocating for human rights for the homeless • Documenting the experiential learning (Outcomes include 2 books, 4 videos) • Demonstrating how social impact design education can bring about social change through public dissemination and academic publications

Table 1. Pedagogical Strategies adapted from theory U (Scharmer 2009), offering a curriculum roadmap to social impact design education

RESULTS AND PROJECT OUTCOMES

Project outcomes of DMB are both tangible and intangible. The tangible outcomes include eleven culturally-inspired projects. Over the course of two semesters and (2) five-day periods at the site, we have designed, built, and installed: a directory and wayfinding system for the 1500 square meter space (Figure 4), 4 kitchen tables, 8 kitchen chairs, a book shelf, a storage unit, a sound-insulating curtain wall, stools and benches, and vibrantly colored wall graphics including photomontages of PopRua members, (Figure 5). Our aim was to help transform the barren space into a vital "place" and promote a sense of belonging by engaging members of the PopRua on each phase of the creative process. PopRua members expressed their pride and enjoyment working side by side with the students. One individual helped design and install the sound absorbing curtain wall (Figure 6). Another worked with students to design chairs with back support (an important feature he said for those who "sit on city curbs" all day).

Figure 4: Wayfinding system painted on floor of 1500 sq meter interior space
Photo credit: Susan Melsop
Figure 5: Designs installed at CISARTE; Design projects include benches, stools, and all wall graphics
Photo credit: Susan Melsop
Figure 6: PopRua members and students co-design and install the green curtain wall project to attenuate noise pollution
Photo credit: Susan Melsop

One project warrants particular attention, the poetic inscription project. Beyond its functional utility, the 10 ft-long storage unit was conceived as a billboard to amplify the unheard voices of individuals living on the streets. During an action research session, students collected statements from members of the PopRua. Together the students and PopRua members assembled the quotes and created a visual billboard that graphically displays their words of wisdom, insights, and aspirations to live life with dignity, belonging, and community (Figure 7).

The intangible outcomes of the course are reflected in students' journals and begin to demonstrate the transformative learning they accrue from their experiences in the field. In a final reflection, a student shared "I always thought design [was] not only as a profession, but a tool that should be shared with society. After this experience, I can say [the course] has had a huge impact on my life. I plan to continue ... working with social and participatory design. The project at CISARTE has opened my eyes to seeing others." Another student commented, "This project was more than just design work, we were able to see it as a social tool to solve problems in our society, even if these problems are hidden in our community." These statements attest to student transformative learning and highlight the new ways they feel about their communities and design practice. Of the participating students, more than half have stated their intentions to pursue practice in social design, and three members of the PopRua have "existed the street situation" and now live in subsidized housing, and contribute to program development at CISARTE. Of course, there are many contributing factors that lead to social and economic mobility, but we would like to believe that participating in the Design Matters course has had a positive impact on the lives of the PopRua members. And, we are simply grateful they let us engage with them on their personal journeys to "exist the street".

Figure 7: PopRua members and students with the poetic inscription project completed
Photo credit: Susan Melsop

CONCLUSION

In this paper, Design Matters in Brazil served as the pedagogical case study to critically examine how theory U can facilitate collaborative learning, inspire personal and collective transformation, and authentically engage with underserved populations to bring about social change. The text offers a pedagogical strategy and framework as it explains the principles of theory U and its applicability for social impact design education. Indeed, we attempted to demonstrate the value of theory U in practical application to a community-engaged design course. We highlighted the significance of building partnerships in learning and the project outcomes of our collaborative efforts.

Our work on this pedagogical praxis will continue as we gear up for the next Design Matters in Brazil course beginning January 2020. For this, we remain committed to partnering with the PopRua to create lasting change, focusing on collaboration over competition, and providing students the experiences, methods, and skillsets to continue social impact design into the future.

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A RESEARCH AND TEACHING PROJECT FOR THE MARTESANA DISTRICT

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Re-occupation and re-designing of public spaces are becoming increasingly frequent, particularly in peripheral and semi-peripheral neighbourhoods. This essay will try to explore a research teaching project that involves different realities, including small local communities of the City of Milan, a Milanese private company called Cargo, and a group of students from second-year studio on the Master's Degree course in the School of Design of Politecnico di Milano. Here, the role of the design discipline is to take advantage of the fertile context of the Martesana District in Milan, and to propose new solutions, scenarios and strategies, by placing the resident population and the small local communities in a relationship by using the skills of the design students' skills to create synergies and new processes of inclusion and social innovation.

The process began when Cargo, a traditional furniture store in the north-east of Milan was looking to be more innovative. The company asked the Polimi Desis Lab, a research team of the Department of Design at Politecnico di Milano, to help them to increase their relations with the neighborhood, offering the residents a new space for meeting together, community, and sharing. Corresponding to a common phenomenon in many commercial areas in the world, Cargo is maintaining the character of a place of consumption, without engaging in community dynamics.

After an in-depth concept analysis about the context and the associations involved, the studio will generate a prototyping event, including some co-design sessions extended to the people of the neighbourhood. Design practice is trying here to cross through the barrier made by the framework of market-driven economies, by co-designing and using a community-driven approach as its central core.

Keywords: Social practices, Design education, Research in design, Community-centred Design, Co-design

INTRODUCTION

Cargo, a traditional furniture store in the north-east of Milan was looking to be more innovative. The company asked the Polimi Desis Lab, a research team of the Department of Design at Politecnico di Milano, to help them to increase their relations with the neighbourhood, offering the residents a new space for meeting together, community, and sharing. A group of forty international students of Temporary Urban Solutions (TUS), an elective course of the Master's Degree at the School of Design at Politecnico di Milano, were involved in this research and teaching project. In particular, they were asked to work with some local associations, creating opportunities for meeting and collaboration at the neighbourhood level, in order to activate the local community, generating strong opportunities for participation.

Starting from this analysis, this essay highlights the collaboration between researchers, students as designers, and the local community, in particular with the aim of understanding how to involve them in the co-creation of new, best solutions.

The results of the course confirm that the social component within an urban reality in close contact with design is favourable to the definition of new responsible strategies for promotion and participation of neighbourhood.

Six associations were chosen for a complete final prototyping, one for each project team. From the educational point of view, this allowed a relationship to develop with the associations and, from the point of view of the coherent, co-planning Human-Centred Design method, a full exchange of experiences, complexity and objectives developed among design teams, neighbourhood associations and local community. The final sharing of the prototyping results coincided with a district-wide event, *Martesana Fest*, which was held in Cargo's outdoor spaces.

PROTOTYPING SOCIAL PRACTICES

Design practice has been influenced by the changing landscape of human-centred design research. The user-centred design approach, which began in the 1970s and became widespread by the 1990s, proved to be most useful in the design and development of consumer products (Sanders, 1992). It became clear that this type of approach cannot address the scale or complexity of the challenges we face today (Edwards et al., 2003). It is no longer a matter of simply designing products for users, but rather of thinking about and designing future experiences for people, communities and cultures that are disconnected and misinformed.

In this text, we want to focus on a critical challenge that includes the collaboration between researchers, students as designers, and the local community of the Martesana district, discovering above all how to involve the latter in the co-creation of new and improved solutions. Researchers and designers have to deal with two main challenges. The first is to understand who to involve in this type of process, such as those who are interested in and impressed by it, like local communities and associations linked to the neighbourhood. Secondly, there is a need to preserve the environment in order to foster collective creativity, including the conjecture that can be improvised at any time during the activity (Lee et al., 2018).

Over the years, design has moved from being a more hand-crafted discipline to a multidisciplinary one, linked to social environments, products, services, systems, relationships and brands (Friedman, 2002; Muratovski, 2010). Referring to innovative, social and service activities means referring to design for social innovation. The objective of the process presented here is to satisfy social needs and demands, spread mainly through local associations with a community purpose (Mulgan, 2006).

In a context such as that of the suburban and near-suburban, the design discipline has a pro-active role, proposing specific research methodologies and intervention strategies in close relation to the neighbourhood, also building new skills, creating unique synergies, functions, relationships, spaces and, in general, processes of social inclusion and innovation. Consequently, the use of spatial design practices and services in social innovation puts into practice a holistic, co-creative and user-centred approach, understanding and involving the behaviour of users such as the neighbourhood, students and Cargo employees, in order to refine new emerging models (Stickdorn et al., 2011). Design is therefore recognized as a powerful driver of innovation, even when its methods and tools are applied in new fields.

The designer succeeds in broadening and investigating his interests even in small, uninvolved communities, leading to an improvement of life in the neighbourhood by establishing new relationships and the power of social understanding, through an applied methodology and a short- and long-term creative perspective. The role of the design discipline, in this particular context, is to optimize the fertile context of the Martesana district by proposing new activating solutions, scenarios and strategies, connecting the resident population -small local communities-using the skills of design students, creating synergies and new processes of social inclusion and innovation. Here, the practice of design is trying to cross and overcome the barrier constituted by the framework of market economies, co-designing and using the community-driven approach as its core.

In the following paragraphs, starting from an in-depth conceptual analysis of the context and the associations involved, there will be a discussion of how a precise methodology is applied during the course to generate co-planning that is extended to the neighbourhood, concluding in the organization of a public event to present the results of a first prototyping.

Martesana District

Martesana District is the urban context selected to develop the experiences undertaken during the elective course of TUS and of the research related to it. This is an area placed on the north side of Milan, between Viale Monza and Via Padova between Rovereto and Gorla Metro stations; it is an industrial and residential area, where people from different cultures and of different ages live.

The Martesana area is characterized by a fragile cultural fabric, which is socially, economically and culturally fragmented. This district is therefore still trying to find its own identity, an unprecedented territory that spans different areas of dialogue.

The historical part of Crescenzago is a coastal village, with houses and farms that show the traditional rural nature of the area. In the first half of the twentieth century, however, the area was intended for other purposes and fell to urban, indeed uncontrolled, expansion (Bonomo et al., 2014). The Metropolitan network is the main communication link for the whole area with the rest of the city, but it also acts as a wall between Crescenzago and the rest of the district that extends beyond the railway line.

In the neighbourhood today there are well-built areas and completely abandoned parts. Even though calls for proposals by the Municipality of Milan have always sought to bring about change to regenerate the situation, especially in terms of urban planning and services. It was decided to revitalize the district with infrastructure and services that will improve citizens' quality of life, making it more strongly connected with the surrounding area. The redevelopment of the Adriano district passes through the management headquarters of the technology multinational Siemens (Rigatelli, 2018). This new project is a symbol of innovation and sustainability for a small neighbourhood that has not yet evolved but has potential for growth. It is closely connected to the metropolis of Milan, but still needs time and the inclusion of new projects of different realities to achieve real urban development, starting from the community and possible future internal and external relations in the neighbourhood.

The first challenge of this research and teaching experience, is to respond to a specific request of a local reality like Cargo, thus finding potential temporary urban solutions, with the possibility of becoming permanent in the future, for those who

live in this neighbourhood, and promoting social, cultural and interpersonal opportunities, and making the most of common spaces through new opportunities. This university research methodology is intended to transform students into primary activators of improvement of the neighbourhood, using their design ideas to experiment with activities of co-design with the different local realities, until you get a first prototyping in real scale. The enrichment of a district with events, activities and social involvement also means helping its environment, thanks to a network of active collaborations between citizens, local merchants and the activities and associations already present in the area, using the public spaces and empty places of the district that have potential.

Development and Methodology

This article presents an action format developed through reflection on different experiments that, through the principles of design for social innovation, focuses mainly on action research and field activities. Design for social innovation is defined as new solutions to social problems that are more efficient, effective and sustainable than existing ones (Phills et al., 2008). More bottom-up approaches are needed, so that multidisciplinary stakeholders can have open discussions and cooperation to form policies and projects that produce social benefits (Needham, 2008).

A Human-centred (HC) design methodology is used - a creative approach to problem solving that builds a deep empathy with the people you design for. As IDEO affirms, the HC approach "is a process that starts with the people you're designing for and ends with new solutions tailored to their needs" (2015). It's about generating ideas and building prototypes, sharing what's been done with the people you're designing for and bringing new innovative solutions into the world. The design of HC basically consists of three phases:

* *Inspiration*: to learn directly from the people you are designing for and understand their needs in depth;
* *Ideation:* to identify design opportunities, and prototype possible solutions;
* *Implementation:* is about understanding how to bring your solution to life, and to market in the real world.

Forty international students on the TUS course were called upon to involve the six associations of the neighbourhood to carry out a process of continued co-design. The phases of the process are:

* *Analysis and Research* that includes desk research and field research on the context of the neighbourhood and their assigned associations, also using tools such as interviews and photo reportage;
* *Concept Generation* which mainly includes a co-design session extended to the neighbourhood;
* *Project Development* the project conception phase after having analyzed all the previous points;
* *Prototyping* which aims to test the planned activities, services, communication, and spaces with the community.

Through the study of local actions undertaken by communities, it is possible to promote the development of the urban public space, focusing on sustainability, conviviality and solidarity, new ways of involving residents and users in the design phases of a transformation project. Each of the six student groups was assigned an association: *G.A.S (Ethical purchasing group) Crescenzago* is a local community of people who share the common philosophy based on the rejection of consumerism, the care of natural products and affordable prices; Assab One is a non-profit organization that promotes exhibitions, events and art projects focusing on initiatives that integrate different languages capable of reaching beyond the art world, symbolic of a meeting place where exchanges take place between different individuals, realities and cultures; *WeMake Fablab* supports and provides a space for digital and traditional manufacturing while also providing access to fablab technologies to explore new fields of innovation involving the local and global community in different skills and learning processes; *Sonomusica Association* is a local reality linked to music, offering concerts and various musical events more generally throughout the neighbourhood, including concerts in community areas; *Artigirovaghe* promotes the spread of cultural and educational research, also promoting social experimentation, especially in creative development and free expression, to create socialization processes for a new social community; and, *City Art*, where the projects deal with the protection and respect of the environment, the theme of social relations and conflict mediation in all those places where the capacity for active participation in social and public life can be increased.

The final output of the TUS course is an event organized in spaces owned by Cargo that open to the whole district, to stage possible future scenarios for the Martesana district, where the local associations and the local community were able to test final prototypes of space and service designed by the students.

WEEK ZERO	WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	EVENT
TUS Course Presentation	Analysis and Research	Concept Generation	Co-design activity with Local Realities of Martesana District	Project Development	Project Development	@CARGO Prototyping Event

The students provided Virtual Reality (VR) models of the spaces, allowing people to interact and imagine the future through them.

The prototypes and the activities proposed during the event were made with the aim of building long-term relationships with local community actors to create networks and new relationships from which design opportunities can emerge.

When design helps small communities

Manzini (2015) says "social innovations are solutions based on new social forms and economical models. They are those social changes towards sustainability when they can reduce the environmental impact, regenerate common goods and social fabric". These innovations often deal with public space because communities often act in it and for it.

Richard Sennett (1992) wrote about the crisis of the city, introducing an idea that differed from that of Jane Jacobs in *The Death and Life of Great American Cities* (Jacobs, 1961). Jacobs, he says, is nostalgic about the past and the relationships between people in small towns and she tends to suggest a restoration of past conditions. Therefore, as Sennett claims, we cannot think that the past can give us elements to improve our present city problems, as the solutions we want must be adapted to an affluent technological era. The answer is probably to be found between these two arguments, or perhaps they are not so far away from each other to begin with. They both conclude that communities must have a need for, and the will to re-reach, some values that have been lost in modern urban life, such as mutual support and conviviality (Sennett, 1992).

According to this last concept, public spaces are becoming places of social innovation, offering a context where creative communities act (Meroni, 2007) to provide original solutions to the daily problems that the current economic system is no longer able to provide.

In the particular context of this teaching research, all the activities and prototype projects have been implemented with the aim of building long-term relationships with stakeholders in the Martesana local community to create networks from which design opportunities can emerge. The actions of these active groups of six associations, the students and Cargo as spokespeople for the neighbourhood, create opportunities for social transformation and sustainable growth that modify the existing model, replacing the old individualistic values with a new sense of community, sharing the exchange of knowledge and information through shared support.

This assessment session helped to explore the opportunities and understand the possible future scenarios of the spaces and services designed. The real impact was visible for the first time from the presentation of six full-scale prototypes referring to spatial design and service design strategies, which took place during the public event. These include strengthening the identity of the neighbourhood, enhancing its unique creativity, preserving material and immaterial culture, and using design to build potential long-term development strategies. These are all elements that, if put into practice, can contribute to improve the quality of life of the local population in the Martesana district.

FROM ANONYMOUS TO COLLECTIVE CITY

The projects described below follow the methodology previously analyzed, anticipating what will then be the last phase of the course, which consists of a triple objective of prototyping:

- *Space Prototyping:* the students have realized a 1:1 scale spatial model of the project or at least a detailed part of it;
- *Service Prototyping:* the idea of a new service or activity as a tool to connect the project to the Martesana District;
- *VR (Virtual Reality) Prototyping:* through the use and support of this technology, the mise en scene of a future scenario regarding the new Cargo spaces.

The students' ideas were presented during the Martesana Fest, a final event: six projects and six activities to involve the inhabitants and six future scenarios to stimulate the vision of Cargo spaces of the future, through their prototypes. With the intention to build

Figure 2. During the event, Martesana Fest, experiencing VR cardboard.

a social, efficient and pleasant activity, and at the same time, take care of the environment, a new strategy for reusability of waste materials and their transformation into furniture or other useful objects was designed. In the project *RE-MIX*, using the philosophy of G.A.S. Crescenzago, combined with the active participation of the locals and the physical/spatial help of Cargo, a co-design system based on inclusion and sustainability was created, re-establishing a better connection between people. The outcome was the creation of a new community that cares for smarter consumption and upcycling of goods for better environmental awareness. *RE-MIX*'s idea is based on the three main activities: reuse, upcycle, and connecting people. One possible future scenario of the project is for G.A.S members and locals to organize a bimonthly event, where all the participants come together and are asked to bring their waste materials, such as plastic bottles. In this event, Cargo's craftsmen could teach people how they can build their shared public furniture together in an enjoyable way. This shared desire to modify the empathy and appearance of the neighbourhood by engaging people in interactive activities, starting from a reuse of existing object/materials, has also developed through the design of creative and sensory activities.

DYNAMIC ART, in collaboration with the Assab One association, aims to create artwork through different body movements and action painting, giving people the possibility to appreciate their own imagination and creativity. All these artistic atmospheres become a large co-created decorative wall piece in the neighbourhood, appreciated by everyone.

Like the project *ECHO*, whose purpose is to gather together people from the area along the canal, and create a stronger identity for the neighbourhood, using another artistic method: music as a medium to connect people and spaces. People's needs and preferences in music create a shared social space with the intent of bringing back the idea of community founded on a collective passion. *ECHO* aims to revitalize the neighbourhood using a stage that will rise in front of the Cargo store to host musical events for young people and adults in the Martesana District and beyond, an "open stage" that allows buskers – from the area and elsewhere – to perform legally and also be seen and heard by the general public.

Sharing arts, is also important for the *SEEDS OF POETRY* project, which proposes an activity in which people are free to participate and express themselves only using the written word. The idea is to create small vertical green areas in the Martesana district, improving the concept of the project named *#riempiamoviapadovadipoesia* driven by the Arti Girovaghe association, circulating poetry in the streets. People can plant seeds, write their poetry, and place it wherever they like in the neighbourhood streets.

Figure 3. From left: RE-MIX (by Katia Al Chosmpan or Al Hussban, Siyka Georgieva, Kristina Mickute, Giuliana Racco, Vanja Rakic, MengTing Xu), DYNAMIC ART (by Aradhana Das, Alessandra Fazio, Hongmiao Liang, Simona Sanfilippo, Yuke Yan), ECHO (by Li Xaoqian, Peggy Liu, Alice Lonardi, Hao Lyu, Margaux Padrutt, Daniele Trappetti).

Figure 4. From left: SEEDS OF POETRY (by Amélie Anger, Beatrice Rinne, Joddy Patrianagara, Niv

The project *TRAMA*, born in association with City Art and the cooperation of its citizens, has the goal of bringing out the potential of intercultural exchange understood as personal, generational and ethnic. The activity created for the bridge co-design with the people who collaborate in the project could be replicated along all the bridges that are in Martesana canal.

Finally, *iCreate*, is a project with the collaboration of We Make Fablab, consisting of an urban garden in which a series of workshops is held about how to grow and harvest fruits and vegetables involving the use of technology, as well as how to process the harvest for consumption (raw food). Fablabs can

promote the idea of prototyping and effectively and efficiently producing efforts for a more sustainable and healthier lifestyle by creating a suitable habitat for people who inhabit modern structures and communities.

These students' prototypes were exhibited during the Martesana Fest, a final event where every single group presented their solution, also telling the story behind the experience and explaining how the local support was useful for designing such prototypes. Six projects, six activities to involve the inhabitants, and six upcoming scenarios to stimulate the vision for the future Cargo spaces, through their prototypes.

CONCLUSION

Setting new dynamics and new habits in the surrounding area was the main objective of this project, in which the students were able to develop relations with the six local associations as new possibilities; future scenarios to give the collective city, often anonymous, a new face and a connection with its citizens, so developing a better atmosphere with positive synergies. The final proposals of the students are only the first ideas born from an educational path; it is fair to say that they could be a starting point for subsequent project phases while maintaining the collaboration between the various actors involved. Some of the projects have a stronger potential than the others, because they have been able to enhance the inputs and suggestions received from the district itself. The prototyping event, Martesana Fest, allowed the results of this research project to be tested for the first time, through the six future scenarios for a collective, and often anonymous city, proposed by the students, and highlighting a new context of connections.

In the next few years, the collaboration between the research group Polimi Desis Lab and Cargo will continue, with the intention of continuing to apply the same methodology in future design phases. The neighbourhood and the community will be the main driving force behind this collaborative project. First, through initiatives and activities in the neighbourhood itself, one of the projects can be chosen, to set and monitor its evolution towards realization. Finally, these future steps will be coordinated through design tools that will promote an integrated design between spaces and services: there will be a single universal language of co-design, providing a collaborative process from the bottom up through co-creation methods that promote a lively atmosphere.

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CARPAS SOCIALES: A STRATEGY FOR SOCIAL INNOVATION IN FENICIA THROUGH AQUAPONICS

Around the Universidad de los Andes in Bogotá, is located the community of Fenicia composed of 240 families from Las Aguas neighborhood (Florez, 2011), here its population has been impacted by the development of the university. Therefore, Progresa Fenicia program is created by the university to design the partial urban renewal plan, which allows to giving a better urban quality to their population. In consequence, *Carpas Sociales* is an Industrial Engineering and Design BA Gradute project which creates an interdisciplinary strategy designed with the Fenicia community to develop a replicable and sustainable business model through an urban aquaponic, for the production of food (vegetables and fish[1]) for self-consumption and the marketing as part of the future sustainability of the community.

The design strategy was carried out based on the "Minimum viable product" as an iterative process and the generation of ideas and learning. With this strategy, through cooperation and co-creation workshops designed with the community of Fenicia, that results in a social replicable model to implement it in the future as a productive agricultural plan. Thus, these workshops were developed in the surrounding urban agriculture spaces, where a functional prototype was created that can be used while implementing the social model.

The project helps mitigate some of the pressures that may exist in the implementation of the partial plan, the reduction of social barriers between Fenicia community and the university, favoring cooperation and social participation.

Keywords: Strategy, aquaponic, urban agriculture, social innovation, community

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1   *Cyprinus carpio:* species of fish to use in the aquaponic model. In common Spanish: Carpas

INTRODUCTION

Within the huge changes that are approaching for the sector of Fenicia, it is found the partial plan of urban renewal designed to improve the quality of life of its population due to the impact of the development of the Universidad de los Andes in it ("Programa Progresa Fenicia", 2019). Due to these changes, social, economic and political pressures will be generated, and in search of a possible solution to mitigate them, Carpas Sociales project was born, as a strategy designed in collaboration with the community of Fenicia to develop a replicable and sustainable business model through an urban aquaponic for the production of food for self-consumption and commercialization of products, as part of the development and future sustainability of the community. This project affects a population that is made up of 240 families that are the beneficiaries of the Progresa Fenicia project that is developed in the sector (see illustration 1).

The project is named *Carpas Sociales*, taking advantage of a Spanish homograph concept in the first word. That is to say, the urban aquaponic is created with the species Cyprinus Carpio commonly known as Carpa fish, but this also means in Spanish a "large awning· to house the community. Consequently, the name of the project is given or being of social innovation and for its natural component of aquaponics.

Ilustration 1. Population impacted whitin Progresa Fenicia

The strategy developed and implemented is collective and get up with co-creation, which is based on the "Minimum viable product" as an iterative process and generation of ideas and learning, with which 4 cooperative workshops were designed with the Fenicia community to be able to train and generate a transfer of knowledge, giving the social value to the project. They are also designed to develop the replicable and sustainable model through aquaponics that can be implemented in the future, as a productive agricultural plan in the partial plan of urban renewal, instead of the plan of ornamental agriculture that is currently available.

The results include the impacts achieved and expected in the future implementation within the community, which are reflected in the mitigation of the social and economic pressures mentioned above. On the one hand, in the development of the strategy in the workshops a reduction of the social barriers between the community of Fenicia and the university community was generated, favoring cooperation and social participation, and the transfer of mutual knowledge. On the other hand, giving a possibility of economic sustainability to the community through the commercialization of urban agriculture can mitigate some economic pressures that entail the implementation of the project.

Finally, it is important to keep in mind that *Carpas Sociales* was born as a derivative of the interfaculty project (2018) of the Universidad de Los Andes, called Alimentos Con-Ciencia, where through aquaponics, creation and learning processes are developed on food security with the Uniandes community. It is a derivative since within the same educational field we want to implement an aquaponics project with the community of Fenicia, which is also considered part of the Uniandes community, where knowledge previously developed in Food Con-Ciencia is applied.

DESIGN AND IMPLEMENTATION

For the development of the project four research questions are posed from different fronts, that is to say, the careers and the actors:

- Industrial Engineering: How to create a productive and social model of urban agriculture in Fenicia?
- Design: How to create a social strategy that evolves over time for the continuous implementation of urban agriculture and its benefits?
- Progresa Fenicia: How to design a means to help the transition of the partial plan, providing social and economic benefits to the community?
- Fenicia Farmers: How to maintain urban agriculture in the future keeping the benefits according to possible changes in the community?

Given the above, the objective of the project is: "To carry out a collective and co-creation strategy that promotes social participation through the implementation of agriculture and urban aquaponics as a social model in Fenicia".

Methodology

For the development of this project, the design thinking model of Beckman & Barry (2007) was used in its article Innovation as a learning process: embedding design thinking, which is divided into four stages (graphic 1)

The minimum workshops are designed to interpret and delimit, according to the "Minimum Viable Product", there are workshops based on participatory design to understand the community and extract the needs and benefits for the last phase to develop a social model. These are designed in the table 1.
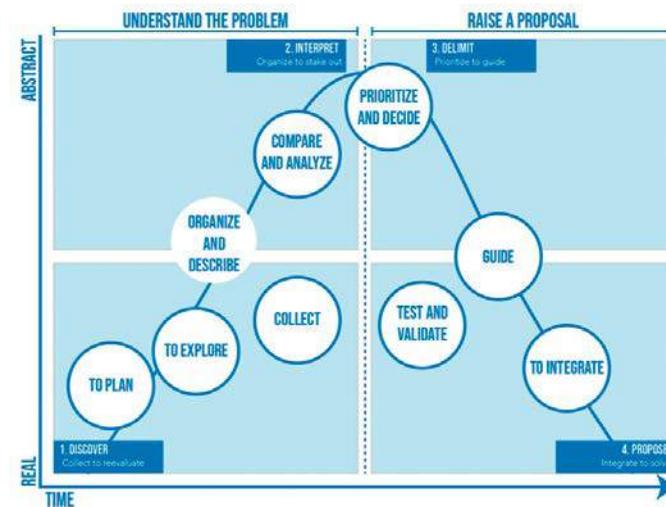
Graphic 1. Design Thinking Methodology (Agudelo & Lleras, 2015).
Table 1. Workshop design

WORKSHOPS	OBJECTIVE	DATA COLLECTION SYSTEM	STEPS TO FOLLOW IN NEXT WORKSHOP
Active training	First approach to aquaponics	Postcards with two questions per station	Use knowledge acquired in aquaponics
Co-creation Benefits	Find the benefits of agriculture for the future	Co-creation of the ideal future apartment with the benefits	relate the benefits with the components of the aquaponic
Circular Economy	Understanding the circular economy and aquaponics function	Post- it exercise	Use knowledge acquired to create the aquaponic
DO - IT! V.1	Arming the first aquaponic in Fenicia	Photos and video of the workshop	Continue to scale the system as you learn

Workshop 1: Active training

This first workshop aimed at motivation and incentive for the different stakeholders of the community. His name: Active training, it is because the workshop consisted of a tour of the university and its surroundings showing the aquaponic systems and their interaction with the territory.

Picture 1. Explanation about aquaponics components
Picture 2. Explanation of La Huerta

Workshop 2: Co-creation Benefits

This second workshop assumes that everyone involved already knows the aquaponic system and urban agriculture, due to workshop 1. It aims to have a co-creation session with the community of both Fenicia and Uniandes, to obtain the benefits of each one of the components found in the previous workshop: (1) components of the aquaponic system, (2) interaction with the system, (3) and involvement with the community. In this way, obtain the needs and desires of the community for the construction of the social model. Additionally, considering the problems previously identified, the workshop is based on a prospective exercise of what the Fenicia community will be in the future so that the community can think of the needs and desires but projecting into the future that is where the social model of the project is located.

Picture 3. Co-creation exercises with the community
Picture 4. Co-creation exercises with the community about the future

Workshop 3: Circular Economy

Considering the ideal model and the tangible and intangible components that come out of workshop 2, this workshop proposes the visualization of this model in the circular economy. Seen as a system that has inputs and outputs and internal cycles, the objective of the workshop is to locate each of the components

and their processes in each of these cycles. In this way, not only a piece of knowledge about the circular economy is given, but also a prospective exercise of the operation of the ideal model proposed, and training to be able to do the aquaponics in Fenicia.
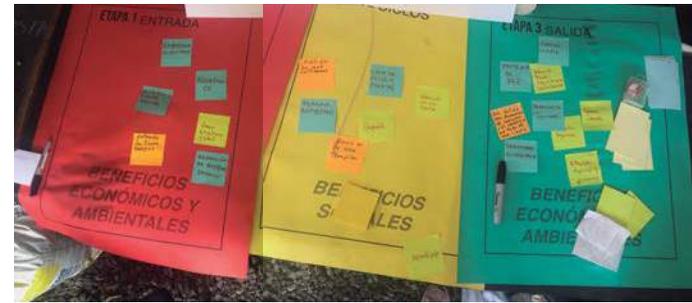
Picture 5. Visualization of the model in the circular economy

Workshop 4: DO - IT! V.1

In this workshop with the knowledge and models developed in the previous workshops, collective construction of the Fenicia aquaponics is made, reflecting on the differences and applications of the prototype of the orchard to the ideal model that remains in ss for the plan partial urban renewal. The system that is implemented is a small scale since it is the first approach to aquaponics, and there is a learning curve to scale the model. This scale includes 100L of water, 5 small carp fish for cultivation and 4 floating beds (40 cm x 30 cm) for the cultivation of plants.

Picture 6. Example of an actual scale of the aquaponic

FINDINGS AND INSIGHTS

In the analysis and evaluation of the workshops, findings are obtained to make up the parameters, conditions, content, concepts, and imperatives of the social model.
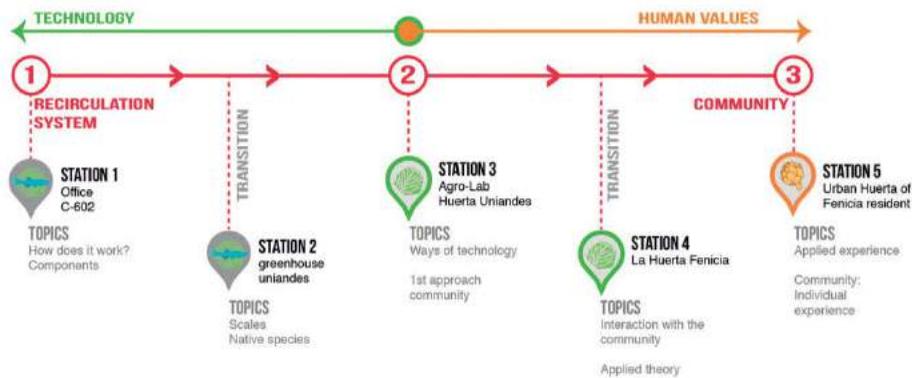
Three components for benefit training

The topics to be developed in the workshops are the components of the system, the interaction, and the community (graphic 2). These topics can be played in a different order or in parallel in any of the workshops, but they are the basis for the implementation of benefits that occur in the intersection of the axis of technology and human values according to the conceptual model.

Leadership against social barriers

In the execution of the workshops, volunteer and host leadership must be promoted so that a change in hierarchical roles is generated, which allows a transfer of knowledge contributing to the reduction of social barriers.

Voluntary leadership

There is a voluntary leadership that occurs when a participant has the knowledge and decides to share it with the group spontaneously, which generates knowledge transfer regardless of the role and hierarchical relationships that exist at the moment, promoting the reduction of social barriers.

Host leadership

It is necessary to empower the community of Fenicia in its territory in order to make the transfer of knowledge not only technical but also human and empirical about urban agriculture. This reverses the hierarchical relationships that exist as the Uniandes community, and in cooperation and collaboration, there is a reduction of social barriers.

Types of interaction

There are two types of interaction: the private and the public, understanding the public as urban agriculture that does not

require daily management such as a fruit tree, because this requires less maintenance and cooperation than the individual; and the individual as the leisure time and daily management required by aquaponics, and some species of agriculture.

Cohesion for implementation

The group has an existing cohesion that makes the dynamics of interaction occur, as well as fostering a commitment to constant and regular management in La Huerta. The cohesion already formed generates a distance with the people outside the group until there is knowledge transfer that generates momentary cohesion.

Generation of Value "Leisure"

Urban agriculture, and therefore *Carpas Sociales* model generates social value by allowing a space for leisure. Although this can represent an economic contribution and ideally be solved likewise, its main function is to have a place of relaxation and coexistence with the community.

Love and agriculture

The love for agriculture and voluntary work are the main sources of agricultural success, especially in the typology of the public because the growth of plants and fish is due to the energy that the community puts into them. Therefore, they are the main components that the model must contemplate, considering love in agriculture as a social construction that is also implemented in the private or individual typology.

My ideal model

In the collaborative constructions of tangible and intangible components and benefits of the system, the following imperatives of the ideal model were reached:

- **Products of consumption and taste:** The products that they consume and like, and in addition there is previous knowledge of urban growth and/or indoors (i.e. celery, garlic, onion, trout, carp, basil.)
- **Minimum Composting:** Composting is an essential element for the community, even if in a small container it must exist within the individual and communal model.
- **Technical infrastructure:** The necessary components for its assembly, as the main infrastructure that is an aquarium and some hydroponic crops that are in different apartment spaces.
- **Additional and modular:** The additional ones of the model that would be, small, modular, and functional vessels for the

auxiliary plants, and containers for the seeds. Due to, this is a is a scalable model and do not want to incur previous costs each time it moves.

- **Productive aesthetics:** The aesthetics to be considered of the proposed species since they will not only be productive but also ornamental.
- **Tourism and natives:** The tourist and commercial component, because in a future Fenicia Agricultural District contains agricultural economy, so that within the species there must be native and famous Colombian products to market it as a commodity or as a product.

RESULTS

As a result of the implementation of the first four workshops with their proper findings, we reach: (1) A future strategy by phases through the continuous implementation of the workshops to be able to implement successful urban agriculture and aquaponics in the future within the partial urban renewal plan; (2) A social model that adapts over time to the community; (3) The minimum workshops to be carried out in the future through a standard format; (4) The concept developed by the sector for its future with the implementation of the Carpas Sociales model.

Phases strategy for implementation

The strategy is composed of two phases, according to the finding of interaction typologies, in the first it focuses on traditional sowing and hydroponics. This phase lasts while group cohesion is
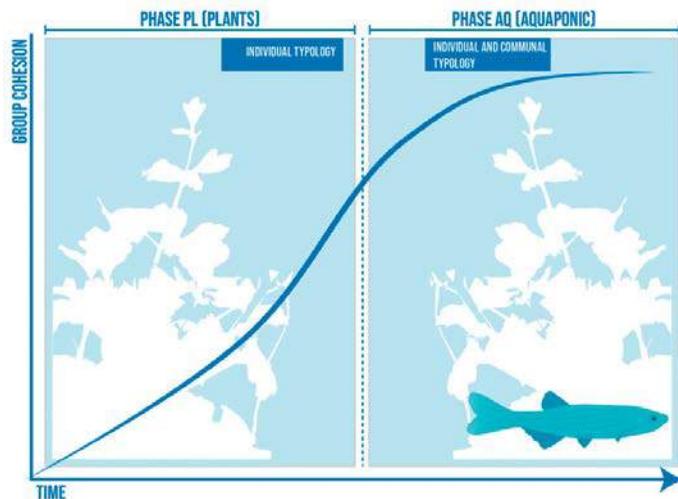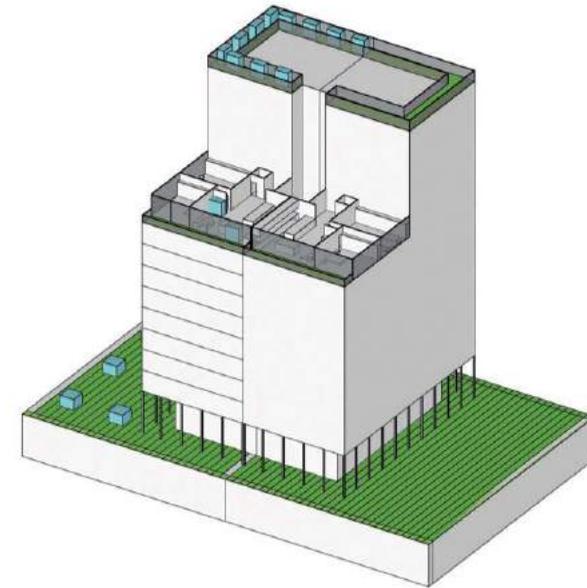
generated through the implementation of the workshops. Then, the second phase AQ should have group cohesion and constant management to add fish to the species previously implemented.

In the model (illustration 2) you can see the PL phase on the right side and the AQ phase on the left side. There are the green parts: plants, and the blue parts: aquaponics. The model shows the first floor, the example of an apartment, and the upper part is the example of what could be a terrace with living spaces.

Social Model

The social model is the result of the aforementioned workshops, the Social Business Life model is used, which focuses on social innovation and allows the communities to be integrated with the actors.

Carpas Sociales model emerges as a dynamic strategy to reduce social barriers to mitigate future social pressures, generating group cohesion and social fabric through urban agriculture. It is dynamic due to the implementation of future workshops that will improve and modify it, which will be explained in 4.3 section.

In consequence, the objectives of this model in the short, medium and long term are:

- **Entrepreneurship:** Identify and work with entrepreneurs from the population of Fenicia, specifically in agriculture and/or food marketing.

- **Social Value:** Generate collaboration and cooperation between different entrepreneurs and community actors for the reduction of existing social barriers through the transfer of knowledge
- **Food Security:** Providing access to vegetables and fish in a clean manner for self-consumption
- **Economies to scale:** Develop an economic model where the profitability of the aquaponic system increases with the joint work of these.
- **Local economic development:** Establish a profitable marketing network for entrepreneurs with the aquaponic system within the same territory.

This model is composed of two groups of elements, the first where you can see the value paths between the actors, and the second that shows the value exchanges between the components of the system.

Minimum workshops in the future

There is a planning of the executed workshops, and replicable workshops are also designed to continue the project and keep the social model alive until its implementation with its respective benefits. Therefore, a format for the development of workshops was also designed so that the project is replicable and sustainable over time.

For the strategy of future implementation, there cannot be an exact projection in a timeline for workshops to be developed. This is due to the fact that the execution of different versions and replicas depends on the needs identified in the community as the time passes between today (2019) and Agricultural District of Fenicia (2030). Therefore, exists alert mechanism in every workshop for the replicas, which are explained with each workshop. However, it is necessary to bear in mind that all workshops must be carried out through participatory design, co-creation, cooperation, and collaboration among all attendees.
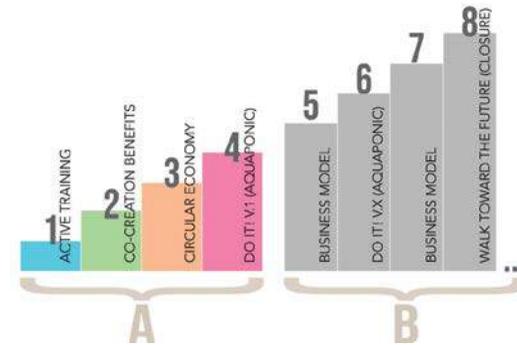
Fenicia Agricultural District

The project ends with a visualization of "Fenicia Agricultural District" a concept developed in co-creation with the community, which allows to visualize and understand the scope of the implementation of *Carpas Sociales* in Fenicia:

Fenicia 2030:

"We are a community developed with the environment"

Feeling like the agricultural utopia of the city of Bogotá, the values they want to represent are love, harmony, and courage, according to them they are the reason for their productivity and social participation. Urban agriculture becomes a spiritual therapy where "if everything is done with love it will grow in the best way because fish and plants also feel".

Its members are creating the EAF: Escuela Agrícola Fenicia, due to their territory is a "Creative Habitat, pedagogical and empathetic for the production of clean, organic, and healthy crops ".

CONCLUSION AND FUTURE WORK

In the first place, as a result of the prospective exercises in the workshops, *the pillars of the Fenicia Agricultural District* are conceived: the voluntary effort and the **cooperation of the residents** that generate social fabric around urban agriculture; **environmental** concerns such as irrigation with water, **the non-use of pesticides** for the production of clean foods that generate food security; **The recycling and elimination of waste**, which is done through compost, both communal and individual.

Secondly, the *objectives established for the project*, since as progress was made, the objective of the project becomes a **strategy that provides social value** in the first place and, secondly, the **analysis and implementation of urban agriculture and aquaponics in the community**. In this way, the project manages to provide the **social value of reducing social barriers** in the present to mitigate the pressure of the future, at least for the members of the project. In addition, the project continues responding to the initial question of **¿How can aquaponics be implemented in Fenicia, in the present and future?** (graphic 7)

Finally, the success of the project lies as a result of the implementation of the *minimum workshops* through participatory design. Because the findings that are implemented in the **business model** are also the analysis of the community that works as a tool to create social fabric, group cohesion, and social participation through **AgroLAB (Uniandes)**. In addition, the continuous implementation of the workshops allows the social model to become dynamic and be modified and adapted to the needs and desires of the community as changes in the future.
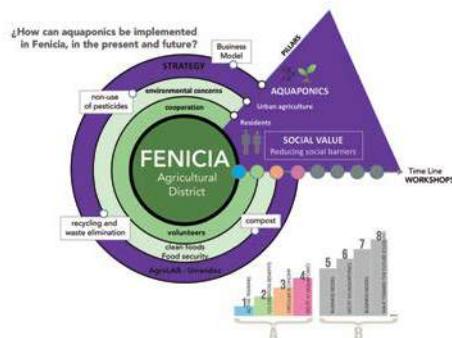

Graphic 7. Conclusions perspective on the future

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INDIGENOUS ANCESTRAL IMAGINARIES AND MATERIAL TRANSFORMATION FROM AN ANTHROPOLOGIC DESIGN APPROACH

The Mapuche people, the most numerous indigenous group within Chile, maintained their territorial and cultural sovereignty until, in the latter half of the 19th century, their Wallmapu ("Mapuche Country") was invaded and annexed by the Chilean State. Since then, the relations between the Mapuche and Chileans have been permeated by an increasing and violent tension that renders future scenarios of coexistence between both cultures difficult to imagine. This difficulty is fueled by historical conditions imposed on Mapuche material imaginaries, which designate and characterize Mapuche objects as such insomuch they refer to the conditions prior to the Chilean annexation of Wallmapu, inhibiting the emergence of new ways of imagining Mapuche contemporary materialization.

The present project seeks to highlight the Mapuche material impositions through the exploration of a methodology centered on an anthropologic design. The first advances of a joint work with Mapuche and non-mapuche elementary schools students are subsequently presented. This collaboration seeks to make an assessment of the elements that these students considered important in order to generate contemporary Mapuche representation.

The purpose of this initiative is to foster a process of reflection that aims to widen the conditions of possibility of the Mapuche people in general, and the material possibilities of the new Wallmapu that the Mapuche hope to build, thus challenging the notion of the white man as producer and the indigenous as reproducers.

Keywords: design anthropology, indigenous imaginaries, co-creation, re-signification, design in elementary school

MAPUCHE NATIONS AND IT'S MATERIAL IMAGINATION

Currently there are 9 indigenous peoples in Chile that carry out a wide array of sociopolitical struggles within dynamics that are scarcely intercultural (Richards 2014). The most sizeable among them, and main topic of this research, is the Mapuche Nation.

The Mapuche managed to uphold their territorial sovereignty, cultural self-determination and a successful socioeconomic system until the latter decades of the 19th Century (Boccara 2007) when the Chilean state sent a modernized army for the "Occupation of the Araucanía"[1], leaving them subject to poverty, violence and racism to the present day (Pinto 2003). In this sense, many nationalist discourses based in the modernizing and racist ideal of accumulative progress, which are a reflection of a cultural and national monism (Millacura 2013), clash with the culture of thousands of people who still remember traditional history and build common futures that spring from collective memory (Aravena: 2003).

On the other hand, Mapuche cultural difference has experimented important transformations since the conquest of *Wallmapu* (Mapuche Country). Even when the overall Mapuche population was greatly reduced after the defeat in hands of the Chilean state (Bengoa 1985), they quickly began to regroup through several modern political organizations (Foerster and Montecino 1988), thus inaugurating their "contemporary history" (Pairicán 2014) and articulating most of the discursive axes that survive to the present day: struggles that call for respect, land restitution and access to education (Ancán 2012). Multiple political and cultural victories in favor the Mapuche have challenged the age-old foreboding of complete assimilation within Chilean culture, having themselves been subsumed in processes of urbanization, translocality, creation and re-signification that contest the forecast of an annihilation of indigenous identity (Figure 1).

In essence, the major part of present day Mapuche society rebuilds itself addressing collective memory alongside new dynamics, a context that is linked to the double movement of national narratives described by de-colonial theorist Homi Bhabha (2000): a "pedagogical narrative" pertaining to a historical discourse, essentially conservative and continuist, which claims a past in common; and a "performative narrative", or in other words,

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1   A historical process that culminated with the annexation by the Chilean state of the entirety of sovereign Mapuche territory. It began in 1852 when the state passed a law that created the Province of Arauco, currently the Region of the Araucanía (see Fig 1). This event was followed by the incursion of the Chilean army in 1862. The formal military action concluded in 1883 with the occupation and the rebuilding of the razed city of Villarrica.
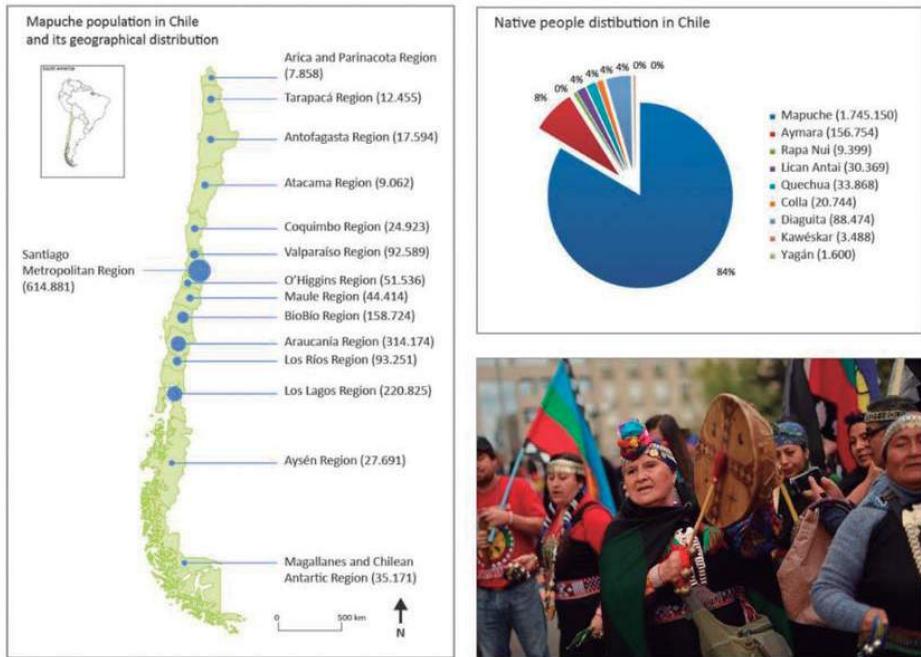
Figure 1. Left, Demographical information of mapuche population (Elaborated by the authors, based on the 2017 Census, INE 2017); Up right, Native people distribution in Chile (Elaborated by the authors, based on the 2017 Census, INE 201), Down right, Mapuche manifestation (RadioUChile 2018).

secular and strategic discourses that conceive Nations as creative entities within the contemporary world. Tradition and modernity are two of the main pillars holding a great part of the politics, theatre, poetry, historiography, among many other contemporary forms that the enunciation of mapuchicity takes. Within this double national narrative, the crucial role of objects as a means of socialization among people (Bourdieu 1988, Miller 2005), which are as fundamental as mental states in the execution of human agency (Ingold 2013, Gell 2016), could still be attached to colonial demands, a situation which we hope to reflect upon through an approach stemming from anthropological design.

Objects have played a key role in the contemporary history of the reorganization and re-signification of that which may be recognized as Mapuche. By positioning themselves as active agents in the forms of representation that are shaped facing the Chilean state and *winka* society (that which is non-Mapuche, *the other*) they have also set discourses harboring truth claims (Foucault 2003) in regards to that which may be recognized as Mapuche and that which may not. In this respect, we notice that even when the changing material universe of the Mapuche after the Occupation of the Araucanía has conveyed several different meanings and has been embodied in many materialities, currently most "Mapuche objects" have to reference material conditions prior to 1883 (see note 1). In other words, the fluctuation of Mapuche political, artistic and academic production scarcely

reflects upon their material universe, which since the latter quarter of the 20th century has carried aesthetic demands that constrain the emergence of new forms of Mapuche materialization.

ANTHROPOLOGICAL DESIGNS TOWARDS TRANSFORMATION

Currently in Chile the Mapuche represent one the major others from which it becomes possible to imagine alternative socio-material relations that contrast to those found in the national sphere, a context that is greatly marked by poverty, marginalization, inequality, depression, among many other ailments emanating from the neoliberal system (Moulian 1997). In such situation many Mapuche advocate for the construction of an alternative space, a Mapuche Nation, a project that while declaring the need for cultural self-determination and a geographical territory for its unfolding (Marimán *et al.* 2006), has yet to define a great part of its practical and material contents (Painemal 2009, in Trictot 2009).

In order to address this issue, we seek to stimulate a thought process regarding the possibilities within the forms of materialization of such contents and, simultaneously, uphold that such an exercise may become bolstered inasmuch when articulating diverse aesthetic and material discourses that dispense of being exclusively based on the reproduction of a perceived "traditional" sphere, therefore challenging the notion of the productive white man in contrast to the re-productive "Indian", an association which, in the case of the Mapuche, has been actively underscored by several state and dictatorial agencies since the last quarter of the 20th century (Labra 2018).

Exploring cultural difference

Our goal is to make headway into the materialization of what Adam Drazin understands by "concept", that is, a "clustering of observation arising from ethnography, which seems somehow related, but for which there is no actual design. The concept is here a space of possibility, not a proposal" (2013: 38), a space which we are studying by means of a design exercise carried out alongside Mapuche and *winka*.

The design of a space hitherto scarcely explored – in this case, non-traditional Mapuche objects – allows us to test alternative socio-technical responses while searching for new interpretative frameworks (de Bono 1969), recovering multiple forms of human existence stemming from the creative materialization of cultural

difference (Tunstall 2013) instead of reverting to a certain origin as a timeless shelter.

Studying, recovering and disseminating diverse types of indigenous ontology has been the workspace of anthropology, discipline that due to its analytic and descriptive positioning towards present and past practices has been characterized as an exercise with little or no incidence on the future, while design "has been hailed as the practice of the future through material intervention and change" (Clark 2013: 199), thus enabling a thought process that may aid in "diversify[ing] the images of the future that are available [and] to improve thinking about futures in the public mind, rather than just in the academic and consulting settings in which it has traditionally been deployed." (Resnick 2012: 47, Forlano 2013).

Ultimately, design, besides allowing us to communicate the outcomes of ethnographical practices ways other than academic writing, enables us to reflect upon the "ethnographic encounter as a production of new realities, where the interests of the ethnographer are brought into play as an important and valued resource" (Halse 2008: 29).

Methodological notes for an anthropological approach

In order to test design activities that acknowledge cultural difference, being aware of the material genealogy of the ethnic group (Barth 1976) at issue, and therefore being able to propose certain work guidelines, is fundamental. In this respect, individual freedom is always taken into account regarding their agency as producers of knowledge (Tunstall 2013). In this sense, the proposed guidelines for the activity which will be undertaken reference an exploration of the contemporary characteristics of that which is considered Mapuche within a Chilean space, discouraging creative action based on the traditional material conditions of the Araucanía before its occupation (prior to 1883).

The aforementioned does not entail a dismissal of Mapuche traditions, as we are well aware that one of the main elements in "ethnic identities", in contrast to other collectivities, is their orientation towards a past (Poutignat and Streiff-Fenart 1995), a temporality that is proudly borne by present- day Mapuche (Crow 2013) and an inevitable source of material inspiration. As such, we have decided to begin the exploration of a design centered on the expansion of the material imaginaries of ethnic identities by re-signifying a preexisting object, repositioning the narrative discourses and material elements of that object within contemporary space and/or near future.

We begin by identifying an object that acts as a marker of mapuchicity, in other words, associated to "that which is

Mapuche" even when it may not be considered necessarily as inherent to the Mapuche world. This becomes possible insomuch many aesthetic and material conditions of colonized peoples are a product of agents that "caricaturize" cultural difference (Said 1997), and therefore it is highly likely to find non-indigenous creations within all contexts in which "ethnic objects" are present, which in turn pre-fix discourses (*sensu* Foucault) associated to those peoples.

Once the object to be re-signified is chosen, several elements will be studied: the history of its making, the position it assumes within the network of current socio-material relations, and its presence within various controversies (Latour 2005), in order to identify the meanings or informal attributes associated with the object. The design activity, or "Re-signification Workshop", is organized with this information at hand, which in this case will consist of a lecture on Mapuche history focused on material history and contemporary expressions of mapuchicity, highlighting the dynamism within both of these in contrast to conservative discourses, alongside the formal description and the history of the object which will be re-signified.

Lastly, information will be handed out that may aid in the identification of the formal and informal attributes of different objects, alongside basic tools for drawing and representation. In this sense, we have decided to begin exploring the possibilities for expanding the Mapuche material imagination through drawing as a means of Pretotyping (Savoia 2012) contemporary Mapuche objects. By following this methodology we seek to stimulate contemporary ethnical and material thought processes in the activity's participants and their consequential materialization in graphic representations, which in turn will constitute our firsts analytical "concepts" (*sensu* Drazin).

We hope to implement the "Re-signification Workshop" in 4 types of audiences in Santiago, varying in activity length and approach: schoolchildren of 13-14 years of age in public schools with high percentages of Mapuche students with the interest in dealing with ethnical issues (for example, schools that celebrate important festivities of the Mapuche ritual calendar), Mapuche and non-Mapuche university students associated with the Design faculty, Mapuche organizations registered in municipal listings, and groups of Mapuche and non-Mapuche artists and artisans.

RE-DESIGNING THE "INDIO-PÍCARO" WORKSHOPS

We chose the "Indio Pícaro" (Kiny Indian, Fig 2) as the basis for our run-tests. It is a handicraft which was first created in the 80's by a *winka* in Southern Chile and inspired in an Apache statuette.

Figure 2. The "Indio Pícaro" (Wikipedia n.d.).

This object is currently sold in several touristic spots and is described in Wikipedia as "a traditional Chilean wooden statuette referencing a Mapuche Indian with a broad smile that, when the body is lifted, shows an erect penis or vagina".

This "Mapuche object" was presented to a student audience in 2 Re-Signification Workshops (Fig's 3 and 4) taken place during late May and early June of 2019. It is an audience that, due to the significant upcoming festivity of the Mapuche ritual calendar (*WeTripantu* or Mapuche New Year, the 21st of June), is preparing many activities related to the "Month of Indigenous Peoples" in their schools. Both counted with the assistance of approximately 30 to 40 students and consisted in an hour-long session which concluded with the history behind the Indio Pícaro, a fifteen minute break and an hour-long drawing workshop. Beginning the drawing workshop, the Indio Pícaro's figure was taken as the analytical locus, where we focused on the object's characteristics that students considered meaningful.

The main characteristics that were mentioned by the students were its indigenous garments, however remarking that they were not properly Mapuche; its broad smile as a humoristic element, which some interpreted as evidence of Mapuche affability and their inclination for dialogue, while for others it contrasted the ideal of the warrior-like Mapuche that resisted the Spanish and currently fighting against state repression. The display of its genitals was characterized as an expression of the racist bias towards the Mapuche as being vulgar; the dimensions of its overall body, and the size of its stomach, as particular signs of looking at the Mapuche as lazy, inactive and reticent towards work.

In short, most students agreed that the Indio Pícaro was not a figure that represented them or Mapuche qualities; taking this in consideration, the following question was posed: How should a figure representing modern-day Mapuche look like?

Figure 3. First workshop. School "Valle del Inca".
Figure 4. Second workshop. School "Araucaria".

Findings

The findings that were obtained in these preliminary experiments allow us to articulate a preliminary classification system based on two interrelated axes (Fig 5). The first one, horizontal, shows within its endpoints the association of the drawing with traditional characteristics in contrast to modern ones. In other words, if the character represents a chronotope prior to 1883 (ancient objects, absence of modernity markers) or, conversely, if it bears modern technology or is located in the city, naming few examples. The second axis, vertical, indicates the correlation between the drawings and the passive or active attitudes of the characters at issue; that is, if they are shown as characters that are able to make use of violence as an element of mapuchicity, or on the contrary, if such an element is no longer present.

The diagram is based on several attributes represented in the student's drawings. Among these, the "garment" and "equipment" attributes are one of the most meaningful, and their similarities and differences can be illustrated through four examples (Fig 6). In the first example we see a character wearing modern clothing (sneakers and a t-shirt with the Mapuche flag[2]) and making use of modern technology; the second one wears a Mapuche poncho which the student identified as a "Puma-brand poncho" and an ethnic headband colored as the Mapuche flag; the third one wears a traditional poncho complemented by a modern outfit and headphone; the last one wears traditional garments devoid of modern markers. In this sense, only the last drawing is located near the "traditional" end of the horizontal axis, while all are placed within the "passive" spectrum of the vertical axis.

The vertical axis was conceived by analyzing attributes such as warlike equipment and/or attitudes or actions of the depicted characters. In the first of the four examples (see Fig 7) we recognize a Mapuche wearing traditional garments and who, although showing a broad smile, holds a spear. While this
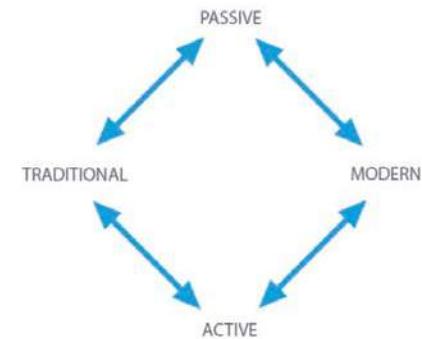

Figure 5.

2   Created in 1992, it is one of the few non-traditional Mapuche objects.
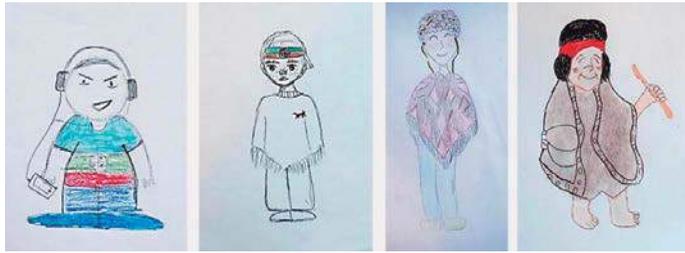
Figure 6.

Figure 7.

Figure 8.

weapon allows us to locate it in the middle section throughout the "passive-active" axis, it contrasts with other images in the "traditional" horizontal axis which are much more "active", such as the scenario shown by a Mapuche in which the head of a Spaniard is severed. A similar comparison can be made between two possible "cyborg" Mapuche warriors, representatives of the "contemporary" horizontal axis; we may observe that one, likened to "IronMan" with Mapuche symbols in the forehead, is shown in combat disposition, while the other, in accordance to its smile and the vegetation that grows at its feet, would seem closer to the "passive" side of the spectrum.

On the other hand, we believe it is remarkable noticing the influence of certain elements pertaining to Japanese anime and *kawaii* culture as a possible aesthetic expression of mapuchicity (Fig 8); elements that, while they might be located in different sections of the diagram, show a disposition towards depicting Mapuche markers relating to non-traditional narratives.

CONCLUSIONS

Within the current and multiple conditions of possibility of the Mapuche Nation, objects represent one of its more aesthetical spheres insofar several non-Mapuche and colonial agents have established "traditional" parameters for the authenticity of Mapuche objects. We have decided to test a thought process regarding the aforementioned conditions by means of an anthropological design methodology seeking to diversify possible future visioning of the Mapuche material universe, as well as an ethnographical exercise that may allow us to learn from the otherness' ways of expression (Ingold 2013).

In order to accomplish this we established the Indio Pícaro as the analytical locus of mapuchicity, an exercise which was put into practice within two "Re-signification Workshops" hitherto imparted, in which 8th grade students worked in regards to the question "How should a toy representing the modern-day Mapuche look like?"

This question was answered in several ways. Some students made sketches that were coherent to traditional representation, which enabled us to corroborate the current state of static material imaginaries pertaining to that which is considered Mapuche; others, however, presented diverse aesthetic visions, noting the existence of favorable conditions of possibility for Mapuche material growth, both due to its reception of non-Mapuche aesthetics as well as its use of contemporary technological equipment. On the other hand, many students represented the current debate regarding the validity of violence as a Mapuche political tool in contrast to dialogue.

Ultimately, yet-to-define conditions are recognized within material imaginaries, in which traditional and contemporary spheres present overall correlations of juxtaposition or exclusion differentiated by degrees of violence or passivity. We therefore identify fertile soil in which it is possible to rehearse, through anthropological designing, multiple materializations of contemporary mapuchicity that may aid the empowerment and richness of the visions regarding a Mapuche future.

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ARTISANS AND DESIGNERS: SEEKING FAIRNESS WITHIN CAPITALISM AND THE GIG ECONOMY

The artisan sector is the second largest employer in the developing world and an estimated 34-to-526 billion dollar industry (Nest, 2018). Why then are the majority of the world's artisans living in poverty? And what role have designers played in extracting money and value from these marginalized communities? Co-authored by an economist and a design educator, this paper posits that a critical and productive way to get to the bottom of these questions is to analyze the artisan sector as a member of the gig / on-demand economy, and, most importantly, to propose a fairer economic and design architecture for this sector that achieves a better alignment of compensation and value creation, particularly for those with the least economic resources (the artisans). With several designer-founded-and-run artisan enterprises as case studies, the paper questions the key variables that determine the success of such a venture vis-a-vis artisan livelihoods. These include scale, ownership models (cooperatives vs. outsourced labor), and various social justice issues including power and privilege. A further concern is that as they submitted to the logic of rational economic exchange rooted in a market economy, some artisan practices that were traditionally embedded in social and cultural institutions were transformed in ways that jeopardize patrimony, traditions and social fabric. The paper concludes by outlining economic principles for a proposed methodology for collaboration, through which designer/founders can frame their future work with an understanding of how they can strive to reach ventures that emphasize poverty alleviation, artisan empowerment and the celebration/preservation of cultural heritage.

Keywords: artisan, capitalism, gig economy, inequality, design

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SABER DEL MONTE: DESIGN AS A CATALYST FOR SOCIO-ECOLOGICAL RECIPROCITY

As researchers and implementers, conservationists today face new challenges that emerge from the need to better understand local interactions to be able to build successful and situated environmental conservation projects. This paper reflects on the introduction of a design approach in the strategic conception of an environmental conservation project and the final design process of Saber del Monte, a socio-ecological reciprocity system that intends to promote value exchange dynamics between human populations and ecosystems. The project emerges from collectively envisioning a change of paradigm from environmental and social crises campesinos in Los Montes de Maria live today, due to the implementation of national rural development programs which tend to emphasize the role of economic growth in generating wellbeing. A systemic socio-ecological approach played a significant role in associating an environmental methodology with a set of design methods to promote a collective pluralistic initiative where dialogue and organic construction of new knowledge and the design of support processes and tools were possible.

This experience has led the design of Saber del Monte: a network of people, organizations and ecosystems who work together to create a socio-ecological reciprocity system that enhances sustainability in agricultural production and its entire value constellation. It is based on 4 pillars and their implementation has strengthened communities of practice that generate daily innovative actions towards the appropriation of situated value exchange systems that connect the global and the local.

Keywords: conservation, socio-ecological systems, situated knowledge, social design, rural design.

INTRODUCTION

This paper describes a series of activities proposed by Fondo Patrimonio Natural (FPN), Colombia's environmental conservation fund to safeguard the Tropical Dry Forest (TDF) in Colombia's Montes de Maria subregion. The design, prototyping and specification of these activities were made in 2018 in alliance with the Design department of Universidad de los Andes, Project Resound, a social design organization based in Savannah Georgia, and the local campesino communities, generating new local alternatives for the people and ecosystem to thrive. The paper is structured in five sections: a brief introduction and contextualization of the project, the design opportunity and methodology used by the team, an explanation of the design interventions, the practical results of the implementation and a conclusion exposing lessons learned during the process.

As stated by Areiza and Matallana (2016) Colombia has made a considerable effort in order to strengthen current protected areas and establishing new ones in ecosystems poorly represented on the national protected area system. Nevertheless, it is well known that countries should take into account Other Effective Areabased Conservation Measures (OECM), where conservation is partial, voluntary or even secondary. Aware of this situation, the country has also worked towards the increased visibility and recognition of different conservation strategies, some of them known as Complementary Conservation Strategies. These measures include different governance arrangements and can range from private lands to community managed territories (Areiza and Matallana, 2016). One of these strategies is related to the integration of ecological connectivity criteria in the planning of fragmented natural habitats as a fundamental activity to reconnect forest relics, in order to create coherent ecological network nodes that contribute to the ecosystem preservation (Carrol, 2004).

The context

For instance, the Tropical Dry Forest (TDF) is one of the most threatened ecosystems in the tropics, due to the fragmentation of natural habitats (Portillo-Quintero, 2010). This ecosystem has historically supported high human population densities given that its climatic and edaphic characteristics are attractive for human settlement and development in the tropics (Sánchez-Azofeifa et al., 2005). In Montes de Maria subregion, the area of study, there are only small relics of TDF remaining according to the connectivity analysis carried out by Patrimonio Natural in 2013. Also, there is currently a process of occupation of the territory by the inhabitants who were previously displaced by the violence. In the area, traditional small-scale agricultural activities for subsistence

purposes converge with agroindustrial oil palm and rice crops and extractive industries such as stone quarries. The livestock activity is being re-established on deteriorated soils, occupying previously agricultural areas and causing the displacement of these towards new forest areas (Florez, S, 2018).

Shifts in the approach to biodiversity conservation

In 2013, Patrimonio Natural implemented the *Conservation Landscapes project*, focused on the conservation of the TDF ecosystem in Montes de María region. A connectivity corridor strategy was proposed as appropriate for a highly fragmented and threatened ecosystem. For this purpose and as a conservation and restoration strategy, the identification of areas with potential for the establishment of connectivity corridors (figure 1) between the patches of tropical dry forest existing in the sub-region was proposed (Patrimonio Natural, 2013).
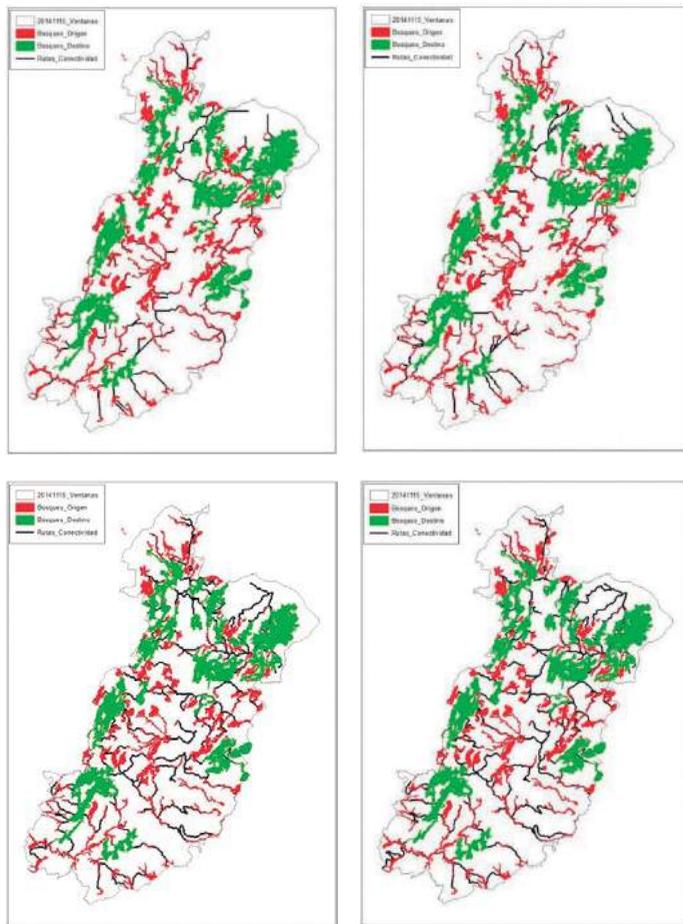
Once the potential corridors were traced, it was necessary to work with private plots, one by one, convincing campesinos to leave a patch of forest in exchange of goods to enhance the agricultural activity. In this process, a three-year drought killed all the agricultural production of yam, cassava and corn, campesinos' traditional crops. Due to this, Patrimonio Natural searched with local seed keepers ways to help the families working on the project and found a native seed of Cuarentano bean, Spanish for forty-day bean because it grows in forty days in extremely dry conditions. While creating these ecological corridors, one small pilot of Cuarentano bean production was established and Crepes & Waffles, a restaurant chain interested in the TDF conservation got involved in the process (figure 2). The bean not only brought revenues in terms of money to 15 families but also represented an innovative way to involve communities directly in conservation. Beans needed to be produced with agroecological techniques in order to be sold to the restaurant above the local market price, in addition, they fixed nitrogen to the soil. As producers were using agroecological techniques, the soil didn't need time to recover and there was no need for expanding the agricultural frontier. Also, the group of campesinos was trained to apply these techniques. In total, thirty kilometers of corridors were established with seventy families from which 12 became Cuarentano bean producers and agroecology promoters.

This practical comprehension led FPN to broaden its approach to encompass the interconnectivity between all inhabitants of Montes de Maria through design, by understanding and
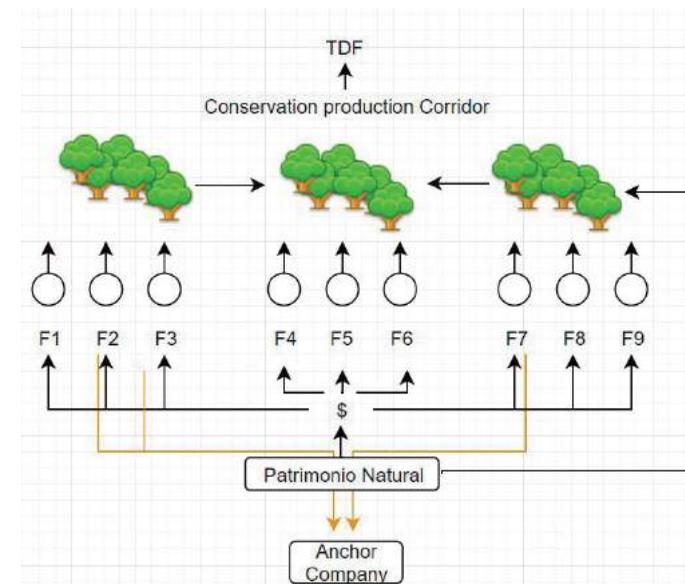
discovering new drivers for relational change with the TDF. In consequence, that would derive in strengthening the ongoing construction of smallholders and ecosystem resiliency to the challenges they face.

DEVELOPMENT

Redefining a socio-ecological system for Montes de Maria

Academic work and social action with a critical perspective on development have been around for several decades. Some of these reflections question the modern relationship between humans and nature and emphasize the need for a social change regarding extractivist economies and consumerism and their effect on ecosystems and life on the planet. Arturo Escobar, in his article regarding Transition Design (2017) collects some of the alternatives to this situation—or Transition ideas—proposed both on the Global North and Global South. Some examples of this are degrowth, conviviality (Illich, 2015), post-development (Gudynas, 2015), and Buenvivir (Escobar, 2017). These reflections provide ideas and methodologies that nurture the way of conceiving, designing and implementing Complementary Conservation Strategies based on biocentrism, and socio-ecological justice. Also, from the environmental perspective, authors such as Morrison (2014) and Schultz (2007) have long recognized the imperative of generating new transition methodologies towards sustainable livelihoods, better understanding how people can live productively and sustainably while conserving biodiversity.

Having this in mind, the socio-ecological system in Montes de María was redesigned with the participation of the local promoters, using as main inputs a better understanding of the communities involved, the potential that Cuarentano beans had in reintroducing a conservation agenda to the agricultural process, market-specific needs like traceability, quality check and product volume increase, as well as the expansion of ecological corridors.

In the frame of this conservation project, two design interventions were introduced by the project's team in the socio-ecological system of Montes de Maria. These interventions are (1) Saber del Monte, a platform for value exchange between stakeholders, and (2) Compa, a device for data collection about campesinos' productive processes. Together, these designs intend to add value to the several actors involved in the project, and therefore to contribute to safeguarding the TDF in new ways: anchor companies which buy agroecological produce, campesinos and promoters, organizations interested in financing these projects and visualizing the impact.

Design methodology and tools: in between conservation and design strategies

The methodology was a result of the broad spectrum of skills of the people who participated in the project. We predefined some participant profiles, based on a starting brief of creating services and communication strategies to connect valuable products from the TDF in the Caribbean Region to new viable markets, through the implementation of tools and proposing design interventions to contribute towards farmers' association and the development of new value chains (Lopez-Lopez et al., 2018). The brief was continuously redefined by the skills of new participants joining the team and the transdisciplinary topic of the project, seeing that environmental conservation is a topic that reaches every discipline, with no exception. Therefore, a framework for environmental conservation was essential for inviting researchers to focus on exploring why conservation might be relevant to people who need to be mobilized to act in a way that supports nature, because, ultimately, conservation depends on social, economic, political, and cultural systems to sustain it, as stated by Morrison (2015, A. Morrison) in the virtuous socio-ecological cycles framework for environmental conservation.

The importance of building a team with diverse skills lies on Jones and van Patten's definition of the four levels of design complexity: (1) designers as makers of artifacts and communication, (2) designers as creators of value through products and services, (3) change-oriented designers with strategies and organizational transformation and (4) designers as social changers in complex social situations (Jones, P. H. , 2014). Even if what he refers to as Design 4.0 -designers as social changers- faces a bigger social complexity than Design 1.0 -designers as makers-, the skills from makers, creators of value, and strategists are needed to face a complex social situation.

Working in teams with this wide spectrum of skills poses a methodological challenge because of the different approaches of each profile; i.e., a maker approaches the context and the brief in a different way than a strategist does. The result was a hybridization of our methods, not only from the different levels of design mentioned above, but also between our disciplines: environmental studies and conservation, system design, and a socioecological approach that decentered the process from the human to the relationship between humans and ecosystems.

This relational approach to the conception of the project helped the team to identify components, linkages, and interactions that directly governed or correlated with the TDF ecosystem. It demanded to conceive conservation as a complex system of interconnections of people, resources, policies, and processes and to consider a new set of societal values that became insights

Figure 3. Local Promoter understanding their village's ecological structure with the local community. Gaitan, 2019.

to engage people again with the forest in a meaningful way. All actions taken were determined by the whole to function successfully, and in the process stakeholders at different levels had the opportunity to understand environmental and social implications derived from their activities. The knowledge acquired and the relationships made during this period were fundamental inputs for the design of Saber del Monte.

Moreover, a successful method used to involve communities was the construction of a multi-layered mapping activity that encompasses technical information about the forest, watersheds, and microclimates, social information about communities gathered through research tools such as process mapping, written life histories, and social cartographies, cultural and natural assets, type of production by village, donors proposed landscape, and finally, organizations working in each area (Figure 3).

Later in the implementation phase, the use of maps at different scales with students, producers and institutions, fostered (1) a collective tree catalog, (2) farm planning, and (3) the ecological evaluation of the villages, among others.

Accumulative work was essential for achieving the final outcome. FPN gathered information on their fieldwork, and each team of designers proposed strategy and service design tools for systematizing the ongoing selling and teaching processes while working with the community. In addition, those tools also helped to communicate and to pay attention to the backstage of every activity that was aimed to continue after the desirable intervention, e.g. the use of graphic design as a means to highlight the work of each community of practice. Likewise,

Project Resound and the design department of Universidad de los Andes brought together three teams of students and teachers: (1) a strategic and service design team, (2) a communication team -branding, graphic designers and illustrators-, and (3) a film and photography team. Those teams developed the final branding and service design for Saber del Monte. The result and methodology was the sum of the input of each one of the participants: conservationists, academics, professional designers, and campesinos.

DESIGN INTERVENTIONS

Saber del Monte as a strategy

The resulting strategy of Saber del Monte is the sum of the collaboration of different stakeholders. It is a network of people, organizations and the TDF ecosystem who work together in order to create a socio-ecological reciprocity system that enhances sustainability in agricultural production and its entire value constellation (figure 4).

Through these actions, efforts are made to find and exchange value between producers, anchor companies, support networks, promoters, and the TDF. Consequently, the aim is to achieve a

Figure 4. Saber del Monte socio-ecological system and design interventions, Lopez-Lopez et al. (2019)
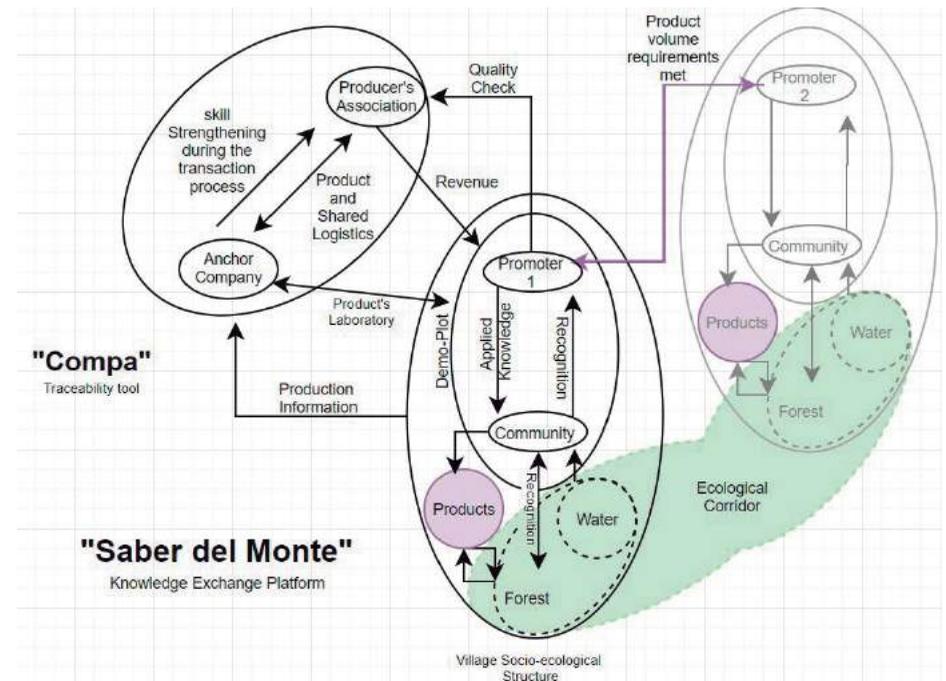
relation of reciprocity among the actors. The intention of this reciprocity-based system is to highlight societal values from this ecosystem that create welfare for the living beings who depend on it and to promote practices that return value for the system to thrive as a whole.

Four pillars guided the design of Saber del Monte´s strategy and brand image. These are: (1) the pursuit of reciprocity and virtuous value exchange cycles between humans and the ecosystem; (2) the role of knowledge as one of the values that is exchanged between the stakeholders of Saber del Monte; (3) the integration of agroecological produce with responsible markets; and (4) the accentuation of the value of local seeds, flavors, species, landscapes, people, and music.

First pillar: reciprocity and virtuous value exchange cycles between humans and the ecosystem

The creative concept of the strategy emerged to guide the next stages of the project, i.e. socio-ecological reciprocity driven by value exchanges between humans and the ecosystem. Two theoretical tools were used to support and nurture this vision: the study of reciprocity by Marcel Mauss (2002) in his Theory of the Gift and the analysis of virtuous value exchange cycles between humans and the ecosystem proposed by Morrison (2015, A. Morrison). The underlying idea that links these two concepts is the interdependence that exists between human beings and the ecosystem, and therefore the need to design strategies that lead to actions and relationships through which both humans and the ecosystem can give and receive value. Those socio-ecological exchanges are supported by the following elements of the proposed strategy: the articulation of land use planning of individual campesinos' plots with ecological corridors, co-teaching spaces and a network of promoters of agroecological production practices, and market networks that strengthen the value constellations of the resulting agricultural products.

Second pillar: knowledge transmission between stakeholders

The creation of exchange spaces as part of the strategy aims to generate a common language where traditional practices and knowledge have the same importance as technical methods of conceiving the territory and agricultural production. These spaces, generally used for the promotion, exploration, and implementation of agroecological knowledge, are transformed into a collective arena to jointly explore the territory, discover new techniques and new ways of growing food while generating knowledge.

Third pillar: Visualizing the value of the system

Consequently, Saber del Monte's logo is composed of elements that represent the people, the ecosystem, the knowledge, the attitude of care and the efforts for the future (figure 5). Furthermore, its purpose is expressed in the phrase "Cultivar la tierra y el saber", which translates "Cultivating land and knowledge", referring to the pursuit of continuous knowledge generation.

In addition, the valorization of the local, the enhancement of the memory and the identification of the territory with new stories of resilience, e.g. the Cuarentano bean capacity of growing in extreme dryness, and the producers' process to rebuild their lives on a changing social and ecological context.

Figure 5. Saber del Monte Logo, Project Resound (2018).

Fourth pillar: Integration of agroecological produce with responsible markets

The resulting graphic design transforms the relationship between the producers and the market. The economic dimension of the strategy pulls societal and environmental values expressed along with the commercialization system and connects campesinos to commercial allies who are willing to buy agroecological produce.

"Compa" traceability tool

In order to achieve the proposed reciprocity system, information is a key asset. Compa is a tool created to support the process of acquiring data. It recognizes the diverse challenges of working in complex rural contexts where illiteracy is common and digital technologies have a low level of penetration. As well, the proposed agroecological practices result in a complex data system, e.g. based on permaculture principles campesinos grow on the same plot at the same time different crops with the plants following a pattern that doesn't answer to a regular grid making it hard to measure the amount of area occupied by each product. Compa is an analog tool used by promoters and campesinos to gather that data. It was created in a participatory process with the existing promoters and Curentano beans producers. It consists of two parts (figure 6): first, an analog canvas that can be filled


Figure 6. Compa traceability tool and Compapp Platform, Uniandes, 2019.

through a natural conversation, inspired on the previously existing conversations, and secondly, a software that identifies the registered on the canvas and digitalizes it, resulting in a series of visualizations that can be used by FPN, anchor companies, and the farmers to make informed decisions about production and commercialization (Navarro-Sanint et al, 2019).

RESULTS

Compa is currently being used as a data collection system as well as a learning tool where promoters map current practices with campesinos and propose alternative ones based on the agroecological knowledge they have acquired. With this information, they are planning specific workshops with the community to enhance bean production practices. Promoters serve today as a local agroecological extension service in 23 villages of Montes de Maria.

Furthermore, sharing information about the production process and the ecological corridors between the promoters and campesinos has driven activities such as tree planting and forest and watershed conservation implemented by campesinos themselves. Also, social and environmental values discovered during the design process of the strategy, have encourage promoters to implement greenhouses composed of native melliferous and wood plants to enrich the conservation corridors and to generate additional income to fund extension activities.

To meet the anchor company's demand, Cuarentano bean is now being planted twice a year. In the first semester, campesinos plant this bean with corn and cassava, extending the benefits of agroecological practices to other traditional products that otherwise would be grown using agrochemicals.

Cuarentano bean demand by Crepes & Waffles has been met for the first time in 5 years, and today more than 150 new families implement agroecological practices to grow their food in a sustainable way while preserving patches of forest across the Montes de Maria landscape. There has been a 25% increase in bean sales that represent 92'447.950 COP that strengthens local associations and benefits producers. Moreover, two main anchor companies are willing to work alongside the producers to generate additional value to Montes de Maria's traditional crops like sweet chili peppers and sesame seeds following the principles of Saber del Monte .

Moreover, 80 Km of new ecological corridors (figure 7) are slowly beginning to connect bigger forest patches with legally protected areas, generating an ecological matrix that comprises a diversity of conservation strategies.

Figure 7. Conservation-production corridors construction in Bolivar and Sucre departments, Patrimonio Natural (2019).
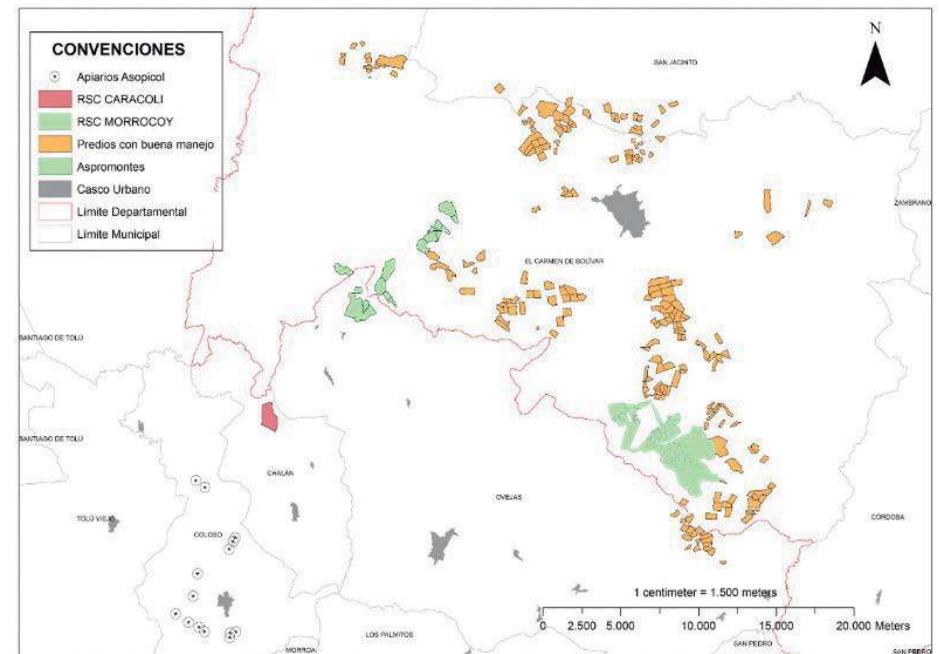
CONCLUSION

The interconnections found during the implementation of the project between conservation and relational studies, systems thinking and design have enriched FPN vision of conservation with a new set of design principles and tools that enhance the execution of conservation activities alongside communities and institutions more effectively. A diverse set of tools designed to support the implementation of Saber del Monte generate alternative ways of establishing communication channels and recognizing significant forest values with people. Ultimately, this activity is facilitating the introduction of conservation practices in the production agenda.

Among the possibilities design tools offer, generating evidence-based processes have been decisive to enhance the learning process that allows iteration to improve interventions during the project timeframe. In a complex context as the Montes de Maria face today, the ability to react assertively to emerging challenges creates confidence especially with the communities involved.

This approach has given a new layer of complexity to the development of a conservation project and at the same time, has allowed researchers, designers and organizations to recognize, embrace and act towards current world crises, rethinking

established economical and social dynamics to create small contributions that have the potential to balance relationships in a territory. However, designing socio-ecological transformation systems is still a big challenge, but this contribution shows that the collective participation and co-responsibility in ecological subjects can create spaces for successful transdisciplinary conservation projects.

Nevertheless, design evidence offers an opportunity to sensitize institutions and donors about the value of the process in a scenario where interventions oblige immediacy. Hence, the ever-existing challenge of reconciling the pace of the project, the requirements of the stakeholders, the design process and the production process.

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PERCEIVED DESIGN VALUE THROUGH THE LENS OF GENERATION Z

This research addresses the perceived design value of Generation Z (Gen Z) and indicate design transformation from a result to the key method of defining problems and challenges. The design-conception process should be articulated for the best solution, with analytically informed design-led practice moving the design paradigm and design thinking process towards design mindfulness. Deeply rooted in defining a real need or problem, this approach involves continuous mindful action in the development and reformulation of the questions why, how, and who, particularly asked by Gen Z's. We all are continuously bombarded with new products and services, which causes us to doubt the ongoing process towards sustainability. This study investigated Gen Z's perceived design value through 50 open-ended, qualitative online interviews and contributes to the development of a new design theory and framework to determine the value of design and to redefine the design thinking process as perceived by Gen Z. It proposes attributes that identify Gen Z's perceived design values, and it articulates and systemizes these perceptions, thus contributing to improved development of products and services, including design education. It also analyses Gen Z's learning environment and needs in continuously changing external context.

Keywords: perceived design value, Generation Z, design process

INTRODUCTION

The Silent Generation, the Baby Boomers, Generation X, Millennials or Generation Y, and Generation Z (Gen Z) denote the various current demographic cohorts based on birth year; experienced economic, political, and social events; values; attitudes; and behavior. In psychology, it is assumed that a generation covers 20 years and is typically bound by significant events in the cohort's country or region (Codrington, 2008). The examination of societal groups is a useful way to assess and understand economic, technological, and societal impacts and allows for analysis of upcoming trends (Cagle, 2018). This paper analyzes perceived design value, visual and aesthetic sense and the learning environment particularly of Gen Z's in the context of Latvia.

The years following the millennium mark not only significant economic and historical development as not only Latvia joined the European Union but also experienced rapid increases in access to technologies such as personal computers, nationwide connectivity to the one of the fastest internets in the world, and the use of mobile telecommunication networks in everyday life. This post-millennium period created a shift in culture and behavior (Cagle, 2018).

External context and the way information is received and processed form today's society and economy and will drive them in the future. Design thinking as a particular approach to creatively solving problems evolved in 1960's and was formed by Greatest and Silent generations. As external context is changed dramatically and thus also society, the methods, thinking and doing processes. Empirical and qualitative research is a background of forming analytically informed design-led mindfulness as a paradigm preferable to design thinking for Gen Z.

METHODOLOGY

Theoretical research provides structured information and understanding of Gen Z's perceptions, learning practices, visual and aesthetic senses, and experience as value formations. It constructs and supports the underlying principles and uncovers differences in how Gen Z perceive values of product and service design.

In the current study, Gen Z's perceived design value was investigated via open-ended, qualitative online interviews with 50 youngsters born after the year 2001. Respondents were asked to answer to the following questions:

- What should a product be like to create a positive experience, satisfaction, and sense of well-being for you?

- What should a service be like to create a positive experience, satisfaction, and sense of well-being for you?
- What creates an emotional attachment to a product, so that you are willing to use it again and again?
- What creates an emotional attachment to a service, so that you return as a client to use it again?
- How would you characterize what makes an object or service beautiful and aesthetic?

Empirical research as observation of Gen Z's learning and doing practice is described as a case example. User and theory research are resources for synthesizing design theory and drawing conclusions.

External Context and Its Implications for Constructing Gen Z's Perceived Value

A generation's location is integral to constructing commonalities such as attitudes, behaviors, and consumer patterns that construct sociocultural environment. Gen Z is the first generation that has not experienced life before the internet. It means that global network impacts Gen Z's capabilities to find an information, to learn and think, to socialize and to behave. Channels of communication have been influenced by the development and expansion of technologies and wireless communication with increased connectivity. Individuals no longer need to interact in real time, and smartphones, with their simultaneous access to all forms of media, allow individuals to hold the world in their hands. The media and communication explosion have contributed to the massive expansion of multitasking behaviors, characterized as Gen Z's continuous partial attention (Turner, 2015) by being connected globally.

Objects in everyday life produce meaning, and communication technologies contribute to the construction of culture and society. "Technologies are actors that 'do' by stating discourse and building contexts. But they are also actors that 'make us do'." (Caron & Caronia, 2007, p. 40). Today's teenagers do not even understand the concept of watching television on someone else's schedule, as they watch programs whenever they choose on their computer screens and portable devices. Social networks, blogging, games, and other user-generated internet content have created mass communication tools that connect both local and global users and dictate no time limit (Castells, 2010). The term *absent presence* denotes that people may be physically in one place while their social attention and communication is focused elsewhere (Rainie & Wellman, 2012), highlights the need of analytically informed mindfulness to cope with overloaded information and changing external environment, thus shifting also the design thinking process.

Information is only ever a click away. With an unlimited access to the global network and channels of communication, Gen Z's are used to watch and listen before read and talk. YouTube and Instagram are information and learning channels thus forming Gen Z as visual observers first. They use videos and other visuals that explain a theory or concept or demonstrate a challenging process. Gen Z want to know that the content they are learning and have to perform have an applicability beyond just single practice. Gen Z prefer intrapersonal or solitary learning as a backup to using technology; they are accustomed to learning independently (Seemiller & Grace, 2017). Hence Gen Z's need a time for individual learning and reflection before group work or think-pair-share process. Gen Z's individual learning differs radically from the teamwork-oriented and collaborative nature of Millennials (Schofield & Honore, 2009). Gen Z value peers and instructors as learning resources only after thinking through a concept, problem, or project on their own (Seemiller & Grace, 2017). The *absent present* and intrapersonal learning are background for rising analytically informed design-led mindfulness as a shift from design thinking process defined and practiced before Gen Z's.

Gen Z's perceived value.

It is important to explore Gen Z's expectations and perceived design value since they have more power than any previous generation to redefine production and consumption (Priporas, Stylos, & Fotiadis, 2017). Consumer expectations are important indicators of customer perception and satisfaction (Mitra & Fay, 2010).

Perception is the final link in a chain of related events from the physical world to the perceiver. Perception, which is formed by the environment in which people live and is based on the information they translate and create from objects and events, guides people's actions (Sekuler & Blake, 1990). At the same time perceiving requires some action on the part of perceiver. Perceptions such as taste and touch are near senses, whereas seeing and hearing are far senses (Csikszentmihalyi & Robinson, 1990). Hence to experience products requires near senses, but acquiring and processing information, far senses.

Value can be perceived from a position of power and wealth and by the quality of their experiences. The senses define the parameters of human experience, thus needed to be stimulated and provoked. The ability to see allows an organism to gather detailed information about the environment without needing to be in physical contact (Csikszentmihalyi & Robinson, 1990, p. 2).

Nevertheless both products and services should create a positive experience, satisfaction, and sense of well-being, and emotional attachment.

The visual and aesthetic senses characteristic of Gen Z.

Vision, a far sense, represents the richest source of information formed by color, intensity, location, direction of movement, etc. If one's tactile feeling and eyes provide conflicting information, one's experience tends to follow what the eye conveys (Sekuler & Blake, 1990, p. 21). One identifies objects and the other visually guided action (Eysenck & Keane, 2015, p. 48).

There are two main criteria for understanding whether an observer has consciously perceived a given visual stimulus — the subjective and objective thresholds. Reaching a subjective threshold means reporting conscious awareness of a stimulus, whereas reaching an objective threshold means the ability to make accurate forced-choice decisions about a stimulus (Eysenck & Keane, 2015, p. 76). Aesthetic value depends on an artifact's ability to produce vivid experiences in its audiences (Csikszentmihalyi & Robinson, 1990, pp. 6-7). Due to individual subjectivity, there are no two identical judgments of aesthetic experiences (Lyas, 1997). Thus aesthetic experience is a human's alternative way of apprehending reality through an experience of blinding intuition, which provides a sense of certainty and completeness as convincing as any reason. Aesthetic experience, which includes cognitive, perceptual, emotional, and transcendental perspectives (Csikszentmihalyi & Robinson, 1990, p. 10), develops with age, personal experience, knowledge, and time. Aesthetics has to do with perception (Lyas, 1997).

Everyday aesthetic judgments are empirical observations rather than logical distinctions between different kinds of beauty, and they are singular judgments (Forsey, 2013, pp. 146-147).

Experiencing and defining experience as a value.

Major social changes are characterized by transformations of space and time in the human experience, where space is not a tangible or simultaneous reality (Castells, 2010, p. xxxi). "The experience is that when one acts in some way something follows, or that when something happens one acts or responds in some way. The experience is attributed to the actor. But what is experienced is not." (Haworth, 1986, p. 80). Humans experience time in different ways depending on how their lives are structured and practiced, as time can be defined by a sequence of practices and perceptions (Castells, 2010, p. xxxix). This experience is tied to a vivid awareness, as to be out of the ordinary, an action must be non-routine. Experience lets one discover and test the connection between means and consequences (Haworth, 1986, p. 82). Economic, social, and cultural values are dependent upon and influenced by technological inventions and thus by time, experience, and culture.

RESULTS

Results of Gen Z's perceived design value are derived through 50 open-ended, qualitative online interviews and empirical case study. Results contribute to the development of a new design theory and framework to determine the value of design and to redefine the design thinking process as perceived by Gen Z.

Perceived value of design indicates important aspects and needs that products and services should provide from the user perspective (Gen Z). Research shows the preferences of the Gen Z and demonstrate correlation how Gen Z is learning and doing design process, that helped to formulate design mindfulness as a shift from design thinking process.

Perceived and received value of design from the user perspective (Gen Z)

Gen Z users' perceived design value indicates important aspects and needs that products and services should address. Research shows the preferences of Gen Z and demonstrates the correlation between Gen Z's learning and doing design process, which helps to formulate design mindfulness as a shift from the design thinking process.

Gen Z Users' Perceived and Received Design Value

According to the perceptions of Gen Z, products that provoke positive experiences, satisfaction, and a sense of well-being are comfortable, long-lasting, easy to use, visually beautiful, aesthetic, enjoyable, practical, and qualitative (Table 1). These findings indicate design as a method for creating positive experience as well as visual and technical quality. The services that Gen Z members believe create positive experiences, satisfaction, and a sense of well-being present positive attitudes and are friendly, intuitive, comfortable, pleasurable, and effective. Positive aspects such as comfort or coziness, intuitiveness, and quality are sources of happiness.

Respondents reported perceived attributes linked to the sense of touch (a near sense) as creating positive experiences, satisfaction, and a sense of well-being and the sense of sight (a far sense) as object identification.

PRODUCT ATTRIBUTES		SERVICE ATTRIBUTES	
comfortable, cozy, long-lasting, well-ordered, good to use, easy to use			positive, kind, polite, individual, friendly
beautiful, good form, pleasant design, good looking, beautifully designed			understandable, intuitive, comfortable
enjoyable, funny, pleasant, fun-loving, object that makes you smile, fortune-catching			fun, pleasurable, satisfying
practical, useful, working			fast, effective (time saving)
qualitative, good, durable, perfect			interesting, unforgettable
interesting, unusual, unique			qualitative
I like it, appropriate to my needs, suitable for me			does the job for me
convenient, handy, understandable			trustworthy, addressing
natural, easily recyclable, nature-friendly			orderly, correct

Table 1. Product and service qualities that create positive experiences, satisfaction, and a sense of well-being for Gen Z

Perception through taste, touch, and visually aesthetic experience creates authenticity and uniqueness. Residual value and quality of experience emerge from emotional attachment. Products that create an emotional attachment for members of Gen Z are unique and eye-catching and provide moments of fun or inspiration (Table 2). To spark attachment, products should provoke cozy feelings; should be pleasurable, practical, and easy to use; and should be high enough quality to last a long time.

The Gen Z respondents reported that service providers should portray friendly attitudes, honesty, and kindness; should be fun, of high quality, and easy to use; and should provoke enjoyable feelings and happiness.

PRODUCT ATTRIBUTES			SERVICE ATTRIBUTES
interesting, unique, eye-catching, specific (I personalized it; I made it)			friendly, honest, positive, kind
cool, funny, entertaining, joyful, creates inspiration, creates new ideas			enjoyable, fun, entertaining, cool
cozy, pleasurable, pleasant			good quality
usable, practical, convenient (easy to use)			convenient, comprehensible, easy to use
good quality, long lasting usability			happy, people-oriented (family, friends)
visually appealing, beautiful			good atmosphere, pleasant
prompts happiness, prompts memories of childhood,			
relationships with friends, or family traditions			purposeful, needed
comfortable			interesting, unusual

Table 2. Attributes that provoke Gen Z's emotional attachment to products and services

Vision (a far sense) is most important to Gen Z members, who perceive, learn, and communicate visually through empirical observation and response to beauty. Gen Z members have ingrained aesthetic and visual senses. Therefore, it is important to clarify what objects and services they perceive as beautiful and aesthetic. Results suggest that what they find beautiful and aesthetic are the same qualities that prompt them to make emotional attachments, but respondents could not precisely name what they found beautiful and aesthetic (Table 3).

unique, interesting, noticeable, weird, prominent	
lovely, pleasant, creates fun	
high-quality, good performance, well-manufactured	
beautiful	
tasteful, meets what I like, stylish	
colourful	
useful, practical	
comfortable, easy to use	
clean	
nature-friendly	

Table 3. Attributes that make a product or service beautiful and aesthetic to Gen Z

Gen Z can be characterized as the "green behavior" and aesthetic generation. Caring for the environment, questioning the need for products and services, and inquiring where resources come from and how products impact nature characterizes their typical active attitude and decision-making process. As Gen Z members have ingrained visual and aesthetic senses and are the first generation to have immediate access to information when it is needed, they communicate across the globe and value comfort and convenience. Using technology tools so closely, they must develop critical thinking and a sense of space.

The Gen Z Perspective on the Features of the Shifting Design Process

Members of Gen Z will be the next students and professionals. Ethnographic research and case study demonstrate a correlation between Gen Z's practical learning and doing, and process theory.

Gen Z members learn intrapersonally via observing a need or purpose and how to complete a task. They learn to do visually through self-directed video tutorials. They make a decision and then find a leader, someone whom they respect, to guide them through the doing process. This approach demonstrates their ingrained empathy, design-led thinking process, and skill in defining a need or problem.

Figure 1. An individual observing and visually learning before doing — a common practice within Gen Z

In the case demonstrated in Figure 1, a representative of Gen Z is aiming to learn metalworking. By watching tutorials on YouTube, he discovers that the process can create a cloak pin. When this is clear in his mind, he first defines a need or purpose by recalling his empirical observations about who might need a cloak pin. This process is intrapersonal and demonstrates visual learning before doing. Next, he confirms the need by asking users whether they have a problem keeping a poncho on their shoulders. He had empirically witnessed that ponchos can fall off the shoulders. Finally, he asks poncho users and the leader whether solution, demonstrated in a YouTube video, could solve the problem. The leader then guides this member of Gen Z in traditional knowledge and towards a master who can teach the needed metalworking skills. As a result, this Gen Z member crafts a traditional cloak pin.

This example demonstrates the paradigm shift from teamwork, which is characteristic of Millennials, to the intrapersonal learning characteristics of Gen Z. The shift to analytical design mindfulness from a design thinking process is a current research topic of the author and will be described in the future.

CONCLUSION

This paper articulates and systemizes design value as perceived by Gen Z users, thus contributing to improved development of products and services, including design education, to address this generation's real needs and continuously changing external context. Gen Z users seek comfortable, long-lasting, easy to use, visually beautiful, aesthetic, enjoyable, practical, and qualitative products and friendly services that convey an individual attitude and are intuitive, comfortable, pleasurable, and effective. Gen Z members perceive and feel visually and aesthetically. They care about and act to achieve sustainability and resource efficiency. They are mindful and intrapersonal, so their learning process differs from the methods created for Millennials. Members of Gen Z are seeking true purpose; they have a true need to understand the reason for doing something or creating products. This means that for this generation, design process and methods will change from design thinking to design-led mindfulness, from a focus on the result to a focus on the why of the beginning.

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FICTION AND DE-INNOVATION

The focus of the track is the articulation between world-making exercises and design methods that reformulate the identity of design. New domains have emerged that include Critical Design, Speculative Design, Design Storytelling. These methods and practices trigger creative, disruptive and conscious architectural and design practices by applying technological developments combined with ideation and speculation. The result generates spontaneous designs that are both, efficient and imaginative. Can the relationship between design, fiction, architecture and games redefine the role of each specific field? Can the intersection of these fields provoke a revision of the rhetorical innovation? Can these design processes lead to novelty without repeating innovation as a dry formula?

TRACK CHAIRS
JAVIER RICARDO MEJÍA
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DRESS ACTION: AN ALTERNATIVE FOR POSTFASHION

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This research aims to propose an alternative method of dressing a body while challenging current fashion practices. Through this process, the role of the fashion designer and maker is questioned while cultivating a more creative attitude and engagement on the side of the wearer.

This innovative method shifts the approach of the body from the perspective of a subject always addressed through benchmarked and rigorous processes to a subject that becomes open for exploration and experimentation at any point in time. It becomes an active subject in a continuous state of change, a body responsive to shifts in society and culture.

Based on a power-mesh skin-tight bodysuit which features snap-buttons strategically placed on the suit's surface, dressing the body becomes a simple activity of draping materials on this suit (already dressed by a body) which allows infinite possibilities of placements, configurations and combinations.

Through this method each individual becomes the explorer of his/her own body, being able to express his/her own individuality overriding the necessity to acquire pre-designed elements of dress. Subsequently, this method offers an alternative to fast fashion and contemporary consumption habits and stereotypes that our society is currently facing by simplifying the production processes together with a strong underpinning of sustainable and phenomenological considerations.

Keywords: Dress, Action, Draping, Postfashion, Critical Fashion

INTRODUCTION

The focus of this paper is to offer an alternative solution to current and established fashion systems from design to production and wear. This study will investigate *Dress Action* from both theoretical and practical perspectives grounded in a two-pronged analysis that responds to sustainable fashion practices and phenomenological considerations of the act of dressing.

Is no news that for the past decades the contemporary fashion design practices and production processes have been indirectly damaging the planet and endangering the future of the next generations at a global scale and also ill-treating the individuals directly involved in the manufacture of fast-fashion goods (Welters, 2015). Sustainability became a ubiquitous term these days, when we talk about fashion and other aspects of quotidian life and various sustainable alternatives and approaches have appeared in response to established fashion models, some challenging the existing norms, some still using the same tools but in a more considerate manner.

While responding to our incessant need for fashion novelty, alternatives like Zero Waste Design (Rissanen, McQuillan, 2012), Recycling, Upcycling, Cradle-to-cradle, Eco-regionalism, just to count some, have been trying to solve the existing fashion and design systems but have not yet achieved to override the established fashion production processes or to challenge the way fashion is directly influencing the cultural mechanisms dictating us how to dress the body and therefore indirectly the formation of our identities.

On this account I would like to propose a method that outsets from the particular discussion that fashion is an affective process of becoming that relies on a continuous mechanism of dressing the body (Ruggerone, 2017). Underpinned by considerations of historical and ethnic practices of dressing which seem to have been overlooked in this age of continuous renewal, I hope that I will succeed in proposing *Dress Action* as a valid alternative for fashion that regards the action of dressing a body from a wider perspective than any existing practices in terms of self-perception and the phenomenology of dressing.

HISTORICAL AND ETHNIC CONSIDERATIONS OF DRESS

Some of the historical dress pieces like the ancient Greek *Himation* and *Chiton*, the Roman *Toga* and Indian *Sari*, which still plays an important role in the contemporary Indian wear, they all belong to the first category of elements of dress introduced by Francois Boucher in 1965 as being "a flat piece of skin, fur or cloth, with no

holes that is draped or wrapped around the body" (Payne, Winakor & Farrell-Beck, 1992, p.8-9). Long before the time when sewing was used to put materials together in order to form what we call today garments, human were used to drape these archetypal dresses onto their bodies every day. In some cultures, this type of dress still exists and with time technological development has slowly embedded a substantial semiotic value, relevant for that ethnicity to survive in the contemporary global society. The respect and appreciation of the textile resulted from the weaving loom, a material which is the result of an intensive labour, sustained by the entire set of historical connotations embedded as carriers of cultural identifiers of the social group it belongs to, explains why in these cultures the piece of fabric should be used as it is, without any cutting or sewing. A relevant example is the South East Asian Sarong, a piece of cloth which embeds the ethnic identity of each community in the weaved motifs and colours used but at construction level is a tubular weave as resulted from the backstrap weaving loom (Lee, 2014).

To better exemplify the incommensurable value that could be embedded in a textile, I will exemplify the Balinese community from the Hindu tribe of the Tenganang village. *Geringsing* is an intricate double ikat patterned cotton cloth, naturally dyed with only Indigo and Morinda pigments and hand woven in a backstrap loom. All variations of the *Geringsing* are featuring a white selvedge on both sides of the weave. The cloth is considered by the community to carry miraculous powers that reside in it while the white selvedge is intact. Once the selvedge is broken or cut, the cloth loses all the miraculous powers (Hauser-Schäublin, Nabholz-Kartaschoff & Ramseyer, 1991). *Geringsing* stands as a clear and undoubtedly example of the cultural value that materials can be invested with when carrying semiotic identifiers of the culture which has produced it. In this regard, the piece of cloth is the final product in its' own and requires nothing more than only draping in the process of dressing a body.

In contrast with this range of historical and ethnic dress practices, in the western and modern society the history of dress gathers a broad spectrum of approaches that shifted in time from a style to another. From the casual everyday wear of the working class to the strict and bespoke attire of the wealthy, dress practices have been benchmarking the body into standards and typologies to ease the process of pattern cutting, assembly and implicit the time of production. Nowadays, on a very general overview, at antipodal extremes we can distinguish the slow, laborious, expensive and specialised made-to-measure and its' counterpart, fast-fashion practices. In either of the alternatives, the final product involves a series of production processes that overall are following the same principle: the garment is made to suit more or less the body type that has been designed for.

Considering the entire production path from the raw materials to the final product, the current production systems require a broad spectrum of technical specialisation, facilities and manpower together with an increased use of energy and production of pollutant residues. For the current fashion design practice a thorough and in-depth reconsideration of all these aspects is strongly required, therefore the main aim of *Dress Action* is to be a disruptive method, shifting the existing design paradigms and potentially offer a solution to reformulate the identity of fashion.

PHENOMENOLOGICAL CONSIDERATIONS OF THE DRESSED BODY

In order to re-address the relation between body and garment and implicitly the way we perceive and think about clothes, we have to shift the way we understand the act of dressing. As societies and individuals we have explored countless ways of re-fashioning our bodies and our identities and this has influenced first and foremost our behaviour. Shifting the paradigm of dress as a new territory of investigation, together with developing new methods of approaching the act of dressing, this practice based research immerses itself into a vast area with immense potential, not only from a design perspective but also from anthropological and sociological perspectives.

The limit of our physical body, namely the skin, is directly involved in the process of body identification (Anzieu, 2016), the territory where we take shape and define ourselves as what we are/aim to be/become in society (Giddens, 1992). As the organ mostly used in the non-verbal interaction, the skin has already played a myriad of roles, functions and meanings throughout our history, being the site where processes of absorption and manifestation of cultural expression are taking place (Connor, 2004) and most and foremost the organ that carries the act of dressing and established our physical relations between body and the garment. While situated at the intersection of the field of perception, where vectors originating from the body as a poststructuralist and affective construct (Ruggerone, 2017) and the outer forces that confine the body as a finite entity in the social and cultural reality, the skin appears as an *amorphous* entity in a continuous state of change. What most of the existing fashion practices are proposing for this *amorphous* body (and implicit for its' skin) is a multitude of possible identities, existences, desires etc. manifested through the medium of the garments. The act of dressing the body is therefore the act of experiencing these possible identities one at the time in a fixed and predetermined manner, thus, the body becomes a framed entity.

Before introducing *Dress Action* method I will briefly discuss two practices somewhat similar in terms of approach and consideration of the skin as the surface where the garment is anchored on the body and somewhat influenced the proposition of this method. The *Colombe* dress proposed by the Japanese designer Issey Myiake in 1990 (Dimant, 2010) is an almost rectangular piece of monofilament fabric featuring snap fasteners and synthetic straps (Fig. 1). The textile takes the shape of a dress (Fig. 2) when draped around the body and set in shape with the help of the fasteners. A very innovative and visionary design approach, the *Colombe* dress was challenging existing production practices by eliminating drafting, sewing and sizing. While opening up a dialogue about the modularity of garments, the piece is still lacking the flexibility to be draped in other forms and silhouettes than the only one it was designed to be, a dress.

Almost 10 years later, in 2001 the British designer Alexander McQueen envisioned for the Icelandic singer & songwriter Bjork in the video-clip for her song *Pagan Poetry* (Biesenbach, Ross & Dibben, 2015), a dress that is anchored in a unique way, new for fashion but closer to fetishist BDSM practices. The lower part of the dress was designed and produced using established methods of garment construction and textile materials while the upper part, at first glance, is absent as a clear bodice but replaced by beaded strings which are woven through the skin through piercing holes (Fig. 3a & 3b). The entire look carries an intense emotional energy where pain and pleasure are working together to support the deconstructed image of a dress-necklace

Figure 1-2. Colombe dress exhibited as a flat monofilament (Figure 1) and draped on a human form (Figure 2), designed by Issey Miyake, 1990 (Dimant, 2010).

amalgamation. This garment-jewellery/jewellery-garment ambivalence of the piece is challenging dress archetypes while pushing the boundaries of perception and proprioception of the body as a finite entity adorned and covered by garments from what Tarryn Handcock (2014) defines as a "body that wears" to a completely new area of semiosis. As the interaction between the garment and the body is brutal, the approach retains a strong conceptual and innovative value that has not yet been further developed either by the designer himself or by other practitioners.

DRESS ACTION METHOD

Starting from this outset, in order to de-frame the body from the existing fashion practices, a new paradigm has to be approached; this will allow the amorphous nature of the body to manifest unhindered through the act of dressing or being dressed. This new paradigm, which I call *Dress Action* (Fig. 4), will be considered as an alternative to Fashion practices and adventure even further than what Barbara Vinken (2004) proposes under the concept of *Postfashion*.

This research aims to explore fashion design from a disruptive and conscious perspective, as an amorphous process of draping unstitched materials onto the body, as garments. This action of draping materials is mediated by a skin-tight bodysuit which plays the role of a second skin. Made from a power-mesh textile, the bodysuit is featuring a range of snap fasteners strategically placed in various areas (Fig. 5a & 5b) to allow the anchoring of materials on the body in a multitude of options and combinations, as illustrated in Figures 6a-6g and Figures 7a & 7b.

The draping of the textiles onto this bodysuit while dressed by the subject could be approached as a twofold: the first alternative is taking the act of draping only, without cutting the textile which
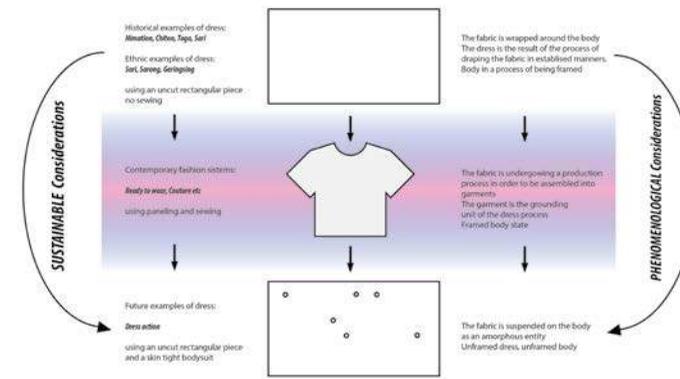
Figure 4. Diagrammatic mind map for Dress Action paradigm.

Figure 5a. Placement of the press-fasteners on the bodysuit before stitching
Figure 5b. Positioning of the bodysuit as a completed piece.

I will call *Draping Action* (Fig. 6a-6g) while the second alternative considers after draping the option of cutting of the textile in order to supplement the drape which I will call *Draping and Cutting Action* (Fig. 7a & 7b). The resulted outcome, for either of the alternatives could be subsequently reproduced or reiterated in a completely different manner, as the subject desires.

While the bodysuit playing the role of a second skin is the only element of dress that would involve established garment production processes, the rest of the materials used to dress the body require only their own production as textiles (or involving any other stages of post-production embellishments) and the

addition of the snap-fasteners (pairing the ones on the bodysuit). It is important to mention that the addition of the snap-fasteners on the materials to be draped could become a domestic activity carried by the wearer herself/himself. This opens up an active engagement on the wearer's side in the process of designing, allowing space for adjustment at any moment, imaginative involvement and play.

While being dressed, the body gains a new role, the one of the mannequin, that adds to the embodied experience of the subject which has to negotiate simultaneously as subject to be dressed and as dresser of this subject, both roles experienced while the action of dressing is happening in real time from a non-dualistic Spinozian perspective (Ruggerone, 2017). This action of dressing allows the entire construct body-dress to exist in a continuous state of negotiation with itself while experiencing with endless possibilities of becoming.

CONCLUSION

Dress Action is a speculative and radical design paradigm which responds to existing and known fashion practices in a

spontaneous, efficient, simple yet imaginative manner by re-interpreting historical dress practices from a new and uncharted perspective.

Taking this new approach, concepts like garment, wardrobe, dressing and being dressed have to be reconsidered simultaneously with most of the processes involved in the production of fashion making and fashion dissemination. *Dress Action* brings forth fashion as an individual experience offering the full freedom of expression, eliminating any mediators and agents of fashion design and production while opening the intrinsic agency of the textile material itself.

As an experience, through this method the body as subject and object of fashion is also freed from any benchmarking practices with regards to measurements and size. Terms like fitted or tailored become redundant and potentially obsolete together with the entire suite of mechanisms serving to this purpose.

As this approach overrides most of the current fashion production processes is also an alternative to the sustainable paradigm of Zero Waste Design. Even though *Dress Action* it appears to endanger the current ecosystems of industry specialisation and economic welfare, the potential alternatives for new industries in this sector are still open and ready to be explored. The only aspect that is changing is the angle from which fashion will be approached as practice of the future.

Somewhat similar with the ever changing body proposed by the French artist Orlan, (Clarke, 2002) which ceaselessly modifies its' shape, identity and boundaries, this method also proposes an ever-changing relation body – garment that responds in an ethical manner to current and future fashion needs of a society facing the fashions and trends of the ever-increasing digital era. The body and the dress become the component parts of a work in progress where the power to control and manage the act of dressing returns fully to the wearer. Together with this, the body as a confined and familiar entity transcends beyond the existing semiotic knowledge allowing new territories of meaning to form and be explored. This body is a body in motion, in a continuous change, demanding a new set of tools and mediators to facilitate and entertain its' existence in the world.

Lastly but not the least, Dress Action should be perceived as a playful, borderless and rule-free solution instigating the creativity and imagination while speculating on the potential each of us play as individuals forming societies and cultures.

As this method opens up a wide horizon for new knowledge yet to be explored, as research I intend to continue exploring, further developing and challenging it in order to achieve better outcomes and solutions for the future.

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EVERYONE DESIGNS IDENTITY AND DETERMINISM IN THE DIGITAL AGE

Design has rapidly permeated our lives since the last century. Its ability to project a desirable scenario at any scale—its fiction: how the world "should" be—seduced us during a 20th century whose character was technological. This paper explores some challenges that the pervasiveness of design in the digital age entails. It argues that the increasing importance of the logic of design demands a theoretical reflection to counter the merely practical or decorative. It considers that concepts, such as innovation, identity, choice, and aesthetics, need constant redefinition, at the deepest cultural level, in the highly globalized world of the 21st century. This effort analyzes the prospects of a theoretical reflection based on the Latin American experience, during the transition from a technological to a digital or information age, to left behind the primacy of imported theoretical and practical models from Europe and the United States.

Keywords: design thinking, innovation, identity, choice, aesthetics

INTRODUCTION

"Everyone designs who devises courses of action aimed at changing existing situations into preferred."
Herbert Simon, "The Science of Design: Creating the Artificial," 1988

It is not particularly controversial to claim that the flexible and creative logic of design has become pervasive in the 21st century. Unlike the descriptive logic of social sciences or the positivist reasoning of engineering, design provides a framework to propose the "potential"—what does not exist yet. The increasing primacy of design methods developed gradually. The technological character of the 20th century replaced the humanism and rationalism of the 18th century as well as the tension between the romanticism and the economism of the 19th century (Schmitt, 1996). Marinetti, Gropius, Le Corbusier, Mies, Fuller, Archigram, Banham, Foster, Gehry, Ito, among others, embraced the technological rationale, while, in a reciprocal process, several forms of knowledge adopted the flexible logic of design as part of their methods. While Gropius and Le Corbusier proposed to build a better world through standardization, design thinking permeated the professional training of business, law or engineering to inform 'decision-making' processes. Today, in the transition from a technological to a digital or information age, it may be argued that everyone designs. Everything is regarded to be designed today—from daily-use objects or experiences to our most sophisticated robots—falling prey of "innovation" as a category of aesthetic and economic speculation that is, first and foremost, subordinated to consumerism. This fact, of course, questions its own identity: what is design today? If design is everything, design is nothing.

WEEK THOUGHT AND DESIGN THINKING

Science and engineering rely on precision and clarity to identify problems and their potential solutions, whereas design thinking is open-ended or "weak." Weak thought, in this context, is understood not literally but through the philosophy of Gianni Vattimo. Therefore, "thinking is no longer demonstrative but rather edifying" (Vattimo, 2002, pp. 452–463). Professor Peter Rowe, former Dean of the Graduate School of Design, argues that *design thinking* synthesizes precision and incompleteness. It provides, thus, both the ability of *precision* "to recognize and understand successive stages of problem structuring and to ensure success in narrowing the search for satisfactory outcomes," and the openness of *incompleteness* "to prompt useful

and novel forms of further heuristic reasoning pushing toward potentially better outcomes" (Rowe, 2017 p. 43). According to the American social scientist Herbert Simon, unlike science or engineering which study how natural and artificial things are and work, design "is concerned with how things ought to be, with devising artifacts to attain goals" (1988, p. 67). The propositional content of design equates the findings of the German philosopher Theodor W. Adorno in the Kantian system which was paralleled, retroactively, to the architecture of the French Claude-Nicolas Ledoux by the Viennese art historian Emil Kaufmann through the term *autonomen Architektur*. The architecture of Ledoux, Kaufmann argued, inaugurated a new architectural attitude based on material sincerity and the geometrical autonomy of the parts in relation to the whole, replacing the heteronomy of the Renaissance-Baroque system in which the subordination of the material to animism and the parts to a unified composition prevailed (1982, pp. 69-94). During the second half of the 20th century, this formulation was echoed mainly by the theory of the Italian Aldo Rossi and the American Peter Eisenman, as the "autonomy of architecture." This implies the return to the theoretical study of the discipline (thinking), in contrast to what the Italian Tendenza, led by Rossi, considered its professionalism (making) based on the commodification of culture (Scolari, 1973). A theoretical study that is scarce in contemporary Latin American architecture and urbanism. Adorno argues that, in Kant's philosophy, the ideals of the Enlightenment—such as *freedom* and *autonomy*—are "regulative ideas" rather than "constituents of knowledge." This means, for Adorno, that "there is a sense in which Kantian philosophy strives to define the world—through the immanent values of autonomy (reason)—as it ought to be" rather than as it really is (2001, p. 137). This formulation coincides with Herbert Simon's argument that "design is concerned with how things ought to be" (1988, p. 69). Therefore, it is not a coincidence that Kaufmann equated the subjectivism of Kantian philosophy with Ledoux's architecture—an analogy that influenced, and even polarized, the architectural discourse in both sides of the Atlantic during the second half of the 20th century.

The last decades of the 20th century witnessed the pluralism to which architectural theory was subjected. The decay of the Modern movement triggered the search for architectural renovation through technological fascination, biological and linguistic analogies, positivist and sociological methods, or historical references, among other methods. The influence of computer systems revolutionized the design and the practice of architecture toward the end of the last century. This revolution allowed the design and construction of the Guggenheim Museum in Bilbao or the Yokohama International Port Terminal, and the possibility to 3D-print not only musical instruments or food but

also entire buildings. In *The Alphabet and the Algorithm*, Mario Carpo describes two events that influenced greatly architectural modernity: Leon Battista Alberti's inception of architectural design and the industrial revolution. First, Alberti's distinction between the design and the making of architecture—during the Renaissance—empowered the architect as a humanist creator. The actual building, for Alberti, is identical to the design. Second, the mass production of "industrial standardization generates economies of scale—so long as all items in a series are the same" (Carpo, 2011, p. 32). The specters of mass production and mass consumption seduced design at all scales, consolidating the alliance between architecture and computer science created since its early development in the late 19th century.

The problem-solving logic of architecture informed the rationale of computer science which appropriated the term 'architecture' to define "the conceptual structure and logical organization of a computer or computer-based system."[1] The antecedents of our increasingly internet-based communication network and our information age could be traced back to The Hollerith Machine (1888), The Bombe Machine (1940s), and the SAGE: Semi-Automatic Ground Environment Air Defense System (1950s-1960s). Herman Hollerith designed a machine that captured and processed data for the US Census Bureau whose technology was replaced until the 1950s by computers. Alan Turing designed The Bombe, a machine that reduced the work of the British codebreakers to decipher the German codes during Second World War. The SAGE system was "the first geographically distributed, online, real-time application of digital computers in the world."[2] The development of the Defense Advanced Research Projects Agency (DARPA), during the Cold War, engendered the development of internet. It was just a matter of time for the digital

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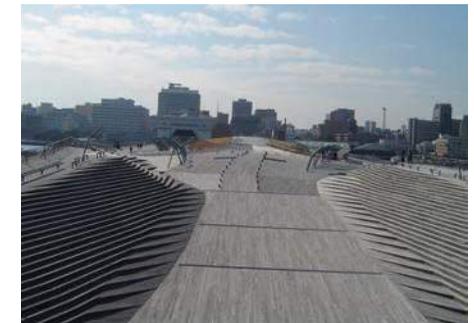
1   "architecture, n." OED Online, Oxford University Press, March 2019, www.oed.com/view/Entry/10408.

2   "SAGE The First National Air Defense Network." IBM 100. Icons of Progress. Accessed May 17th, 2019. https://www.ibm.com/ibm/history/ibm100/us/en/icons/sage/

logic to permeate the architectural rationale, in the same way that it permeated other cultural realms. The computer-aided design software and 3D-printing started replacing the drafting table at the turn of the century. In *Design Thinking in the Digital Age*, Peter Rowe identifies five domains within architecture influenced by digital technologies: first, architectural representation; second, integrative efficiency such as building information modelling; third, building performance assessment such as climate control or resource consumption; fourth, parametric modelling; and fifth, prototyping such as digital printing and 3D-modelling. These digital tools are so powerful that they inform *how we design and what we design*, but Rowe argues that "the ineffable characteristics of design problems and of design thinking" apparently remain (2017, p. 19). For example, he explains how the digital tools seem to prescribe a formal propensity toward "surface" rather than "space" based on the use of applied geometries in fabrication or 3D-modelling. Rowe asserts, however, that the "weak" nature of design thinking that synthesizes *precision* and *incompleteness* has survived the paradigmatic shifts in architectural design since the invention of perspective during the Renaissance until the contemporary digital age (2017, pp. 19-25). This assertion problematizes the understanding of the concept of "innovation" in modern societies as well as concepts whose constant redefinition is necessary in design such as: identity, choice, and aesthetics.

INNOVATION

In "Architecture, Innovation and Tradition," the Chairman of the *Fondation Le Corbusier*, Antoine Picon (2013) distinguishes between "innovation" and "invention". Innovation, for him, "possesses a systemic character," whereas invention not always spread due to "technical limitations, socio-economic and cultural obstacles." Picon exemplifies this distinction contrasting the invention of the German engineer Thomas Diesel with the innovation of Thomas Alva Edison's electric lighting. Diesel designed an engine whose ignition starts through pressure but at the end of the 19th century its broad application was not guaranteed, whereas Edison's invention revolutionized a technological realm whose eventual broad implementation was a matter of time. Thus, the term "innovation" has deep cultural implications considering its systemic character, according to Picon (2013, pp. 128-133). However, it is so used today that it has lost its meaning. It seems that in our contemporary societies the notion of "progress"—defined as "gradual improvement"—could be exchanged by "innovation," but in the shallowest sense. The idea of "progress" understood, philosophically during the 18th century, as "moral perfection," (Schmitt, 1996) has been replaced by its economic and

technological counterpart during the 21st century—the ideals of the Enlightenment were replaced by a technocracy that tends to confound technology with democracy.

CHOICE

In a debate about the influence of big data into urban theory titled "Cities and Technology" at Harvard Graduate School of Design, Carlo Ratti (Director of the MIT SENSEable City Lab) naively asserted that *technology is politically neutral* to which Antoine Picon sharply refuted that *technological devices or tools only legitimize political decisions that have been previously made.*[3] The techno-utopia, supported by Ratti, that imagines a better world through the democratization of technology is instrumental for the few that decide in Silicon Valley, New York, Washington, London, Brussels or Berlin. The lack of theoretical reflection about choice, identity and aesthetics subordinates design to an aesthetic and economic speculation—for example, to the superficial fashion of material and visual mass consumption of social media. In *L'Architettura della Città*, Aldo Rossi regarded the problem of choice as political in nature but questions about identity and
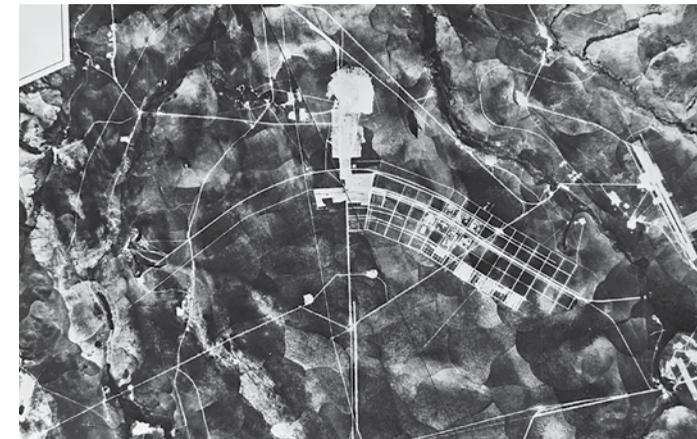
Figure 3. Brasilia under construction, 1957. Geofoto. Arquivo Publico do Distrito Federal

3 The debate was organized by the City Form Lab on Wednesday, March 7th in Gund Hall (48 Quincy St, Cambridge, MA). The panel speakers were: Antoine Picon (G. Ware Travelstead Professor of the History of Architecture and Technology, Harvard Graduate School of Design and Director of Research, Harvard Graduate School of Design), Cesar A. Hidalgo (Associate Professor of Media Arts and Science, Massachusetts Institute of Technology and Director, Collective Learning group, MIT Media Lab), Carlo Ratti (Professor of Urban Technologies and Planning, Massachusetts Institute of Technology and Director, MIT SENSEable City Lab), and Alan G. Wiig (Assistant Professor of Community Development, University of Massachusetts Boston). The panel was moderated by Andres Sevtsuk, Assistant Professor of Planning and Director of City Form Lab.

aesthetics are not less political (1982, p. 162). A clear example in the Latin American architecture of the 20th century is Brasilia whose construction involved political, social, economic as well as aesthetic decisions—as attested by the geometries of its general plan and the specificity of its architectures.

IDENTITY

The term "identity" proceeds etymologically from the French *identité* or the Latin *identitas* which means "condition or fact that a person or thing is itself and not something else."[4] Therefore, its meaning evokes individuality. The genesis of individuality could arguably be traced back to the decay of medieval societies but the outbreak of the French Revolution—whose preceding centuries were described by Karl Marx as a "prehistory"—could be considered a consequence of its formalization through Kantian philosophy. Kant's autonomy, along with Rousseau's freedom, shaped the modern consciousness of the individual toward its emancipation from external ruling—for example, the monarchy. However, in *Dialectic of Enlightenment*, the philosophers Theodor W. Adorno and Max Horkheimer argued that the rationality of the Enlightenment turned into barbarism in the 20th century— fascism and the irrationality of the insatiable capitalist logic (2002). In 1929, in a lecture titled "The Age of Neutralizations and Depoliticizations", Carl Schmitt declared that the succession of eras—from the Medieval age to the Renaissance, from the metaphysical 17th century to the moral 18th century—implies "the striving for a neutral domain" (1996). The belief that technology is "a domain of peace, understanding, and reconciliation" prevailed in Europe in the 20th century as a heritage from the scientific discoveries of the 17th century such as the telescope. Society is not politically homogeneous, thus, as Schmitt stated, technology is an instrument that "precisely because it serves all, it is not neutral" (2007). By mid-20th century, the consolidation of mass society, according to Hannah Arendt, prescribed "a certain behavior, imposing innumerable and various rules, all of which tend to 'normalize' its members, to make them behave, to exclude spontaneous action or outstanding achievement" (1998, p. 40). The social realm developed in the *modern world*—which for Arendt emerged politically after the first atomic explosion—absorbed, and neutralized, completely the political realm excluding any possibility to be critical through action and speech.

As Arendt theorized the political deficit of society, the functional urbanism of *Congrès International d'Architecture Moderne* (CIAM)

4   "identity, n." OED Online, Oxford University Press, March 2019, www.oed.com/view/Entry/91004.

and the Athens Charter was first introduced to the United States in 1942 through the publication of Josep Lluis Sert's Can our Cities Survive? which was an analysis of urban problems and its potential solutions. The social, economic, political context of these modernist ideas was the reconstruction efforts carried out in Europe after the destruction of World War II. While the Marshall Plan (1948) supported the economic and institutional reconstruction in Europe, the *Comisión Económica para América Latina* (CEPAL) was created, the same year, to develop Latin America where architecture was instrumental toward the modernization of the region through the *ideology of developmentalism*. In "Architectures for Progress: Latin America, 1955-1980," Francisco Liernur clearly explains how Latin American states, from Mexico to Argentina, adopted strategies from the European and North American (United States) experiences to modernize their main cities at an architectural and urban scale (1969, pp. 69-89).

By mid-20th century, urbanization exploded in Latin America and the population of its major cities increased dramatically, while, in 1956, Josep Lluis Sert (as Dean of Harvard Graduate School of Design) organized the first Urban Design Conference. The rapid growth of the American cities and their suburban sprawl, according to Sert, demanded the development of urban design to coordinate the efforts of urban planners, landscape architects and architects to intervene the urban environment. In this historical context, projects such as the *Museu de Arte de Sao Paulo* (1957), the Nonoalco-Tlatelolco housing complex, in Mexico City (1960), or *Teatro and Centro Cultural San Martin in Buenos Aires*, (1950s-1970s) were implemented to tackle the urban scale referred by Sert at Havard. The ideas developed in other contexts, thus, were implemented in Latin America but without a theoretical framework. The project for Brasilia (1960s), according to Liernur, could be regarded "as the primary symbol of Latin America developmentalism" through its strategy to reorganize the territory (2015, p. 73). But, as the project developed, a paradigmatic shift took place. The slogan "being modern," for Liernur, described the first half of the 20th century, while the problem of identity dominated the second half of the century. Luis Barragan's oeuvre, in Mexico, synthesized a colonial heritage, a vernacular tradition and a modern language into a coherent whole—from Casa Prieto to Las Arboledas. Barragan's work countered the loss of identity—a consequence, perhaps, of rampant developmentalism.

Barragan's architecture provided the aesthetic index of what until today could be called "Mexican architecture." An architecture that lacks any critical reflection toward the redefinition of its identity during the 21st century. In *Poesía en Movimiento*, Octavio Paz expressed his skepticism about the term "Mexican poetry." He wrote that it is believed that Lopez Velarde is the most Mexican

Figure 4. San Cristobal Stable, Horse Pool and House, Planned by Luis Barragan, Mexico City, Mexico, 1976. Presented by Pierre Brahm 2015

of our poets, but his oeuvre is so personal that if its "Mexicanity" distinguishes it; thus, it cannot be compared with that of any other Mexican (Paz, 1981). Lopez Velarde's case might be analogous to Luis Barragan's aesthetic sensibility which, despite all the efforts, cannot be replicated. But the search for identity was not exclusive to "Mexican architecture." In the context of post-modern concerns, *The Architectural Review* asked in 1984: Is there a British Architecture? At the turn of the century, the sociologist Manuel Castells considers that in the increasingly globalized world, the redefinition of individual and collective identities is the main source of social meaning (2000, p. 3). The rise of nationalisms in international politics, the racial tensions or the cultural homogeneity prescribed by Facebook, Instagram or Google legitimize Castells's argument.

AESTHETIC

It seems that the contemporary eagerness for innovation lacks any theoretical and cultural reflection as well as any historical reference. Antoine Picon (2013) argues that, after *Delirious New York* whose theoretical argument is based on the historical process of modernity experienced by New York City, there seem to be, finally, a return to a historical consciousness in the parametricism of Patrik Schumacher and the use of contemporary ornaments. In *The Autopoiesis of Architecture*, Schumacher attempts to trace a genealogy from Vitruvius, to Bernini, to Le Corbusier. Additionally, Picon argues that the architectural ornament is back via the influence of digital tools. He explains that the use of the ornament attached to surfaces today differs from its traditional use—from the Renaissance to the 19th century—constituting essential parts of the building such as pediments or columns.
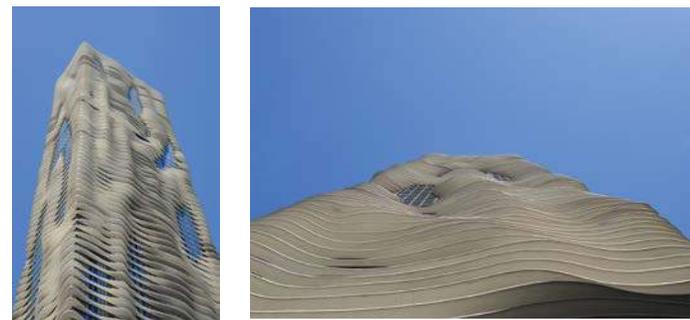
Figure 5. Prada Aoyama, Tokyo, designed by Herzog & de Meuron (2003)
Figure 6. Aqua Tower, Chicago, designed by Studio Gang (2010)
Figure 7. Aqua Tower, Chicago, designed by Studio Gang (2010)

The rebellion against the ornament of Adolf Loos informed the strict geometries and plainness of the architecture of the 20th century. But today our dissatisfaction with the recent past has led us to turn to a distant one: the historical use of the ornament. In the Prada Aoyama in Tokyo (2003), by Herzog & de Meuron, the ornament synthesizes the structure and the external skin in the structural façade of the building, while in the Aqua Tower in Chicago (2010), by Studio Gang, the slabs become constituent parts of an ornamental composition.

Picon argues that this ornamental return responds to technological developments—i.e. building envelopes often relate to sustainable concerns—and that "innovation in architecture could be defined through the interaction between formal change, technological challenges and cultural concerns" (2013, p. 133). What Picon did not consider is that this recurrence of the ornament can be found in Latin America—half a century ago— through the Biblioteca Central of Ciudad Universitaria in Mexico City, by Juan O'Gorman, Gustavo Saavedra and Juan Martínez de Velasco, in which the two dimensional ornament gives aesthetic character to the simple geometries of its structure (1948-56); the

masterly church of Cristo Obrero in Atlantida (1958-60), designed by Eladio Dieste, in which the brick walls are structure, skin and ornament, at the same time; or Rogelio Salmona's Torres del Parque (1964-70) whose ornamental composition merges with the geometries of its immediate context.

The historical development of aesthetics as special cultural realm reveals its cultural significance and its potential contemporary application to theories and practices related to design in general. The philosophical theories of Kant and Schiller not only consolidated the principles of aesthetics as autonomous cultural realm but also exposed its political and social nature. Kant proposed an aesthetic judgment disinterested on the utilitarian concerns of bourgeois society; on the other hand, Schiller considered that art could restore the humanity lost through the division of labor of the capitalist logic. The avant-garde movements—for example Dadaism—tried to cancel the distance between art and society, while the Bauhaus, according to Pier Vittorio Aureli, proposed the creation, or design, of a (social, economic, and political) context rather than objects.[5] In Latin America, as Liernur points out, the Paulista Brutalism—such as that of Vilanova Artigas and Mendes da Rocha—"represented an important development in the Marxist debates about architectural expression" (2015, p. 82). Today, the lack of these theoretical and cultural reflections in Latin America subordinates our practices to the merely *practical and decorative*—to the picturesqueness of social media—and condemns our architecture, our urbanism, our design to the tropicalization of external experiences. Paradoxically, we could trace the roots of this critical Latin American reflection to the philosophy of Immanuel Kant, who greatly influenced our contemporary Western thinking, and whose ideas constantly evoke the motto of the Enlightenment: *"Sapere aude!* Have the courage to use your own understanding!" We, in Latin America, have the means, we have the knowledge, do we finally have the courage?

5   Ilka and Andreas Ruby. Endless Bauhaus. Ruby Press. Video Installation (part of the exhibition "Modell Bauhaus" held at the Martin-Gropius-Bau, Berlin, 22.07-04.10.2009).

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'PATADESIGN: A PEDAGOGICAL EXPERIMENT ON DESIGN OF EXCEPTION, ABSURD ARTIFACTS AND IMAGINARY INTERFACES

Combining 'Pataphysics with speculative critical design approaches, our goal is to present 'Patadesign, a pedagogical framework and thought experiment that can expand possibilities for design practices. Invented at the turn of the 20th century by French author Alfred Jarry, 'Pataphysics can be defined as the science of imaginary solutions and laws governing exceptions. The collection of ideas explored by pataphysicians worked as a critique of traditional science and its concepts of rationality and progress. What does then a 'Patadesign practice look like? Can it challenge and redefine designerly ways of thinking and doing? We explored these questions in a class called 'Patadesign: Design of Exception, Absurd Artifacts and Imaginary Interfaces, taught for three semesters in the design undergraduate program at the University of Brasilia. The course was itself an exception in the curriculum, organized mostly according to a modernist agenda. Inspired by the work of Jarry and various pataphysicians, we developed a non-exhaustive list of 'Patadesign principles, which include Uselessness, Absurdity, Humor, Bureaucratization, Latency, Exception, Ambiguity, and Equivalence. The purpose was to offer imaginative and provocative counterpoints to traditional design methodologies, in resonance with a speculative critical design approach. What kinds of conversations can we raise through useless cartographies, ambiguous organizations, poetic services? In the paper, we give an overview of 'Pataphysics and its subcommittee Oulipo and their influence in the 'Patadesign framework. We then present and analyze some examples of student work. Finally, we discuss opportunities that 'Patadesign can bring to contemporary design.

Keywords: 'Pataphysics, speculative design, critical design, pedagogical framework, imagination

DESIGNING FASHION FICTIONS: SPECULATIVE SCENARIOS FOR SUSTAINABLE FASHION WORLDS

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The globalised fashion and textile industry is deeply implicated in the devastation of Earth's life-supporting systems. Industry-led sustainability initiatives have been incremental and inadequate; fundamental change is required to develop an approach to fashion that works within the means of the planet. Potential for transformation is limited by a collective inability to contemplate alternatives to the status quo. A newly established research project, Fashion Fictions, responds to this challenge. It will imagine, prototype and analyse enticing alternative fashion worlds through a playful and collaborative design process in order to research people's attitudes to the future.

A literature review demonstrates that this project is a work of design fiction: an emerging field which takes design from its commercial context to explore political, social and cultural issues via speculative 'what-if' scenarios. Yet much design fiction divides the 'expert' designer from a passive, voiceless audience. The related fields of interventional anthropology and experiential futures offer critical and methodological guidance for a much more participatory approach, in which designer and participants become co-researchers, learning together about visions of the future. Drawing on these influences, a three-stage process for the research is outlined.

A reflective analysis offers an insider view of the first stages of the design fiction project. It discusses the complexities of developing a detailed design brief, which involves the construction of parallel presents, rather than future scenarios; specifies three key parameters that shape the fictions being devised (possible; sustainable and satisfying; based on diverse economies); and identifies various potential sources of inspiration.

Keywords: fashion, design fiction, speculative design, participation, futures

INTRODUCTION

The globalised fashion and textile industry is deeply implicated in the devastation of Earth's life-supporting systems, with negative environmental and social impacts generated at every stage of a garment's lifecycle (Fletcher, 2014). These challenges have been exacerbated by a dramatic growth in production: the number of items sold worldwide doubled between 2000 and 2015 (Ellen MacArthur Foundation, 2017). To date, initiatives in the fashion field have been driven almost exclusively by reformist strategies: approaches which modify, rather than fundamentally rethink, the status quo. These incremental changes do little to shift clothing consumption practices within affluent countries and fail to develop an approach to fashion that works within the means of the planet.

As Fletcher (2010, p. 263) argues, 'prevailing ways of thinking lock us into particular ideas about the shape and practices of the fashion sector.' Thus, the potential for future systemic change in fashion is limited by the dominant practices within today's globalised industry. Perhaps most fundamentally, we are locked in to the growth-based structures of capitalism: unable to imagine alternative economic systems, whether in fashion or other spheres (Fisher, 2009). In essence, the future feels foreclosed; change seems impossible. This is of crucial importance if we are to tackle global challenges, for 'the actual limits of what is achievable depend in part on the beliefs people hold about what sorts of alternatives are viable' (Wright, 2010, p. 23). Or, as Lockton and Candy (2018, p. 3) state, 'imaginaries of futures can affect people's actions in the present'.

How might this attitude be transformed? Transition activist Rob Hopkins (2018) highlights 'the need to fire the imagination about the future it is still possible to create.' Taking inspiration from Hopkins' call, my newly established research project, Fashion Fictions, will imagine, prototype and analyse enticing alternative fashion worlds through a playful and collaborative design process. The project aims to investigate whether people living within consumption-intensive fashion systems can be supported to contemplate the possibility of fundamental change. This work builds on my fashion design practice and prior design-based research into slow fashion, homemade clothes and the domestic reworking of knitted garments (Twigger Holroyd, 2013).

The project is guided by three research questions:

- How can alternative fashion systems be designed and prototyped?
- How are alternative fashion systems experienced?
- How does engagement with alternative fashion systems change people's ability to imagine change in this context?

This paper will focus on the first research question, considering the design and prototyping process via a literature review and reflective analysis of the first stages of the project. The literature review commenced with an initial 'quick search' (Hart, 2001) to establish key texts, using the Design and Applied Arts Index, university library catalogue and general web search; search terms included 'critical design' and 'design anthropology'. References within these key texts identified further sources and specialised search terms, such as 'experiential futures'.

CONTEXTUALISING THE RESEARCH

In order to situate the speculative and collaborative approach being developed for this project within critical and methodological debates, I will examine relevant approaches to practice and research in various design and design-related disciplines.

Design fiction, speculative design and critical design

The Fashion Fictions project will construct imaginary fashion worlds; as such, it can be framed as a work of design fiction. While the literature offers a range of definitions for this term, design fiction essentially encompasses any work that integrates fiction and design (Hales, 2013). Design is taken from its usual commercial context and instead used to explore political, social and cultural issues. Galloway and Caudwell (2018, p. 86) describe 'works of design that imagine, speculate on, and represent alternate visions of design and the world it inhabits.' As Auger (2013) explains with reference to the influential work of Dunne and Raby, such projects are also referred to as speculative design or critical design, with the choice of terms largely down to context. Without space to articulate the nuanced differences, in this paper I use 'design fiction' to refer to all such work. Knutz, Markussen and Christensen (2014, p. 8.2) explain that design fictions 'can usually be described according to a basic rule of fiction, an imaginary, sometimes even impossible "what if"-scenario.' While much existing practice is based on dystopian visions of technological change (Dunne and Raby, 2013; Revell, Pickard and Voss, 2018), fictions can equally be utopian and focus on cultural, social or economic dimensions. The scenarios are materialised, typically through models, prototypes, films and/or documents. There has been a surge of interest in recent years, including in design fiction as a form of research through design.

Design fiction projects aim to interrogate the contemporary status quo and open a discourse about the future. As Haylock (2019, p. 16) explains, they '[expose] something about the contingency of present situations or about the mutability of

possible futures.' This capacity has much in common with science fiction and other utopian writing. Ursula K. Le Guin, for example, described her work as 'offering an imagined but persuasive alternative reality, to dislodge my mind, and so the reader's mind, from the lazy, timorous habit of thinking that the way we live now is the only way people can live' (2004, p. 218). Through design, these fictions are made tangible: 'real enough to be addressable' (Lockton and Candy, 2018, p. 17). As the field matures, commentators are highlighting problematic aspects of many design fiction projects. De Oliveira and Prado (2018), for example, discuss the privileged understandings often exposed by dystopian scenarios and criticise the power dynamics embedded in the gallery presentation that is frequently used: 'the designer, as the enlightened subject, speaks and exhibits; the silent spectators in the audience merely listen and observe' (De Oliveira and Prado, 2018, p. 109). While some design fiction researchers adopt a somewhat more participatory approach (Bardzell, Bardzell, Forlizzi, Zimmerman and Antanitis, 2012), we must turn to related disciplines to find speculative work that more fully embraces participatory methods.

Interventional anthropology and experiential futures

The first design-related discipline I will consider is design anthropology, also known as interventional anthropology. Informed by participatory design techniques and methods, this hybrid approach enables anthropologists to engage more fully with social change and visions of the future (Otto and Smith, 2013). In contrast to the long-established mode of ethnography, in which the anthropologist develops an in-depth knowledge of an existing cultural system, interventional anthropology seeks to develop 'ethnographies of the possible' (Halse, 2013) through temporary interventions. Like design fiction, interventional anthropology uses material prototypes; however, social aspects are given much more importance and the two are integrated in what Pink, Akama and Fergusson (2017, p. 145) describe as 'social and material assemblages'. Halse (2013, p. 182) explains that 'this kind of design experiment works through a playful mode of trying out how everyday life might play out differently'. This 'trying out' might involve games, performances and enactments in various forms. Essentially, interventional anthropology seeks to sensitively examine the embodied experiences of the participants as they encounter fictional situations made real, working in a highly collaborative mode: 'we learn about and with other people's expertise, accredit this expertise to them as collaborators in shared endeavours.' (Pink and Salazar, 2017, p. 16).

A further area of activity which has relevance to the Fashion Fictions project is that of experiential futures. Experiential futures

sits within the context of futures studies — an interdisciplinary field which explores possible, probable and preferable futures — but draws on design processes and has recently been connected with the sustainability-focused field of transition design (Lockton and Candy, 2018). Essentially, a future vision is made accessible in the here and now, using artefacts and immersive installations. As Lockton and Candy (2018, p. 12) explain, 'An experiential scenario is a future brought to life. It's a tangible "what if", more textural than textual, and a way of thinking out loud, materially or performatively, or both.' As with interventional anthropology, a focus is placed on the participant's experience.

Developing a methodology

I propose that Fashion Fictions should be framed as a design fiction project, though with an ethos of participation that draws on both interventional anthropology and experiential futures. A three-stage process will guide the project, which loosely follows the structure for design fiction research proposed by Bardzell et al. (2012). First, working solo, I will develop a range of fictional alternative fashion worlds, presented via short written summaries; second, a group of collaborators will 'build' the worlds, adding complexity via prototypes — fashion media, illustrations, social media posts and wardrobe mockups, for example; third, diverse groups of wearers will be invited to become co-researchers by inhabiting and 'dressing in' these worlds, '"liv[ing]" the experience of the changes being discussed' (Revell et al., 2018, p. 287). The participants will record and reflect on their experiences by 'stepping in and out of [the] imagined story worlds, shifting between immersion and commentary' (Halse, 2013, p. 192). This activity will take place over a period of weeks or months, allowing for meaningful relationships to develop (Bardzell et al., 2012). As proposed by De Oliveira and Prado (2018, p. 110), the collaborators (stage 2) and wearers (stage 3) will be encouraged to adapt the material they are given: 'to untangle and weave them into any direction they see fit.'

DESIGNING FICTIONAL FASHION WORLDS

Having outlined the premise of the methodology, I will now discuss the first stage of the research, in which I am developing a collection of fictional fashion worlds. As Bardzell et al. (2012) argue, there is very little guidance on how to undertake a design fiction project, or how to evaluate work generated during the design process. This reflective analysis of the project to date is an effort to capture insider insights that shed light on this activity.

Alternative presents

Although this research focuses on the future of the fashion system, from the outset of the project I instinctively felt that the fictions I constructed should be those of alternative worlds – that is, alternative presents – rather than future scenarios. Dunne and Raby (2013, p. 82) discuss this approach to speculation, which is influenced by both alternate histories in literature and counterfactual histories in historiography: 'A historical fact is changed to see what might have happened, if …'. As Auger (2013) explains, such fictions re-imagine the present day, questioning cultural, political and technological norms. The construction of *contemporary* parallel worlds allows me to sidestep the challenges that arise when discussing the future in the context of fashion. In many ways, fashion is obsessed with the future: the industry thrives on anticipating emergent trends through a network of expert 'cool-hunters'. Yet, somewhat paradoxically, that future looks incessantly familiar: the cyclical nature of trends means that styles from past decades reappear, minimally remixed and restyled for a new generation.

A focus on parallel presents is appropriate also because my aim is not to explore how fashion *products* might be transformed through future technological innovation; rather, I wish to explore how today's consumption-intensive fashion *system*, and the practices embedded within it, might work differently. In essence, the fictions will be all about social and cultural factors. and not at all about technological change. This distinction is best served by reconceiving the present day, rather than speculating about the future. It should be noted that I am seeking to explore alternatives to a consumption-intensive fashion system, as dominates in the global North, and thus it is the history of this system from which I will construct the counterfactual fictions.

I commenced the project with a small pilot workshop, working with three colleagues from my university department of fashion, textile and knitwear design. Through discussion, we sought to identify a range of 'junctures': points in history that were decisive in generating the consumerist fashion system of today. It was remarkably challenging to identify pivotal moments to convincingly encapsulate gradual cultural shifts, and even harder to imagine how history might have unfolded differently. Somewhat ironically, we experienced intense 'lock in', finding it almost impossible to imagine otherwise. After a period of reflection, I realised that I needed to turn the process upside down by *first* imagining an alternative world, and then constructing an engaging, perhaps even fanciful, backstory to explain its development.

Parameters

The epiphany regarding my approach to creating parallel presents brought a further challenge into focus: just what sort of worlds should I be inventing? I realised that I needed to develop a set of parameters – and that this activity would be a crucial part of the design process. The first parameter instructs me that the worlds should be possible – 'what *may be*', to borrow from a categorisation used in futures studies (Haylock, 2019, p. 15, original emphasis). This rules out fantastical notions such as magic spells, time travel and alien inhabitants. Second, the worlds should offer an enticing vision of a sustainable and satisfying fashion experience. This relates to what Haylock (2019, p. 16) describes as utopian speculative design, which 'renders thinkable a range of preferable futures that might reside on or beyond the limits of the probable or even the plausible'. I hesitate, however, to designate the visions I construct as utopian; this implies an all-encompassing, top-down vision of a perfect world. The idea of the micro-utopia – 'more tentative, temporary, pluralised or truncated' (Wood, 2007, p. 3) – feels more appropriate. Rissanen (2017) highlights the value of design for micro-utopias, as conceptualised by Wood, to bring about fundamental change in the fashion system.

This second parameter needs more detail: if the worlds are to be sustainable and satisfying, what does this mean? I am using the concept of 'prosperity without growth' (Jackson, 2009), also described as New Economics, as a guiding principle. Seyfang (2011, p. 23) explains that this approach 'requires a realigning of development priorities away from the primary goal of economic growth' – the central logic of capitalism – 'towards wellbeing instead'. Essentially, the imperative is to create a system in which economic activity takes place within environmental limits (Fletcher, 2016). While there are many ways of defining wellbeing, I choose to use the approach proposed by Max-Neef (1992). He identifies nine basic human needs which constitute wellbeing; I have argued elsewhere (Twigger Holroyd, 2017) that fashion can meet our needs for identity, participation and creation. The fictional worlds should portray people satisfying these human needs by participating in fashion in ways which are resourceful, rather than resource-intensive, as described by Fletcher's (2016) compelling vision of 'post-growth fashion'. In practice, this will mean worlds in which the flow of new clothes into the wardrobe is slow; the number of unworn items in the wardrobe is minimal; useful lifetimes of clothes are long; and/or the resources used in laundering are limited.

A third parameter builds on the New Economics orientation, specifying that the fictions will explore 'diverse economies' as proposed by Gibson-Graham (2006). These diverse economies

involve practices of non-consumption and non-market consumption such as gifting, loaning, sharing and bartering. This parameter places a strategic focus on how clothes are worn, owned and exchanged, rather than how they are designed and made. While manufacturing conditions are of importance, in both social and environmental terms, I choose to place this issue in the background to avoid the project becoming dominated by discussions of business models and ethical consumerism, which do not challenge the consumerist paradigm.

Looking forward

My plan is to use the parameters described above – which operate as a design brief – to develop a collection of twelve fashion fictions. The fictions will vary in aspects such as aesthetic, participant behaviour and social organisation, in order to demonstrate that there is no single 'perfect' sustainable fashion system, but rather many potential sustainable approaches. Their backstories will vary too, with diverse types of events (from major technological inventions and cultural developments to seemingly frivolous pop-cultural moments) causing the juncture and processes of societal change including collapse and imposed discipline (Dator, 2009) unfolding alongside more idealistic sustainable transitions.

As with any design process, I need inspiration to support the generation of ideas for the alternative worlds. The first port of call is what Davies (2018) describes as 'enclaves of anti-capitalism within capitalism', such as the 'Craft of Use' stories of individual resourceful fashion practice collected by Fletcher (2016), and collective fashion initiatives such as clothes swaps and the contemporary mending movement. I will amplify these stories, transforming individual practices into coherent subcultures and marginal movements into core societal beliefs. I will also transpose principles of noncapitalist practice from other sectors into the fashion field; take inspiration from past ways of living and working (Tonkinwise, 2019); and seek to learn from contemporary fashion cultures from the majority world that are not dependent on high levels of consumption (Chang, 2018). These historical and cross-cultural stories will influence the construction of the fictions at stage 1, through desk research; at stage 2, through the expertise of the research collaborators; and at stage 3, through the lived experiences of the participant co-researchers.

CONCLUSION

This paper has discussed the development of a new research through design initiative, which seeks to construct and enact fictional alternative fashion worlds in order to challenge the seeming inevitability of consumer culture and change perceptions of the future. By reflecting on the early stages of the research, I have gained a nuanced understanding of the multiple factors which must be considered when commencing a project such as this, including the role of participation, the nature of the speculation, the creation of parameters to shape the fictions and potential sources of inspiration. Further reflection as the research develops will undoubtedly generate further transferable insights.

With little design fiction exploring the fertile ground of fashion, this research contributes to the development of a new context for fashion design, which reshapes 'the sociomaterial systems in which garments are produced, used, and discarded' (Rissanen, 2017, p. 535). The project also makes a contribution to the emergent category of 'economic design fiction' (Revell et al., 2018; DiSalvo, 2019), which explores ways in which design can fully engage with, question and reimagine the economic forces to which it has long been supplicant.

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BLACK PANTHER'S UTOPIAN PROJECT: THE INNOVATIVE POTENTIAL OF FICTION AND SPECULATION BY NON-ARCHITECTS

From games to film to literature, images of utopia in media have been successful in generating fictional worlds with high aspirational value. The process of creation for these utopias is not unidirectional; unlike typical design methods, designing for fiction requires a cyclical approach wherein creators draw inspiration from the real world and use them in turn as the basis for their own process of innovation. The final product—'fictional' and 'utopian' in nature—then influences the field from which it drew inspiration.

For architecture and urban design, the ideation of fictional utopias and futures facilitates place-making for and inclusion of groups of people often excluded or oppressed by the architectural project. The participation of non-architects in the creation of utopias generates ideas and learning for mainstream architecture and its adjacent fields. In this sense, the process of fiction creation mitigates exclusivity and eliminates architecture's barriers to participation.

Building off Hannah Beachler's fictional city of Wakanda for Black Panther (2018), we argue that utopian ideation by non-architects has the potential to create immense possibilities for adaption of their design principles in real life architectural projects. In our academic paper, we question: How does a production designer with a non-architectural background draw inspiration from Zaha Hadid's futuristic buildings to create a utopian city at the intersection of tradition and technological innovation? Furthermore, what can architects borrow from a non-architect's fiction? Finally, by way of its design process, how does fictional architectural ideation differ from intra-disciplinary speculation?

Keywords: utopia, fictional architecture, speculative design, Hannah Beachler, Wakanda

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RETHINKING THE PLACE OF NARRATIVES IN DESIGN FICTION: A GAP BETWEEN POLICIES AND THE REAL APPROACH TO VICTIMS

Fiction Design should broaden its study to other fictional genres, beyond the commonplace sci-fi and its futuristic tone, using narratives for design study. The term 'Design Fiction' is commonly addressed as the speculative work of designers in visualising, prototyping, and developing "what if" scenarios (Rabby & Dunne, 2013) from science fiction and technology. By revealing the qualities and effects of narratives and by positioning them as characters, stories have the capacity to provoke recognition of the social problematic represented and, thus, they can shape social and political questioning (Yelavich, 2015) and even improve government processes and policymaking. Design cannot talk about the future without starting from an annoyance/opportunity seen in the present. Design Fiction attempts to speculate on possible futures from the present. Therefore, the presence or use of a futuristic "formula" or "Science Fiction" is not necessary to evaluate the tension between the present and future over which it moves. The only thing that counts as successful innovation, as well as how it is defined and measured, is reaching a techno-scientific successful future? (Ehn, Nilsson and Topgaard, 2014). The objective of this paper is to assess whether Design Fiction should extend its study to other fictional genres and, with this, evaluate a non-techno-scientific approach. As examples, the series When They See Us (DuVernay, 2019) and Unbelievable (Grant, 2019) will be used to evaluate if could Fiction Design improve government processes and policymaking and think about the justice of the future.

Keywords: Design Fiction, Policymaking, Audiovisual narratives, De-Innovation, Social speculation.

INTRODUCTION

Design Fiction

Design Fiction has often been treated as the speculative work of designers in visualising, prototyping, and developing "what if" scenarios for the future. In terms of cinematography, this has usually been dealt with in the genre of Science Fiction. Speculation through design in cinematic narratives opens a dynamic space between possible futures and preferable futures, or between reality and the impossible, where scenarios and social dreams based on everyday situations can become catalysts for public debate (Rabby & Dunne, 2013).

The oscillation in binaries (utopian or dystopian futures) undermines crucial information and renders a tool limited to address contemporary struggles (Easterling, 2018). Design Fiction allows technoscience to become the centre of its study. "Innovation" has become a buzzword. Less discussed is what really counts as successful innovation and how it is defined and measured. Stories that are framed as "successful" tend to connect with technology. However, one must wonder if reaching a techno-scientific future is the only thing that really counts (Ehn, Nilsson, and Topgaard, 2014). No single future arrives first and faster, rather multiple, heterogeneous, and controversial futures are formed through networks, and contradictions of things, beings, and infrastructures. These futures in progress see the mosaic and collision of humanities that intersect, and they envision much more intangible design and innovation activities (Suchman, 2008).

Examining Science Fiction without the necessity and commonality of human subjectivities and its political lens restricts and prevents it from being critically reviewed and remade (Fry, 2011). Deeming Design Fiction as completely futuristic and utopian/dystopian (Science Fiction) biases its study because it limits its analyses to artefacts and technologies.

Audiovisual Narratives

From the theories of cinema, narratives generated by writers become the representation of the political, economic, and social values of the society that is represented. Screenwriters poetically develop the space-time of the narrative, and they create a critique of the context and culture in which the story exists (Gonsher, n.d.). They are the holes through which cultural, mental, and historical walls are crossed, and designers can see the other at the same time as seeing themselves (Shafak, 2017).

The vision of an aesthetic product (TV series, painting, or illustration) is always a cross between what is predisposed before the spectators' eyes and value systems, beliefs, and prejudices.

Both depend on a context and a history, on constructed social and cultural negotiations, on situated aesthetic languages. The exercise of the TV series scriptwriting does not only refer to the narrative's space-time, but refers to its way of seeing it from the present in which it is written. Creatives imagine space-time as a projection of the author's present values. In this experience, filmic images are projected, and the spectators' eyes naturalise the forms of representation to make them accessible. This allows the viewer to feel and understand as if they share the set of values that the moving image shows, at least for the 90 minute-experience (Merlo, 2017).

Men need the help of fiction because he seeks to evoke representations that last longer than the oral and the ephemeral movement of bodies in space. Cinema works like an artistic record of political action and discourse (Arendt, 1998). It is a mode of expression and action, fully capable of projecting alternatives, formulating speculations, and provoking political and ideological debates (Yelavich, 2015).

Despite this, cinema tends to be regarded as a secondary or tertiary source. It is often reduced to 'mere' entertainment, and its role in transformation and social and political questioning is frequently undermined (Rabby & Dunne, 2013).

Design Fiction and Cinema Narratives

TV series are a fertile source of information for design research, in particular, those stories that explore the reciprocity of the sensitive and insensitive, a mutuality that points to a new kind of politics that respects the horizontal relationships between human beings and their surroundings (Yelavich, 2015). Design should link other possibilities that allow one to find different ways of managing ideas and strategies to investigate possible futures (Rabby & Dunne, 2013).

Fictional design discourse has been studied from the perspective of design itself. If one looks from the perspective of narrative and image theory, it must be understood and committed to a level of foundational causality (Fry, 2011). In the book *Real Presences* (Steiner, 1991), the author explores "the politics of the primary", where performative criticism is demanded. Steiner actively recognises the voice of every piece of art that speaks for itself and should not be cast aside to be considered a secondary or tertiary source of criticism of the artist and his/her work. He asks that we give the same respect to works of art and film that we give to science when we respond its questions. By positioning narratives as real situations stories have the capacity to provoke recognition of the social problematic represented and, thus, they can shape social and political questioning (Yelavich, 2015). Therefore, Science

Fiction is not the only genre in which to explore Fiction Design, as, according to Steiner, this would be to ignore the critical capacity of other fictional genres.

The objective of this paper is to assess whether Design Fiction, in terms of its study of fictional narratives and film, should extend its study to other fictional genres and, with this, evaluate a non-techno-scientific approach to innovation in this type of design. People cannot talk about the future without starting from the present or an annoyance/opportunity seen in the present. Design Fiction's attempt to speculate on possible futures, comes from the present; therefore, the use of a futuristic "formula" or "Science Fiction" is not necessary to evaluate the tension between present-future over which it moves. By placing narrative in human subjectivity, fiction has the capacity to provoke the recognition of interactions and the activity of systems by materialising the social and the political (Yelavich 2015).

ANALYSIS

Methodology

When They See Us (DuVernay, 2019) and *Unbelievable* (Grant, 2019) are two Netflix series that talk about real-life drama. They are crime stories that give visibility to real cases that only through fiction have managed to have a voice. Each of these series will be evaluated on how the narrative manages to critically show the way in which a whole system fails in its purpose to protect individuals within a democratic state. It seeks to answer the question: Could Fiction Design improve government processes and policymaking? (Kolehmainen, 2016)

1. When They See Us (DuVernay, 2019)

This series shows the events of the Central Park corridor on April 19 1989, and describes the lives of the five suspects who were prosecuted and sentenced to jail on charges related to the sexual assault of a female victim—a crime they did not commit. The prosecutor divided the five young black men into two groups to be tried on various charges related to the assault. Four of them were convicted of rape and were sentenced to the maximum penalty for minors. Korey Wise, who was 16 at the time of the crime served his sentence in adult prison. In 2003, the real sexual assailant confessed to the crime. The five men filed a lawsuit against New York in 2003 for wrongful conviction and were granted an agreement in 2014 (Fuster, 2019).

Those who are forced to plead guilty are the real victims and society takes a long time to realise it because of the racial burden

that a highly racist society implies: a black person accused of rape must be guilty. The first undeniable victim was the woman raped and murdered. However, the second level of victims are those who were falsely accused. This affected a whole vision of equality of justice in the country and the world.

This being the case, the series director, producer, and screenwriter Ava DuVernay, achieves after 29 years what almost no other medium has been able to create as vividly: a story that manages to fill peoples' huge appetite for relevant stories that facilitate meaningful conversations. People want to share ideas that inspire action or change the way we see the world (Quinton, 2019).

This is a story that illustrates two main problems: the deep cracks that the American judicial system presents and the latent racial discrimination in a society where the rights of people of colour are supposed to be already established. When it is studied legislatively, criminally, socially, and politically, a gap becomes evident in this kind of cases: A law can be created, but the social acceptance is much more difficult and slower (especially a law that is created after centuries of violent opposition). It had been 21 years since the murder of Martin Luther King Jr. when in 1989 five young man were tried and convicted for their race. It is in this gap where Fiction Design appears. Between the legal implementation of the law and its social implementation, there is a hole, a rupture where beyond seeing it as something negative and perhaps worthy of fetishism or morbidity, it is an opportunity to analyse this rupture a propose a way to ensure this situation is not repeated in the future.

Design Fiction seeks the way in which many related real cases find not a possible future but a path to a preferable future. This series makes evident a problem that is part of the day-to-day problems and events that occur every day and do not need the help of Science Fiction to be dystopian enough to be studied by Design Fiction. As is often said: reality often surpasses fiction. However, throughout this analysis a question arose: Why should people look to fiction to explain topics that can be investigated anywhere today? The next analysis will address this premise.

2. Unbelievable (Grant, 2019)

This series discusses the Colorado and Washington serial rape cases from 2008–2011. It is a real story that follows Marie, a teenage girl, accused of lying about being raped and the two detectives who followed a winding path to get to the truth. Marie was violated, yet the mechanism of the US entity in charge of investigation was negligent and aggressive in its methods, which led to the girl opting to deny her violation and then be convicted of false testimony (Armstrong & Miller, 2019).

This series, also based on a true story and created by Susannah Grant, makes clear the large gap between first, the denounce to the police by the victim of sexual abuse and, second, the investigation of the case until the capture of the sexual assailant. In this wide gap there are many cases where detectives and police officers never found anyone guilty, thus, they closed the case, leaving sexual rapists to commit crimes with impunity. Design Fiction should work on this gap.

To clarify, it should be considered that in the development stage of this type of audio-visual product, an exhaustive investigation of all the facts is conducted. Each scene and each sequence are based on real-life facts that have been fictionalised to bring them to a wider audience. The creative part then establishes the point of view of the story, which may be more remarkable when narrated and, from this, show a whole universe of invisible real cases that deserve their own voice. It is for this reason that this type of fictions should not be seen as a tertiary source but as worthy of receiving answers to intrinsic demands.

First, Marie is a victim of a sexual assault. Marie inevitably denies the violation for fear of a system she does not understand. Then, the system accuse her of false testimony. This excludes her from the benefits to which she is entitled because of her real condition as social victim. Thus, the result is that she is revictimized, and now the assaulters are the authorities. Designers could look into this series based on real and current events because it opens a world of infinite possibilities of details that allow the designer of Fiction Design a lot of material to analyse and study.

Furthermore, this series shows all the agents involved in the system failure. For example, why did the police and judicial authorities fail, what possible pressures may they have been under at that time to make the decisions they did, and was it politics that pressured them to make quick decisions? Moreover, was there media pressure? What were the methods that were used? Why did the victims decide to give false testimonies even though they had been violently attacked? Why do victims agree to lie about their condition if, in principle, they denounce the violence they suffered? Why, how and where does the justice system fails? Fiction shows many details where those answers may be found.

These two fictional works represent examples of many more similar situations where policies have not worked. In this type of legislative, criminal, social, and political hole is where Design Fiction should work on the justice of the future. Designers can look for a preferable future in the implementation of policymaking. Fiction Designers should work with Political Designers to lead the innovation in policies and social change. The challenge is to ask and then propose solutions: what needs to be changed or innovated in this justice system to be efective? Design

Fiction in a Legal Design Lab can work from the series specific case of study to help innovate the justice procedures to protect the most vulnerable people. There is no doubt that the law exists, however, the ways of proceeding in many cases is not efective and Design Fiction can create new methodologies with no need of a Science Fiction narrative with high technology involved.

DISCUSSION

To reduce the deep human dimension to technology is to ignore a rich world of coincidences that have led humanity to the loss of justice. When fiction is done well, people not only question how it entertains them but they also question themselves because it demands a critical look at tradition and the world that surrounds them and uses poetics rather than the conventional languages of criticism.

As *When They See Us* and *Unbelievable*, fiction can cover a whole life, in fact, generations of living. Designers can then extract their work from the immersive environment of the story, submit that work to a detailed examination, and review their arguments accordingly. In the process, fiction can help designers with the task of anticipating the effects of what the philosopher Peter-Paul Verbeek calls the multi-stability of objects and their mediations (Yelavich, 2015).

Could Fiction Design improve government processes and policymaking? (Kolehmainen, 2016).

> We believe that by speculating more, at all levels of society, and exploring alternative scenarios, reality will become more malleable and, although the future cannot be predicted, we can help set in place today factors that will increase the probability of more desirable futures happening (Rabby & Dunne, 2013).

To do so, people should start by knowing that the future is not only about searching for technology, it is not a fixed destination, but a constantly changing space of varying potential. To reach this potential, people must understand that every individual experiences the world in a different way based on their personal, geographic, social, and economic experiences in the world. Because of this, planning for preferable futures (Design Fiction's aim) must be a diverse and inclusive process, rather than a monolithic and presumptive one (Superflux, 2019).

Starting with this, fiction's focus on creating tools in the form of visceral experiences leads to strategies for understanding the present to change the future. Design Fiction's aim is to show how everyone (from individuals to governments) can be examined and modified to grow toward a preferable future (Superflux, 2019).

Fiction must focus on realities. It zooms into specific situations and bring them to life through design by working hands on, using methods of ethnographic and anthropological research, experience prototyping and storytelling. These rigorous investigations bring ethnographic, material and experiential qualities to designers: enabling people to place themselves in the frame (Superflux, 2019).

In terms of its study of fictional narratives and film, Design Fiction must effectively extend its study to other fictional genres. This represents a wider spectrum of design and innovation processes that generate values that are not easy to measure by today's standards of success. The stories exemplify how innovative alternative forces, far beyond the usual and the seemingly dominant perception of what is considered successful innovation, can become a resource that generates social value and contributes to the creation of a sustainable future.

Therefore, these stories represent a critical investigation of the prevailing situation, not primarily as a conceptual critique, but rather the focus is on exploring alternatives, on controversies that arise, and on composing together around controversial issues. Narratives that are studied by Fiction Design should not tell success stories of innovation in a techno-scientific approach. The position should be more inquisitive, perhaps even with a hint of melancholy, but still with the hope of a future that does not deny subjectivity and justice (Ehn, Nilsson, and Topgaard, 2014).

CONCLUSION AND FURTHER RESEARCH

Design Fiction must extend its gaze to other fictional genres and evaluate a non-techno-scientific approach to innovation. Fiction Design can improve government processes and policymaking because Design Fiction in a Legal Design Lab can work from the series specific case of study to help innovate the justice procedures. Due to the limitations of space, only two narratives of a single fictional genre (drama) were evaluated here. To broaden this discussion, it is necessary to evaluate other fictional genres beside drama and science fiction to make use of more fictional narratives. In a future investigation the author of this paper will develop a Design fiction proposal to the discrimination specific case of study (When they see us) that is going to be evaluated in a real justice system.

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DESIGN FICTION: LATERAL THINKING FOR SOCIAL DESIGN

This article aims to show the results of a product design workshop that has used Speculative Fiction as a creative tool. The experience has been carried out with students of the university degree at Escola Massana in Barcelona.

The construction of fictions has been considered as a catalyst tool for a creative journey originated from a given stimulus. The proposal of alternative futures has allowed the questioning of political, economic, ecological or cultural values associated with different parameters. The method has facilitated the creative capacity to produce critical thinking through works and eloquent objects of those futures.

Throughout the course, discourses have been developed that facilitate the approach to a critical and sensitive vision of creative production. With this approach we have achieved the construction of an inclusive and universal story that develops alternative futures where all voices feel represented. Likewise, the communicative capacity for the construction of the story itself has been strengthened, exploring languages and diffusion channels that are not usual. Finally, the method demonstrates a lateral approach to the creative fact that enhances the social values of the products achieved.

Design Fiction demonstrates its capacity as a lateral thinking tool for a universal design.

Keywords: design fiction, future design, storytelling, universal desing, lateral thinking.

INTRODUCTION

The aim of this paper is to show the experience of the project workshop carried out with students of the Art and Design university degree at Escola Massana in Barcelona during the 2018-2019 academic year. Thanks to the interdisciplinary context that this center provides, in which the construction or spatial or objectual definition as an intellectual artefact has not been exclusively considered, the methodological approach has made it possible to visualize the values of speculative fiction as a creative tool.

The Speculative Design (Auger, 2012) is often cataloged as a branch of what we know as Critic Design (Malpass, 2017). It is a type of creative approach that does not intend to conceive the production of space or objects within the conventions of the market, but rather commits to creations that mobilize the debate around fundamental issues that deserve our concern and commitment. To do so, some strategies are used that go beyond the limits of design and that propose a narrative dialogue with reality (Yelavich & Adams, 2014).

The pedagogical foundations of Design Fiction (Bleecker, 2009) are found in the questioning of the role of objects and spaces in our daily lives, regardless of sociocultural conditions. In particular, the intention is to focus attention on the capacity to articulate groundbreaking messages regarding the dominant narratives of the future, often loaded with social injustices that are not visible and focused on the privileges of the Western world. For this, in the development of creative exercises based on this approach, all the implications and ethical, political, economic, ecological or social consequences of speculative creations are always taken into consideration.

METHODOLOGY: DESIGN FICTION AS LATERAL THINKING

The development of a large part of the creative techniques that we use today with assiduity can be traced back to the 1950s and 1960s as instruments linked to innovation in different areas of production —fundamentally in a moment of effervescence of the commercial expansion of the West. It is not by chance that the first approximations to what we know today as Design Thinking originate in the writings of the inventor and psychologist William J. J. Gordon (Gordon, 1961) or the publicist Alex Faickney Osborn (Osborn, 1963). Once the perspective of Human-Centered Design was incorporated into the service design from the 1980s (Schön, 1983), it was a question of time that international university

centers such as Delft University (Cross, Dorst & Roozenburg, 1992) or Stanford University (Plattner, Meinel & Leifer, 2011) pay attention to these creative methods through symposiums and educational programs. In this context of exploration — partially productionist— of the design processes, methodological alternatives are located that propose a view that provides two fundamental nuances for the creative proposal: social empathy and narration as a critical aspect.

From this perspective, lateral thinking is a problem solving procedure that consists mainly of avoiding traditional methods (vertical) in the prefiguration of solutions. It is usual to cite the pioneering work of Edward de Bono when proposing this type of alternative methodologies (De Bono, 1967). His work was based on the incorporation of useful thinking tools to draw new itineraries in the creative processes developed collectively. His most systematic contribution in this direction was the definition of six thought mechanisms metaphorically transfigured into six thinking hats (De Bono, 1985).

Within the catalog of alternatives that de Bono offers, there are two that prefigure the methodological objectives of Design Fiction, and that have been developed in the experience described in this article. On the one hand, the Yellow Hat, cataloged as the "speculative-positive", from which the technique of Constructive Thinking (What if...?) Is developed as a model of approaching reality from an alternative future that supposes the best possible scenario. On the other hand, the Green Hat, directly associated with Creative Thinking (Yes, and...) as a means to propose alternative situations that have the capacity to both provoke and facilitate empathy.

The use of these thinking techniques prefigures a counterfactual approach to design, in the same way that its use can be recognized in the area of philosophy by authors such as Saul Kripke (Kripke, 1975) or in the field of historical studies by Niall Ferguson (Ferguson, 2011), among others. In all cases, the capacity of the construction of fictions is demonstrated as a highly suggestive tool to understand characteristics of reality and establish a narrative dialogue with it.

DEVELOPMENT: SPECULATIVE DESIGN IN THE CLASSROOM

The objective of this method of work at school is to develop the creative capacity to produce critical thinking through works and eloquent objects of possible futures. That is why different phases are proposed, which lead the exercises in a similar way to other approaches of lateral thinking. In a first phase, a future

world is virtually constructed, between probable and plausible, which leads to a holistic thinking of the political, economic or technological system (Candy, 2010). Next, the characters that inhabit it are defined, their needs are evaluated and the scenarios and objects that are part of their everyday life are worked on. Here collective empathy is developed with the needs and challenges of this society, identifying the challenges that can be the object of reflection. Once a creative challenge has been selected with which to focus on those challenges, spaces and objects that reflect future needs are designed and tested, building a storytelling that makes both the problem and the focused challenge visible. The value of the result is concentrated in the diegetic and eloquent capacity of the proposals projected as critical tools of dystopian futures in relation to collective expectations.

Throughout the course, instruments from some of the disciplines encompassed within the "critical design" environment [speculative design, design fiction, future design] are provided with the aim of facilitating the approach to a critical and sensitive vision of creative production . In addition to the references already mentioned, the theoretical bases on which both the methodological processes and the intellectual conception of the pedagogical model are formulated are amply gathered in the bibliographical references contributed by Anthony Dunne (Dunne, 2008) and Fiona Raby (Dunne & Raby, 2013). In turn, the architectures of the utopian and critical thinking of the second half of the last century are in turn indispensable references for the speculative approach. In this sense, the reflections collected by authors such as Neil Spiller (Spiller, 2007), Felicity Scott (Scott, 2010), Lucas Feireiss (Feireiss & Klanten, 2009) or Geoff Manaugh (Manaugh, 2009) are worthy of mention. And, of course, so are the experiences and proposals of collectives and artists such as Archigram (Cook, 1999), Archizoom, Superstudio (Brugellis, Pettena & Salvadore, 2017), Haus-Rucker-Co, Ant Farm (Scott, 2008), Coop Himmelblau, or Walter Pichler, among others.

STUDY CASES: DIEGETIC NARRATIVES

From the definition of the teaching contents in the Massana School, the speculation and the construction of fictions are considered as catalyzing tools of a creative journey originated from a given stimulus. Such stimuli may vary depending on conditions that approximate the student laterally to known realities.

During the 2018-2019 academic year, the proposed topics have been three: first, the singular character of the temporary constructions and spaces; second, the playful value of the design; finally, the phenomenological implication of the human body in the perception of space has been considered as the third possible

catalyst. With these topics as a context, we intend to achieve the proposition of alternative futures in which political, economic, ecological or cultural values are questioned based on different critical parameters that are addressed in the classroom in work groups. To illustrate the experience in this paper we have made a selection of three examples that show different approaches to each of the topics.

The first example is the piece "Oxygen Pump", designed by students Marc Haefner, Sara García and Oriol Mases. It is a device defined as a serial piece of urban furniture whose objective is to provide oxygen to citizens through self-consumption masks. It is posed in a future context in which oxygen levels in the atmosphere have decreased significantly due to pollution. The distribution of the pumps is proposed as temporary installations developed in public spaces through groups that promote the collective consumption of oxygen. In this way, the temporary occupation of public space and relations between people are strengthened, damaged by the lack of human activity beyond the interior of their pressurized and oxygenated homes.

In this case the fiction eloquently demonstrates a double circumstance: on the one hand the obvious look towards the probable deterioration of the atmospheric conditions of the planet. On the other, "Oxygen Pump" shows the concern for human relations, moving the story towards the need to guarantee a collective conscience in the face of a global problem. The temporary construction of oxygen jets catalyses the recovery of social relations.

The second example is the piece "Backpack", designed by the students Alba Abellán, Teresa Casas, Anna Moreno and Wanda Cuellar. In a similar context to the previous one, the authors describe a future world in which the deterioration of the planet is causing the disappearance of a large part of the vegetal mass. Faced with the collective vision of the previous project, "Backpack" approaches the solution in an individualistic way, proposing a small transportable garden as a backpack that becomes an individual oxygen generator.

The fiction is showing here several unique circumstances: the atmospheric situation, the individualization of the world in search of solutions and, furthermore, the conversion of these solutions into a ludic-symbolic artefact. In a way, the backpacks show customized micro-landscapes converted into an identity image of the people who transport them. It shows a world that combines ethics and aesthetics in a very disturbing way. The ludic value of the piece catalyzes a whole battery of interpretations.

The third example is called "Blinder" and has been prepared by the students Marta Ferret, Maria Bienvenido, Laura Palomo
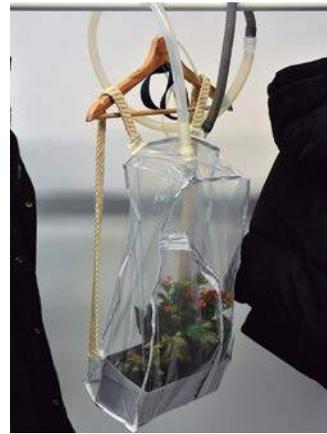
Figure 1. Oxygen Pump. Marc Haefner, Sara García and Oriol Mases. Spain, 2018.
Figure 2. Backpack. Alba Abellán, Teresa Casas, Anna Moreno and Wanda Cuellar. Spain, 2018.

and Marianna Bellmunt. In this case, a future determined by electronic and digital means of communication is emerging, which has caused problems of visual perception in a large part of the population. A possible intolerance of the retina to digital screens and interfaces has degenerated into a high percentage of blindness among the population. "Blinder" is defined as a digital application that facilitates digital communication between blind people through a helmet-scanner and virtual reality gloves. The objective is to facilitate the tactile perception of people through digital devices.

The more elaborate fiction proposed by "Blinder" questions both the physical risks of digital interfaces and the social risks of remote communication. Under a proposal that apparently universalizes and makes digital communications accessible, an acid look is perceived towards the perversions of the lack of human contact. Here, the value of the corporeal has catalysed a somewhat disturbing proposal.
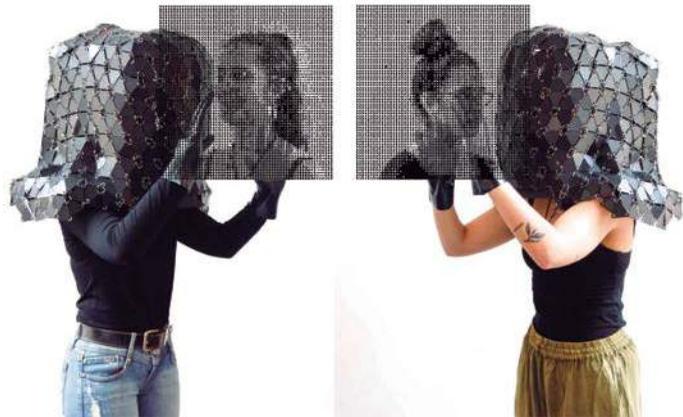

Figure 3. Marta Ferret, Maria Bienvenido, Laura Palomo and Marianna Bellmunt. Spain, 2019

FINDINGS: LATERAL THINKING FOR SOCIAL DESIGN

Among the case studies collected here we can recognize a series of characteristics that certify the proximity between the diegetic narratives and other critical design forms. In particular we can identify some values of design fiction.

- **Ability to visualize global and planetary problems.**
  During the construction phase of alternative worlds, the point of view tends to be located in reproducible situations in different parts of the world, fleeing from local situations with characteristics that are difficult to extrapolate. Therefore, global construction tends to concentrate on the definition of political and economic structures outside existing ones. The productive economy, the technological development and the environmental implications of the model are the triangle on which all the arguments tend to be articulated. Both the economic models and the environmental repercussions are recognized in the projects as key situations with enormous influence for the construction of those futures. The environmental impact of economic and technological development tends to become a trigger factor for the social structures that are built in those futures.

- **Ability to visualize problems of a social and local nature.**
  In the same way, once defined a situation in which global problems have been made visible, the method of thinking about futures leads the students to the construction of characters that inhabit and survive in those futures. In this approach, the empathic capacity of the participants in the workshops is decisive to make visible dystopian situations perceptible at local level and motivated fundamentally by the particular characteristics of the global approach. In this way, the emergence of discriminatory elements, the generation of situations of non-universal accessibility, the existence of non-inclusive structures, etc. becomes visible; in short, all kinds of imbalances that become the basis of the challenges they intend to correct with their projects. The fact is that the projects are not aimed at correcting global problems, but rather seek to minimize their impact on social and local levels.

- **Ability to draw narrative bridges with reality.**
  The great value of speculative proposals is their ability to approach an alternative reality without altering the fundamental principles of current reality. The variations that are intuited in the contexts of the commented proposals are subtle enough to establish links of empathy with any observer, without the need for the observer to have a deep knowledge of those contexts. In this way, the bridges that are drawn

between reality and fiction are solid connections. The viewer is transferred to an alternative reality through the connection with objects, installations or social habits that are completely useful in fiction, and perfectly eloquent in reality. The subtle distance between these alternatives becomes the appropriate channel for the construction of the narrative, which can include all kinds of media: physical artifacts, digital media, hybrid performances, etc.

The mechanisms of lateral thinking that are used in the processes of fiction design ("What if..."or "Yes and..." techniques) greatly facilitate the projection of the personal self over the fictitious situation created. The achievement of a framework of empathy —problem of Design Thinking— that facilitates the interaction with the future, allows in turn to shift the gaze from the global to the local aspects and challenges of a more social nature. In turn, the products defined from this positioning become much more suggestive and diegetic pieces. From a narrative point of view, the approach of the observer from the personalized product facilitates empathy with the difficulties that could be faced in that future, which leads them, in a deeper analysis, to a holistic understanding of the challenges of that future.

CONCLUSION

As a final summary of the experience put into practice, it is shown that narrative fictions converted into diegetic designs facilitate the approach to a critical and sensitive vision of one's creative production. Both these examples and the rest of the projects developed during the workshop pay attention to environmental and ecological risks (global sphere), as well as to the risks of digitalization, the growth of individualism or the post-humanization of society (local sphere).

With this approach we have achieved the construction of inclusive and universal stories that make visible alternative futures where all voices feel represented. Also, in the examples can be seen how the communication capacity for the construction of the implicit story has been enhanced, exploring languages and non-habitual diffusion channels that hybridize different disciplines. Finally, the method demonstrates a lateral approach to the creative fact that enhances the social values of the results achieved. In short, fiction design demonstrates its capacity as a lateral thinking tool for a universal design.

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DESIGNING GOVERNANCE IN THE FOURTH INDUSTRIAL REVOLUTION

In the next industrial revolution, the tipping point of avant-garde technologies (1) will signal the beginning of a new era of relationships between governments and citizens (2). In the near future, procedures, services, and improved quality of life could be moved forward based on the actions of stakeholders of the public ecosystem and the building of citizenship. However, in the social and economic context of Colombia, the problems of governance remain linked to the most precarious life conditions and because of that the solutions in the fourth industrial revolution seem distant and detached. The major challenge is not only how to be prepared for change but also to be producers of real solutions in governance – not only buyers.

In working with the Ministry of Technology, Information, and Communication (MinTIC) (3) for three years, we analyzed national and international experiences of digital public innovation, and we monitored technological development in the experimental stage to imagine new ways of governance. The result was the creation of editorial pieces that targeted public officials and entrepreneurs regarding public solutions, including content and exercises, to forecast plausible (4) solutions for governance and to envision a digital future. The goal was to provide an opportunity to creatively speculate about new designs of governance in the real context of the country. Based on this work, we aimed to reconsider several issues, such as: transparency of fiscal duties; notary efficiency; sustainability in health, education, and agriculture; citizenship participation; processes in post-conflict and peace, among others.

Keywords: digital, public, governance, future, local.

INTRODUCTION

The point of departure in this research and design process was the following question: What should we be doing at present with the community and the ecosystem of stakeholders in the public sector in Colombia regarding the governance of the future? We based our proposal on the theory of trends analysis: A trend evolves like a wave (5). It begins in a state of emerging weak signals that manifest only in specialized ambits, such as the academy, science labs, and experimental spaces. In this disruptive state (6), major changes require opening new markets to capture new consumers, which requires a breakthrough in states of mind. At this initial phase, the future usually germinates beyond the vision of audiences and mass media coverage. A trend evolves into a phase of early adopters when it exists commercial exit, even if it is targeted only for selected groups of people, exclusive or expensive, and disseminated by independent stakeholders. Then when the manifestations in different fields converge in one trend, it will soon evolve into an early majority of users and adopters in the mass market.

In general, innovation values (7) belong to the first two stages when proposals are still experimental, uncertain, and little known. The field of governance is not prominently or intrinsically innovative because of the massive scope of the public sphere. However, to consider its perspective on the future governance requires innovation, such as anticipating and forecasting the possible scenarios of public scope and evolving simultaneously with the changes in cultural, social, and economic contexts. To conceive what is next, governance should be a fertile field of innovation in the first two trend stages where anticipating the future is possible. Thus, governance could be a trendsetter for growth in other fields of creation and consumption.

During the project for the Ministry of Technology, Information, and Communication (MinTIC), our purpose was to link governance with avant-garde technologies (in the first two stages) that were not exclusively in the public domain to take part in the fourth industrial revolution. In our research we included the accelerated development of artificial intelligence combined with other technologies, such as robotics, the Internet of things, virtual and
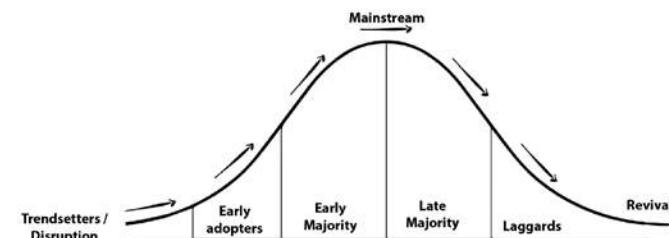
Figure 1. Evolving trends resemble a wave.

mixed reality, the capabilities of quantum computing as well as other smart systems, such as blockchain and digital twins. This revolution has been forecasted to have a tipping point in 2025 in the developed countries, which will directly affect all spheres of human activity (8). With this research we proposed the design of the content of various editorial pieces. We aimed to offer inspiration and knowledge, to spread and encourage the vision of future governance in the revolution of technology, and to reach a massive audience of stakeholders comprising local technology experts, academics, members of the public ecosystem, public servants, students, followers of the Ministry within the community, and the general population in the national territory.

These objectives presented a big challenge: to create content based on quality research; to show evidence based on analysis; and to sustain paths of game-changing innovative ideas. However, in the form of a public publication, the content had to be inspirational and easy to assimilate by non-specialized publics in the country. Another challenge was having a complete panorama of the local and global trends not only to speculate about but to forecast the future in a prospective exercise based on the following question: Which problems and innovative solutions could be derived from the global to the local trends analysis and vice versa? To answer this question, we detected and studied emerging and disruptive technological innovation news develop globally. Also, we interviewed experts, conducted workshops with stakeholders from the public sector, and we analyzed 81 local experiences (55 in 2016 and 26 in 2017) of public digital innovation projects in Colombia.

It was important to define the public sector at the beginning of the project; governance concerns not only governmental entities. The complete ecosystem, including the government, citizens, the private sector, the academy, independent entrepreneurs, and non-profit organizations were called to speculate on the future of governance. Hence, data on the future of governance were collected from diverse fields and sectors. In editorial pieces, we articulated how these cases could be extrapolated to different scenarios to solve problems in the transparency of fiscal duties, notary efficiency, sustainability in health, education and agriculture, citizenship participation, processes during post-conflict and peace, and others.

FINDINGS, DEVELOPMENT, ANALYSIS, AND EVIDENCE

During the initial process of research and design, we gained some insights into the relationships among governance, the fourth industrial revolution, and the actions taken to envisage a future, which became the core values of the final editorial products.

Getting ready for the future.

The gap between avant-garde technologies and organizations exists because technological sciences evolve faster than human systems do in adapting to change (9). One of the tools of research used to gain this insight was to implement a software of technological surveillance, to index contents in the Internet from all over and detect the main issues of conversation around technology, artificial intelligence applied in governance and disruptive innovation. After analyzing conversation peaks, verifying sources and authors, and cross the different points of view around the subject, we understood that a future of technological disruption can be better approached when it is accompanied by human talent development (10).

This insight can be related to some other topics revealed during the research: The technological progress, and so its future projections, can be fueled by public policies that allow that innovation in governance finds an optimal economic, social and cultural context to grow up; but at the same time, the advances of technology for governance in the ecosystem is unstoppable by particular orientation of the leaders towards public budget cuts in science, technologies and innovation as it is the case of the actual international trend of conservative governments. Being empowered to forecast and take actions for the future, governance in the ecosystem cannot be conditioned by the political bias of a government. On the other hand, for real solutions of governance and technology within the vision of an industrial revolution in a near future, the work should not only encompass creativity and technology development, but also enhancing the human capabilities, soft skills and knowledge in order to prevent unfortunate consequences in the quality of life due the impacts of technological development.

Advances in technology should run parallel to social development. It is key that technological and social developments run in conjunction. Technological changes should always go hand in hand with education in social sciences and other human fields, not only to accept and embrace transformation but also to give background knowledge to experiment and learn new ways and tools to work, interact and create. Governance of the future must focus on experiments with technological innovations for public solutions such as Artificial Intelligence, Robotics, blockchain, Quantum Computing or Computer Vision, but running simultaneously guidelines to strengthen capabilities to foresee the positive and negative impact of technology in human life.

Other articles suggest that the problem lies in the fact that technologies advance faster than business structures. The creativity and experimentation in technology is developed more accelerated than the new ways of managing human talent in order

to have a strategic vision to incorporate value to design proposals and solutions. Once again in these articles of opinion, emphasis is placed on the importance of accompanying the implementation of disruptive technologies with processes that integrate them with the real needs of people (11).

On following that insight, and within our goal to propose an ideal future in governance through a design solution, we created an editorial piece to visualize the gap between global trends and local trends. Global trends, understanding the emerging trends in other fields different than governance, and in the international context. And local trends, meaning the governance sector in the Colombian context. We aimed to make evident the gap between the possibilities of high-tech solutions and the slowness of adaptation in the organizations of the ecosystem. We focused on giving guidelines about how take advantage of opportunities underlying technology advances. The proposal took the form of a report of research and analysis encompassing more than 55 experiences of digital public innovation, where participants on the ExcelGel Awards 2015 for the best digital innovations in governance in the country (12). After a work of diagnosis, we design some graphics that displayed visually how the local trends are lagging behind in comparison with the global trends. We studied opportunities of innovation regarding technological trends in other fields that could be adapted to governance to cover the lag and at the same time, to highlight the local initiatives that are truly bringing close the future of governance.

The goal of this solution was to evidence the need to relate the inclusion of technology and digital solutions not as the final objective but more as enablers of solutions with a human dimension. Also, these editorial pieces aimed at inspiring public digital innovations towards the future for next ExcelGel Awards, revealing opportunities of avant-garde governance.

Figure 2. The wave of the background is the state of innovation of the trends detected on the whole of participants of Excel Gel Prices 2015. The columns are the number of cases presented in every trend. Image by Centro de Innovación Pública Digital.

¿The future of governance for whom?

It exists a profound gap between the avant-garde technology and the precariousness of social and organizational problems in a country like Colombia. At the beginning of the creative process we faced a paradoxical issue: we wanted the community of the digital governance ecosystem to get closer to the possible futures of technology for governance, but at the same time it was essential to sensitize the wider community about the genuine transformational value underlying new technologies as a solution to common problems, including those in areas of poverty and underdevelopment. The path was to understand that one of the main filters needed to analyze the emerging fourth industrial revolution advances - and speculate and forecast possible futures of governance - should be thinking that the technologies are not solutions by themselves. The possible future is not technology *per se*. The future is in the positive changes in which they can converge as a facilitator. This idea leads us to believe that if we want to fill the gap between the past and the future in governance, the first step is to get to know the local context and its problems, and start to involve those innovative ideas of possible futures progressively. The present problems will guide how to use the futuristic tools in order to be prepared for and anticipated for the future. If we miss sight of reality in the exercise of speculating about the future of governance, the consequences could entail frustration, alienation from the possibility to be ready for the future, misunderstanding the ideas and contents, or just arousing the feeling that those emerging technologies are so far away from reality that they are only an exercise of amusing fictions.

Having that challenge in mind, we proposed some different editorial products:

The first one is a series of three trend reports with concepts in which we explore emerging technologies for lifestyle, market and design solutions, explaining the opportunities that would arise if these concepts were applied in governance (13) (14) (15). The second was a brief manual to read and apply trend reports (16). This consisted on a step-by-step instructions guide and a canvas to be able to define a problem in the public domain, to read the reports filtering and analyzing the relevant information regarding the problem and generating solution ideas. This manual was tested in lived experiences of creativity and innovation in communities in the country to verify its validity, that is, its effectiveness in the exercise of creatively speculating about the future of governance and proposing possible projects that would make that ideal future begin to approach to present.

The third editorial product was a manual of good practices in digital public innovation (17). The manual was created from the analysis of the innovation experiences postulated for the Indigo

2016 Awards. About 26 documented projects with a successful impact in different regions of the country were analyzed. Some of them were cases working with vulnerable populations or in remote places. In this process it was possible to identify the stages of development of innovation projects with these characteristics (avant-garde technology applied to problems linked to precariousness in the territory), elements that defined the viability of the proposals, common mistakes to be avoided, forms of solution that emerged during the process and ways to overcome obstacles. Analyzing the documentation of the projects we found patterns about how to make a proposal scalable to grow and expand. The purpose of the manual of good practices in digital public innovation was to learn from lived experiences already carried out, the very best way to designed proposals of solution able to lessen the gap between the present problems and the solutions of the future.

RESULTS

Throughout three years of work developing knowledge and inspirational inputs in technological governance for the Ministry, we managed to implement diverse research tools and we had the support of a team of experts in matters of government, the public sphere and digital and technological innovation. The continuity of this work allowed us to consolidate a futuristic vision of governance, conferring projection and forecasts to both the solutions and the problems in fields as education, transparency, fiscal duties, health, democratic participation, peace, natural resources management, agro-industrial management, smart cities, social wellness, security, poverty and millennium development goals. The technologies were seen under the filter of their potential to solve issues of quality of life, collective welfare, equity, and country building. The end result was a very unique set of documents in which we speculated on topics such as Virtual Reality, digital experiences and digital proposals for non-digital audiences, Machine Learning, robotics, 3D printing, the Internet of Things, wearable tech, Quantum Computing, blockchain or digital twins. Information of that quality and kind in Spanish, available to the public and free of charge is quite rare. The final goal was also to inspire the stakeholders of the ecosystem to be not only buyers of governance solutions. The stakeholders of Colombia should be designers and creators of technological public solutions from the very first stages.

CONCLUSION

Currently, the debate continues on what will be the fourth industrial revolution in all human spheres, including public affairs. Speculations on what will happen are in full apogee taking arguments for and against technology. They have begun to emerge counter-trends to the expectation of balancing the acceleration of technology with a return to the artisan and peer-to-peer interchange and solutions. After these years of research, we have the certainty that the transversal theme in all the implications of applied and enhanced Artificial Intelligence is ethics. When speculating about the risks of the future of governance in the fourth industrial revolution, becomes evident some problems as politics that are not only predictive but also prescriptive, issues of financial and information transparency and transactions, or the replacement of human labor with intelligent robots. This is why we conclude that the governance of the future will be about the cultural openness and appropriation of technologies, and also about creating legislative bases with strong ethical content, that can allow these technological advances to work as solutions rather than contributing to worsening current problems.

This type of public exercise directed to imagining and getting in touch with the future responds to the call to foster greater interest and awareness in technology in the larger population. In order for this ethical base and projection of technology to exist in favor of people, actors of all professions and backgrounds should begin to propose their own vision of the future including the innovation actions of the present.

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RE-CONTEXTUALISING THE DESIGN PROCESS IN FASHION EDUCATION

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Identity presentation has become paramount to self-preservation in a culture obsessed with the image, and this is ordinarily achieved through overt material consumption, a pre-eminent threat to a sustainable future. This has meant a continuous effusion of unwanted fibre, cloth, colour, and patterns, making the global fashion industry one of the most polluting industries in the world. Edelkoort, in 'Anti-Fashion, a manifesto for the next decade', throws light not only on practices in garment making but also calls on design schools to change the way they teach their students. Most design schools, she claims, teach to create individual luxury runway stars, instead of engaging students with design practices that are sustainable. Learning to stitch, cut, fit and re-fit every day, mean patterns half done, gone wrong, mistaken stitches, snips and stains. When the day is over, all these mistakes are swept up and taken away. And tomorrow is a new day to learn some more. But what educators may not realize is that they are subconsciously endorsing wastefulness by demanding perfection.

India is a great dichotomy of inherent sustainable traditions of upcycling and reusing, that are deeply rooted in our culture, on the one hand, and a global sourcing hub on the other. This makes us the ideal space to challenge students' perceptions of what fashion design is and their role as future fashion designers. Through an action research methodology, the paper documents the experiment of re-contextualizing the design process through 'unspecified outcome' driven learning that places the process above the product and attempts to create a shift in ideology from 'me' to 'we'. This experiment was conducted with Fashion Design students of year 1, before they were exposed to traditional methods of design process and garment making.

Keywords: Fashion Education, Design Process, Sustainability, Circular Design, Design Education

INTRODUCTION

Author Henry Petroski put it eloquently when he wrote, 'Successful design is not the achievement of perfection but the minimization and accommodation of imperfection'. Designers across the world today are exploring the various avenues of sustainable design and production from a social, political and ethical stand point in an attempt to re-create value from waste. This may be the cumulative effect of the now evident ills of hyper consumption, tragedies like the Rana plaza disaster, films like 'The True Cost', or socially driven initiatives like 'who made my clothes' and 'the makers movement'. Lidewij Edelkoort, founder of the trend forecasting company, Trendunion, has been a harsh critic of the fashion and clothing industry. In her article 'Fashion is Dead, Long Live Clothing' she proclaims '...there is the making of [fashion], which is done in countries where people are killed for making our garments' (Raphael, 2015).

Interestingly enough, these tragedies are generally concentrated in developing economies like India and Bangladesh where a high density of population is putting immense pressure on limited resources and is forcing people to work for and live on less than a minimum wage. Exploitation is rampant and corruption is the expectation. And yet, one looks to the west to provide solutions to these problems. Edelkroot, in 'Anti-Fashion, a manifesto for the next decade', throws light not only on practices in trade but also calls on design schools to change the way they teach their students. Most design schools, she claims, teach to create individual luxury runway stars, instead of engaging students with design practices that are sustainable (Edelkroot, 2014). This sparked the idea of finding ways to educate using the continuous effusion of waste generated during the process of learning fashion design and fashion making.

India is a great dichotomy of inherent sustainable traditions of upcycling and reusing, that are deeply rooted in our culture, on the one hand, and a global sourcing hub on the other. However, from a nationally renowned Design School, Pearl Academy with 500 plus fashion graduates each year, only a handful take up or experiment with existing and new sustainable approaches to design and manufacturing. It is therefore paramount to consider the difference they could make to the indigenous fashion industry if even half of the students did. This makes Pearl the ideal space to challenge students' perceptions of what fashion design is and their role as future fashion designers (Sala, 2016).

The thought led to examining the under graduate fashion design curriculum (Pearl Academy, 2019) as a whole to see what knowledge and skills the graduates were currently leaving with. It was found that students after 4 years of study accrued the following attributes,

- Extensive knowledge of the discipline
- Confident oral as well as written expression and communication
- Skilled in visualization
- Proficient in contemporary technology and software

However, an increasing number of innovators and entrepreneurs today possess a set of attributes that are above and beyond extensive knowledge of the discipline. These do not necessarily present as assessable per-planned, current curricular outcomes. From a list cross referenced across desirable graduate profiles and the changing economic and social climate, the following attributes were chosen, in addition to discipline specific skills, that may be useful if inculcated in current and future graduates.

- Skilled in analysis and problem-solving
- Capable of critical thought, rational enquiry and self-directed learning
- Able to work collaboratively
- Open and intellectually curious

A large number of employers and businesses are also seeking the above-mentioned graduate attributes. Examining the curriculum vis a vis, changing graduate profiles and expected outcomes, the attempt was to create and test a module that, through application and experimentation could broaden student approach to the design process and possibly imbibe the attributes mentioned above. The research hopes to allow for the students, our future designers, to think outside of the regimented nature of assembly lines and mass-produced retail uniformity. The imperfections and non-immediacy provided by this process where the outcome i.e. 'the product', is undefined and unplanned, can lead to change agile design articulation.

METHODOLOGY

Interactive and experiential learning strategies were employed (Beard & Wilson, 2013:26-32), through an action research methodology, that compelled students to look within and question their own beliefs through reflection and action. Action research is a process of systematic inquiry that aims to improve social paradigms affecting the lives of a wider populous (Stringer, 2008). Action research is a befitting option for academicians as researchers, and stakeholders in the teaching and learning environment, to consider (Mills, 2011). It provides practitioners with new knowledge and understanding about how to improve educational practices or resolve significant problems in the classroom specifically and academic institutions generally (Mills,
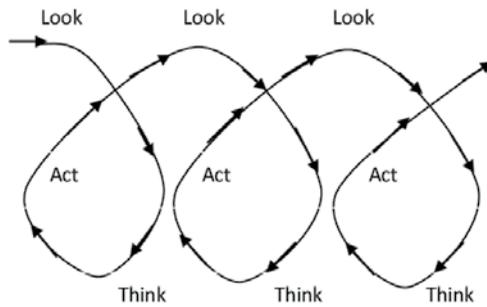
2011; Stringer, 2008). Action research uses a systematic process (Figure 1: Action Research Helix (Stringer, 2008)) (Dinkelman, 1997:250-274; McNiff, Lomax, & Whitehead, 1996), is collaborative and participatory in nature (Hotler & Frabutt, 2012: 253-269), and offers multiple opportunities for those working within the teaching profession (Johnson, 2012).

This particular action-based research is aimed at encouraging and observing students creating garments from a collection of waste. The technique of waste manipulation is eventually intended at modifying the curricular strand of 'form generation' in the current fashion design curriculum. Through this intervention the hope is to open a dialogue about transformative process-based learning that revisits traditional fashion education, and formulate methods that might enable fashion educators and fashion students to become agents of change within the learning space (Sala, 2016).

CREATING THE MODULE

A gap was identified in the form of un-assessed but desirable outcomes as mentioned above and this became the key driver to think of how these outcomes could be included and assessed (Stringer, 2008). When trying to redesign the curricular strand of 'form generation', the question asked was, what should the students be able to do after they complete the module? Also, on a more macro level, how prepared are fashion designers to work with industry beyond aesthetics towards transformative change?

The idea was to redesign the module in a way where the students understood 'form generation' but additionally the learning outcomes were process oriented, in alignment with the teaching and learning activities as well as the assessment.

After some iteration and discussion, the following broad outcomes were finalized.

1. Redefining the design process where waste and not a sketch or idea could be the starting point.

2. Stimulation to subjectively imagine a 'conscious and ethical practice' led future in fashion.
3. Understanding and appreciating dress / garment beyond set standards of garment category, sizes, gender etc.

Using Bloom's Model of cognitive complexity (Anderson & Krathwohl, 2001), the following outcomes were formulated that could possibly justify our intent.

1. **Experiment** with found material using basic taught techniques of construction. *Applying*
2. **Inspect** the relationship between fabric and form. *Analysing*
3. **Assess** the viability of the form vis a vis the body. *Evaluating* (Anderson & Krathwohl, 2001).

The intent with the above higher order outcomes was to focus on the process as opposed to the final product. This is most important towards individual subjectivity in design. Specific product-based outcomes tend to have students focus on the end and tutors more likely to objectively mark them based heavily on the quality of the said product over the depth and quality of the process (Gjerde, Padgett, & Skinner, 2017: 73-82). Here the final outcome was not defined as a product but as a reflection on individual processes. Now using the basics of constructive alignment (Biggs & Tang, 2007: 54-62), teaching and learning activities were created with the intent of achieving the above outcomes.

Kolbs model of experiential learning sees learning as a set of circumferential cycles where the learning activity is constantly evolving and deepening the understanding. Concrete experience leads to reflective observation which leads to abstract conceptualization. Finally, active experimentation makes the learning integral to the students' psyche (Russo, 2017). Keeping this in mind, the sessions were planned in three parts; lecture, group discussion and then practice based experiential learning. This allowed for students to be fully engaged until the end of the class and possibly beyond. To elaborate, this methodology is also called the 'Interactive Lecture Method', and involves the teacher beginning a discussion with an 'engagement trigger' like referencing previous knowledge or experiences. This aids in capturing and maintaining student attention. Following this the teacher integrates a task that engages students in applying and contextualizing what they have learned through theory, action and reflection, (Mcdonald & Teed, 2018) allowing students to practice newly acquired beliefs in order to change their perspective (Howie & Bagnall, 2013).

IDENTIFYING THE SAMPLE GROUP

A small group of 10, year one students from the undergraduate fashion design program, Pearl Academy, Delhi, were selected based on their interest and availability for extra sessions as the module is currently being tested outside the regular curriculum. The students were individually interviewed to establish the level of knowledge and skill they had previously acquired. These students had some basic knowledge of garment types and has some basic construction skill, which is that they had worked on controlling the sewing machine and created a portfolio of seam finishes. They believed sustainability was important but when quizzed further, they didn't know of any techniques or processes that were sustainable. Each of the 10 students interviewed described their current design process as some version of Ideate, Research, Conceptualize, Explore, and Make. The aspiration was for the process to be reorganized to Explore, Make, Contextualize. Only for this particular module they would not have a per-researched and pre-ideated sketch. They would not have a concept to kick off the process. They were to work without guidelines and just experiment for what was possible. Taking away the right and wrong could help students subjectively examine and internalize the process. An attitude of experimentation could also reverse the fear to try new things (Beard & Wilson, 2013:19).

DELIVERING THE MODULE

The group lecture started with a general discussion where we tried to probe the students on their understanding of terms like sustainable, organic, slow fashion, zero waste and ethical fashion they responded in the affirmative and showed a reasonable degree of general knowledge of the terms. However, they also mentioned that it never occurred to them to practice sustainable ideologies in their lives beyond their course prescribed outcomes.

The discussion moved to us asking the student group if they had any idea who made their clothes or how many times they wore each garment they owned? Their answers were not surprising but the questions were meant to provoke thought and that is what their responses showed. They bought their clothes because they were trendy and within their budget. They had given no thought to how many times they did or might wear something. Mostly when first bought, they wore the piece with excitement and then didn't really think about that piece. When asked about where they thought their clothes went after they disposed of them, the group indulged in a lot of conjecture but didn't really think of how the making or disposal of 'their' clothes may affect the environment or anyone around them. Here it is important to note the responses

the students had for disposal or end of use. India as a society has inherently upcycled, reused, deconstructed, reconstructed, repaired, handed down and traded garments that have lived out their usefulness and the students were aware of these cultural practices through their parents and grandparents.

They were now shown a presentation that highlighted the need to upcycle, recycle and reuse. Through a class discussion, it was evident that the presentation had prompted them to think about not wasting resources and how waste in the fashion industry was affecting the environment. Following the discussion, they were shown 'The True Cost', a documentary showcasing the ills of the global garment industry. They looked visibly shaken after the documentary and started discussing their role as future designers and what they could do to reduce their contribution to the waste or find design solutions that didn't affect the environment adversely. Real education is about lighting a spark (Biesta, 2016:1) and this was the spark that set the context for the activity to follow. They then looked at a slide outlining the generic value chain of a garment and discussed how they could possibly make better choices at each stage i.e. design, production, distribution, use, and disposal. They were now moving away from their own belief on why they consume to a larger belief of conservation and how they can contribute.

The students were now asked to articulate their design process again, if they were to use the waste collected to make garments. They all agreed that the process would begin with the consideration of the material they picked up and not a sketch they had drawn. When asked if they might feel limited by the textile waste as it is a mix of different materials/dimensions/colors etc. the students responded that that is possibly the challenge and the best part of the exercise, and will give them immense scope for exploring, so they may devise outcomes that are individualistic and exciting.

The brief to students was to create anything they like from the waste textile pieces. At first it confused them but after they were exposed to certain forms and shapes (Figure 3) that could be worn as fashion garments they became more open to explore and accepting towards unspecified outcomes. The idea of making something or creating is possibly most exciting and rewarding to designers and design students alike. The students were guided purely by their sense of exploration and motivation to make something that would be unique in form. This in a sense reflected a capacity for critical thought, rational enquiry and self-directed learning. The fact that they were not trained in technical garment making did not stop them from exploring (Figure 4). Therefore the outcomes were far less the 'finished' end products of their work and much more examples of thinking-in-action (Figure 5; Figure 7; Figure 8) (Beard & Wilson, 2013).

They picked up and sewed waste pieces (collected earlier from the garment construction labs) together to create yardage which they then manipulated into form. The garment was later dyed to release it of its many meanings and became one entity. The idea was not to expect outcomes but to give them the space to experiment outside the defined boundaries of the rest of the curriculum. Students were more open to explore forms as they didn't know the standard parameters of pattern making and garment making which may have stopped them from exploring some of their ideas. As discussed by Beard & Wilson, interpretation begins where perception ends (Beard & Wilson, 2013:32). This was done with Year One specifically, so they may carry the spirit along as they progressed through the course. It was important, at this early stage, to make them aware of the industry and its issues, so they may formulate their problem statements now, and possibly present as future thought leaders in the space.

One of the students who was not adept at handling the sewing machine started exploring elimination of seams with chosen pieces of fabric from the box. This exhibited an attitude of analysis and problem-solving. They were shedding norms and standards of garments making which induced a series of explorations that were, as expressed by one technical tutor, far more cutting edge, interesting and experimental than previously witnessed from Year One students. After the class students understood the importance of sustainability as an approach to garment making and were highly motivated to explore the concepts of recycle, reuse and circular design further. What was especially interesting is that they realized that each of them had undergone a design process which was very personal to them rather what was taught in classes. It left them more open and intellectually curious. One example was the of a student who started with joining the pieces and then exploring form and finally deciding possible themes for the same. This really reaffirmed the desired methodology of Explore, Make and Contextualize.

Another example was of a student who started the exploration by placing individual pieces of oddly shaped fabric on a dummy,

Figure 4: Form Generation : Student exploration

Figure 5: Form Generation: Student exploration

experimenting with possible permutations and combinations and then joined the pieces together to create a garment. Once the form was achieved she went on to contextualize a theme. She also mentioned that her research and ideation was form centric rather than theme centric. And no student drew any designs on paper. These students had engaged with most of the educational resources we used, earlier, but observed that they had only now made the connections between these ideas and their personal contribution as fashion design students towards sustainable practices. And now, owing to this studio[1] based methodology, they

1   'In studio based learning (SBL) the expectation is for students to iteratively generate and reimagine design solutions, communicate effectively, and collaborate with others. This establishes the studio as a dynamic place where students learn to experiment on their own, to teach and to use all studio members as resources in that search. Instructors support students as they grapple with complexity of design problem-solving through pedagogical practices that include assignments, associated meta-discussions, explicit prompts, reminders, modelling, and coaching (Cennamo et all 2011)'

had experienced theory and application of these concepts. Using form generation, with textile waste, they could relate to and recall the resources immediately through theories applied and activities practiced.

CONCLUSION

The fashion and clothing industry is one of the biggest employers globally today. With an ever burgeoning population, globally, and in developing countries specifically, the industry is ever expanding. This research is an attempt at an intervention right at the start of a student's journey on how to make an increasingly productive, less contaminating, progressively inclusive industry. As Dominique Hes and Andreanne Doyon (2016) note in their article *Thriving, not just surviving*, 'the key is to change our attitude to development and growth, to change the story of what success looks like and the model by which we arrange our communities. This requires a shift in thinking from taking away from our world, community, economy and environment to giving to it (Hes & Doyon, 2016). These changes can, not only make more income for businesses but they can truly benefit the lives of millions of individuals.

This module aims to stimulate the student journey from me to we using design as a critical and social tool. Pearl Academy, provides spaces in the curriculum called 'open labs' and 'immersions' starting from foundation which is Year Zero, right through to Year Three. The intention is to use these spaces in order to engage larger groups of students and refine the module further and eventually integrate it into all design and production related courses including product design, interior architecture and jewelry design.
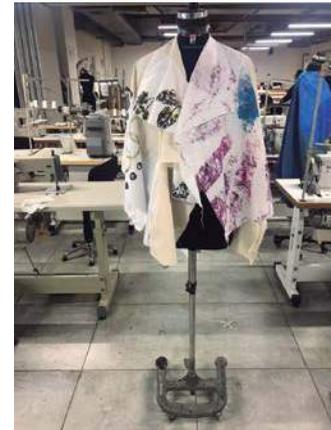
This particular student group was a controlled one and met our expectations exceptionally. They made decisions for the garments based on how they wanted the form to function and not how it should function (Figure 10). This made them more accepting of and open to possibilities in anything they might venture to do in the future. The process of design itself became more personal and self-directed (Figure 11).

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NATIONAL MEMORY AND DESIGN OPPORTUNITIES: PATTERN DESIGN OF TRADITIONAL CHINESE FESTIVAL COSTUMES

Traditional Chinese festival costumes, as the specific representation of national memory and emotion to traditional festivals, have a long history of thousands of years. However, under the major trend of globalization, the development of national culture has been greatly restricted, let alone traditional Chinese festival costumes.

Therefore, this paper aims to discuss the national memory and explore the design opportunities of traditional Chinese festival costume culture. Through examining patterns adopted in festival costumes, analyzing the cultural implications, the system of traditional Chinese festival costumes can be established. Then, this paper devotes to figuring out the re-adaption of these traditional elements in modern design and developing of aesthetics by redesigning and recreating of these patterns, which will stimulate creative and interesting design, to improve and coordinate the current contradiction between traditional and modern costume pattern design. In this way, the design opportunities brought by traditional culture will embrace its dynamic development in modern times.

Keywords: pattern design, traditional Chinese festival costumes, interesting, folk culture, storytelling

INTRODUCTION

The traditional Chinese festival culture system, as a significant part of Chinese long history and culture, was based on a diachronic frame of ancient Chinese people's understanding to live with nature. This system was formed in Han-Wei Period (202 BC- 265AD), which refers to the solar terms (24 solar terms a year) and cultural festivals related to offering sacrifices or mythologies. The cultural activities in prevailing traditional festivals were diverse in forms, and entertaining to the public, which composed a peculiar social custom picture.

Traditional Chinese festival costumes were the major prop in celebrations and sacrifice, and reflected ancient people's philosophy to comply with nature and time. People dressed differently, by altering colors and patterns in different contexts, according to four seasons, as this change could demonstrate festival culture in a visible physical symbol, which constructs a dynamic, harmonious, and orderly costume culture, and elaborates the development of social civilization in different times.

Traditional festival costume patterns not only response to the change of flowers, birds and insects in four seasons, but also portray festival celebrations, and narrate mythologies, to compose peculiar patterns. These patterns were derived from group and social activities, which revealed the interpersonal interactions, showed people's awareness and cultural formation, and gained happiness and cultural recognition in the process of socialization. During this process, the profound cultural connotations, including emotions, values, aesthetics and spiritual beliefs which presented Chinese people's romantic feeling, cultural imaginations and active participation in social development, were uncovered. All these illustrated above are of high academic and aesthetical values. Therefore, this paper takes traditional Chinese festival costume patterns as the cutting point, and focus on the representative patterns, to interpret the existed cultural connotations, and deconstruct or regroup the conceived emotions deep inside national culture, by integrating design theory, costume culture, cultural anthropology, and folklore together. As these patterns possessed different themes, by visualizing the cultural connotations and varying the mediums of national costumes, this study helps us understand national costumes better, and motivate the development of national culture, which can meanwhile provide protection to the transmission and protection for national factors in modern pattern design.

PATTERNS DESIGN OF TRADITIONAL FESTIVE COSTUMES

As illustrated above, costume patterns were alternative to different seasons, and the analysis of patterns can be discussed from three approaches: examination, extraction, and interpretation.

Examination

The examination of traditional festival costumes are based on their typical characteristics, so that it can enhance the understanding of the intrinsic factors of the formation and development regulations of this costume culture. Through field investigating in different costume museums in China, the information of representative festival costumes and accessories can be collected. Then, this research manages to relate to historical background, in order to ensure the accuracy and scientificity of the further categorizations. This examination focuses on many influential elements, such as folk culture, natural plants, religious activities, sacrifice rituals, temple fairs and so on.

Extraction

The procedures of pattern extraction can be discussed from three aspects: composition, idea modelization, and colors. The forms of pattern extraction are illustrated with more details as follows (Figure1):

a. Composition
   As discussed above, patterns changed correspondingly to the change of times, but there were more than one pattern for each festival. Among these patterns, multiple floras and faunas, as well as festive scenes, gradually became the convention because they carried the seasonal features and can be evolved into various compound modes.

Figure 1. Extraction of traditional Patterns
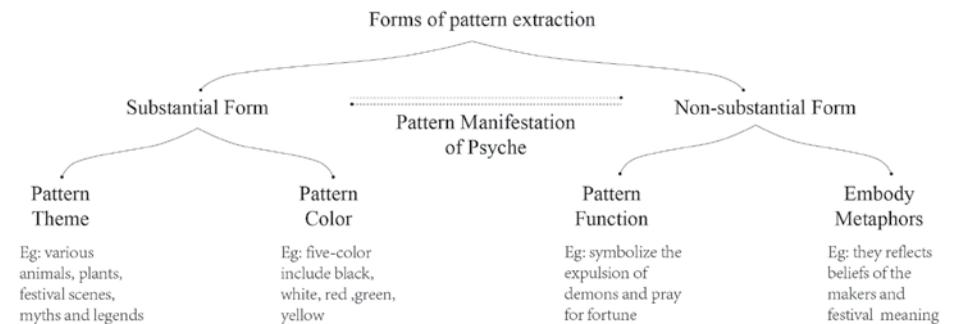
b. Idea modelization

Idea modelization is a technique of expression of traditional Chinese festival patterns, which does not emphasis on the scientific attributes of the objects, either biologically or physically, not to mention perspective science or anatomy. Instead, it relies on the composers to modelize and visualize their emotions. Composers can integrate different techniques of spatial processing and the use of colors together, to show the typical Chinese visionary art.

c. Color

The long-existed agriculture civilization in China had great influence on people's aesthetic concepts, and costume colors hereby implied the intuitive imagination for different seasons or festivals. For instance, in the Dragon Boat Festival (May 5th in lunar calendar every year), children wore colored lines of black, white, red, green and yellow. These five colors not only symbolize five directions-- east, west, south, north and middle respectively, but also indicate the five elements in Yin and Yang-- golden, wood, water, fire and earth, by which means, children were able to expel evil spirits and pray for fortunes. Another typical example is that, people wore black to reminisce their ancestors in Tomb-Sweeping Day (April 5 every year).

The Interpretations of Festival Costume Patterns

As the old saying goes, "patterns must be meaningful and their implication must be auspicious", traditional Chinese costume patterns were designed to embody the living philosophy of ancient Chinese: worshiping agriculture and reproduction, and the unity of Yin and Yang. Through these patterns, people expressed their hope for a better life and desire to exorcise the evil (table 1).

Figure 2. Spring Festival Gourd Patterned Badge
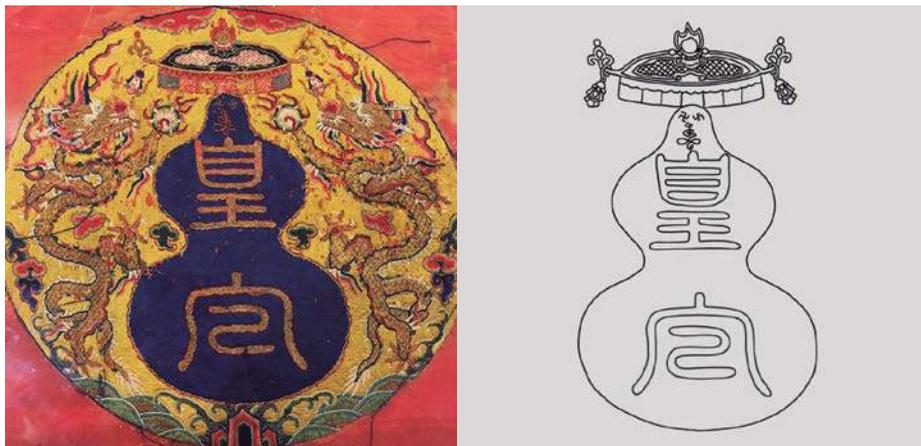
FESTIVAL	NAMES	PATTERNS
Spring Festival	The gourd patterns (Figure 2.)	Gourd vines, pronounced as "wan" in Chinese, are the homophone for the word "ten thousand". Gourds have multiple seeds, implying the wish for "many offspring". The Chinese pronunciation of gourd- "hulu", is also homophonic with tutelary deity and good fortune.
Lantern Festival	The lantern patterns Tiger head patterns (Figure 3.)	The lantern patterns were designed to echo the festival ornaments including the lanterns hanging around the street. On this special occasion, grandmothers were supposed to bring tiger-head shoes and hats, which indicated strong, to visit their grandchildren.
Dragon Boat Festival	The five poisonous animals and insects patterns (Figure 4.)	The five poisons-creature pattern includes five venomous creatures----scorpions, centipedes, vipers, toads, and house lizards, which had the function of "combating poison with poison", so they are usually prepared for children to wear to exorcise evil diseases and protect their health.
The Double Seventh Festival	The patterns of magpies The patterns of the Weaving Maid and Cowherd (Figure 5.) The spider patterns	Magpie patterns implied the coming of spring. The married couple Weaving Maid and Cowherd met once a year on the bridge of magpies, so these patterns adopted stone bridges and constellations to indicate their reunion. The spider patterns were very similar to the Chinese character- "囍"(double happiness). The patterns of spiders sliding down from cobweb symbolized "the descending of fortune from the Heaven".
Mid-Autumn Festival	The jade hare patterns (Figure 6.).	These patterns originated from the myth of Chang'e (The Goddess of Moon), and jade hare was Chang'e's pet. Therefore, in Chinese tradition, jade hare was considered to be the symbol of the moon.
Double Ninth Festival	Chrysanthemum patterns (Figure 7.).	Chrysanthemum has been endowed with the symbolic meaning of auspiciousness and longevity. By using these patterns, people prayed for pray for longevity.
Winter Solstice Festival	Yangsheng patterns (Figure 8.).	Yangsheng patterns usually showed a picture of a boy wearing a fox hat (tartar hat), riding a sheep, and carrying plum branches on his shoulders, while a birdcage was hung on that branches, which stood for "overjoyed".

Table 1. Representative festival costume patterns

FESTIVAL PATTERN DESIGN

Traditional Chinese costume patterns conveyed Chinese national culture and conventions, and from the perspective of anthropology can be viewed as the visible embodiments of the cultural systems and meanings. As a traditional art form, these traditional costume patterns had abundant content, yet had obvious limitations, which resulted in the consequence that these patterns were gradually faded away from daily lives, not to mention the conceived spiritual and cultural connotations. For this consideration, in order to search for cultural recognition, this paper analyzes the design method of these patterns and then constructs a new design language.

The Design Method of Festival Costume Patterns: Recreation of the Story

Pattern Re-design Dimension

According to different practicing, the design methods of traditional Chinese festival costume patterns can be generalized into four different types.

a. Replication elements
    The design of elemental costumes is to extract useful elements from traditional festival patterns and then directly apply onto the surface of the garment. This is the most common and direct method, by which means, people can easily identify the festival factors (Figure 9.).

b. Breaking the mold of predetermined conformism
In fact, when deconstructing traditional festival patterns, we can obtain a variety of constitution forms, which displayed as programmed symmetrical structures either upright or cornered. Usually these arrangements obeyed the rules of virtual-real synthesis or subordinate construction. However, at present, these forms are no longer suitable for modern design. Under these circumstances, deconstructing these old-fashioned patterns by rearranging and regrouping, the new design method could manage to break the mold of predetermined conformism.

c. Simplifying the complexity
The traditional festival costume patterns emphasize on decoration, but as they don't conform to modern aesthetic expression, they seem to be too complicated for modern design. Hence, in order to gain rich visually experiences via the simplest approaches, the traditional elements need to be simplified and extracted. For instance, when dealing with the flora and fauna patterns, the over-designed decorations should be removed. By extracting the sketches or generalizing these patterns with a few graphics, we can obtain concise modern visual effect.

d. Spiritual rebuilding
Clive Bell, a British scholar once noted that, when an artist's mind is occupied by emotions, and he/she happens to have the ability to interpret these feelings, he/she can create great compositions. Spiritual redesign is a deeper level of design, as it intends to deliver composers' emotions, beliefs and spiritual pursuits, which can be seen as their individual interpretation of traditional art.

Story Recreation

Story recreation is the process of recreating the stories conceived in costume patterns, which appears to be a graphic design method based on cultural connotations. In a festival, the composers can be designers, consumers or even children, and they can create new design by telling festive myths via interactive experiences. This design method was resulted from ancient Chinese people's

understandings and expectations for festivals. However, at present, only few Chinese could fully understand the folk culture and myths in traditional festival patterns. Under the modern context, modern festival costumes should combine modern aesthetic and traditional culture together, and serve as the products to communicate emotions and culture with consumers. In this way, the design and creation of patterns then can be appealing to modern Chinese, which can also be beneficial to cultural transmission hereafter.

To sum up, the design methods illustrated above can give guidance to innovative design of traditional patterns, and through designing and developing these patterns from multiple dimensions, people can gradually identify the emotional value of our national culture.

Case Study: Dragon Boat Festival Patterns

Nowadays, as we get satisfaction in material life, the consumer demand of emotion and spiritual needs has naturally become the focus. This paper chooses Dragon Boat festival costume patterns as a case, because this festival is one of the four major traditional festivals, and the first Chinese festival to be selected into the list of the world's intangible cultural heritage.

Background

Dragon Boat festival contains profound cultural connotations. It covers the knowledge of astrology and ancient philosophy, and has established rituals of worshipping dragons and ancestors, warding off evils and praying for fortunes. Moreover, Dragon Boat festival demonstrates Chinese ancient philosophy of the harmony of "heaven, earth and people". However, as there are less and less folk craftsmen, the Dragon Boat festival costumes on the market are no longer exquisite. This situation is due to the fact that this kind of seasonal garments cannot be sold all the year around, so the sellers are not willing to put time and effort in designing. In addition, during the process of transmission, the representative symbols of this festival have been mere formality, people cannot have a complete understanding towards its connotations. As a result, nowadays, most Chinese people's impression to Dragon Boat festival is eating Zongzi (traditional Chinese rice-pudding) and racing dragon boats, while seldom of us know the costume culture. On balance, the problem lies in the fact that the past design was lack of the process of story telling and emotional connection with consumers. Hence, whether the traditional costumes could cater to the needs of the market depends on their continuous innovation, which requires designers to find the way to adapt to the contemporary market.

Redesign of Dragon Boat Festival Costume Patterns

The redesign of Dragon Boat festival costume patterns is to deconstruct, regroup, sketch and silhouette the traditional patterns and then endow them with the enjoyment of stories to manufacture new patterns. However, we must be careful to avoid destroying the cultural elements during the design.

Figure 10 displays the redesigned patterns of five poisonous animals and insects, as well as tigers, in modern interpretations. These patterns are simplified and recreated by personification. The cloth tiger pattern in this figure actually is a redesign of Zhongkui (A celestial being of expelling the evil).
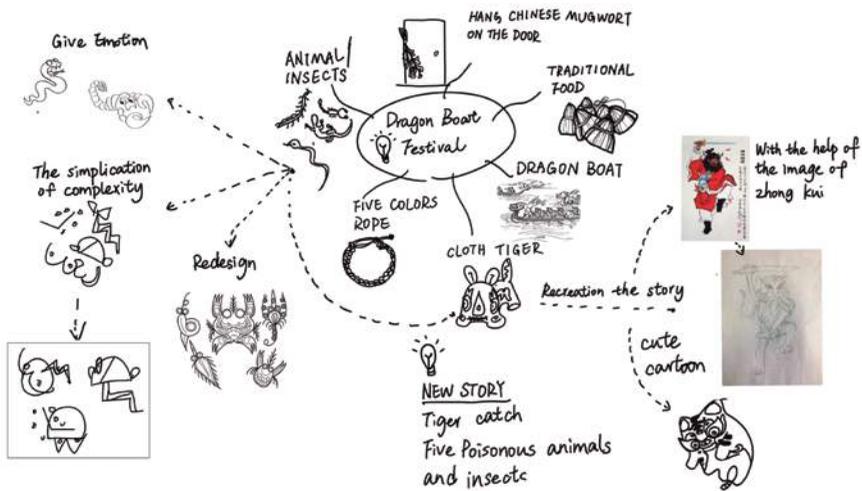

Figure 10. Mind-map Create

In Dragon Boat festival, the colors of costumes are determined as mentioned above, including red, yellow, blue, black and white. These five bold colors together create bright costumes to enhance the festive atmosphere, so in modern design, we can absorb this concept and use some artistic lines to reconstruct these traditional images. After all, to get inspiration and colors from traditional festival can be a fruitful attempt for modernization transformation of festival costumes.

Cultural Design of Dragon Boat Festival Costumes: Interesting Narration

The design method of storytelling is actually meant to look for identity recognition and emotional resonance. The Dragon Boat festival patterns above include the elements of ideology, myths, cultural connotations, which can advocate national culture. Among these, cultural connotations are the most important in Dragon Boat festival costumes, while myths are the most

understandable tool to broadcast didactic values and ideology. With these elements combined together, people can understand each other better and easily communicate to achieve resonance.

The patterns of five poisonous animals and insects, as the direct reflection of Dragon Boat festival code, are the core part for design innovation. The figure 11and figure 12 are examples of new design. As we can observe, the five poisonous animals and insects are chased by a tiger. This ingenious idea is meant to weaken consumers' uneasiness of bugs. Another design in figure 13 is a tiger imitating Zhongkui, who symbolizes justice and exorcism. This design has a distinct contrast between the fleeing five poisonous creatures in figure 11.

Figure 11. Design for Dragon Boat Festival

Figure 12. Design for Dragon Boat Festival

CONCLUSIONS

By examining the images and cultural connotations, we can explore ancient people's pursuit of fortunes and desire to avoid disasters in these patterns, such as hoping kids as strong as tigers, happiness, love, abundant offspring, blessings, and so on. As illustrated above, five colors in Dragon Boat festival is exactly a case to echo Chinese festive culture. This design process reveals our long-existed agriculture civilization and religious worship, as well as the philosophy of unity of heaven and man, under the context of the backward modes of production. Meanwhile, this paper analyzes four redesign methods, including replicating elements, breaking the mold, simplifying of the complexity, and spiritual rebuilding, which can lead to a fresh narrative design method with Chinese characteristics. On this basis, by establishing interaction among designers, consumers and products, and realizing the traditional patterns' representations in contemporary costume design, the modernized design can better adapt to contemporary life. Yet, the design methods mentioned in this paper can be further explored in many other aspects, including consumers' acceptance and feedback, and market evaluation criterion.

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TECHNOLOGIES FOR INTROSPECTION: SPECULATIONS ABOUT THE RELATIONSHIP BETWEEN SUBJECT, PERCEPTION AND TECHNOLOGY

Nowadays we have access to large amounts of information at our fingertips. Technologies and means of communication are capable of extending our bodies and senses in infinite levels and, since these extensions modify the way we experience the world, they change the way we think of ourselves.

In this context of overconsumption of information our sensory body almost always refers to a different place: outside of ourselves. Therefore, we find ourselves in a state of sensory numbness and limited use of our bodies that do not allow a proper self-recognition.

As a result, this project wonders if it's possible to turn these body extensions towards the self, and return to the visceral scale of the body. Can the same technologies that take us away from ourselves help us to get closer to ourselves? Through an explorative process of bodily experimentation this project is able to reach the development of three devices that create a rupture with the normalized —corporal and sensory— experience of everyday life. Each of the devices proposes a critical approach towards our daily interactions with technology and, in turn, proposes new ways of perceiving the world through a digitally mediated body.

Keywords: Human perception, Body Extensions, Body Ornament, Bodies

INTRODUCTION

As subjects we are the result of the environment that surrounds us, namely, our becoming is directly affected by the technological, social, cultural and economic apparatuses with which we relate (Agamben, 2010). Thus, the body and its relationship with its surroundings constructs the subjects' reality, their identity and their correspondence with others. For this project, this relationship is interesting from the daily life point of view. It is in the actions that we carry out and repeat day after day and to which we pay little attention, where the most fundamental part of our existence is built and settled.

Because of this, the question of how to explore the body in day to day life and in the movement of contemporary cities emerges. Nowadays, urban spaces have become places of passive perception and body coding. We move from one place to the next automatically, understanding our body as the vehicle that transports us and not as the place from which we make sense of the world (Foucault, 2010). In short, the body is asleep in the midst of the constant transit of postmodernity.

Specifically, it is on the intersection between body and technology, and their relationship with the day-to-day, where this project is focused. Technology allows us to extend our body infinitely and to connect with different people, places and times, fragmenting our attention and taking it to a distant, foreign location. In other words, it connects us to others but distances us from ourselves. For this reason, the intent of this project is to return to an active and conscious relationship with the body and gaze inward. This is an active experimentation process that seeks to, through design, imagine new technologies that open the doors to a closer and more honest relationship with our body.

THEORETICAL BACKGROUND

What Can a Body Do?

This project arises from a fascination with understanding the body. Ultimately, it is the only thing that accompanies us from birth to death. What is truly interesting, however, is not defining bodies but understanding and exploring their possibilities. In spite of this, getting to know all the possibilities of a body is a titanic, impossible task. No matter how many disciplines have tried to measure and understand it, not one has ever come to know the body accurately enough to explain all of its functions (Spinoza, Kisner and Silverthorne, 2018). Thus, inside this area of uncertainty, a vast space for exploring the bodies we inhabit exists.

The body is certainly similar to an egg, at birth: full of potential but not entirely formed, with infinite possibilities for development (Deleuze and Guattari, 1972). Initially with a myriad of capabilities and possibilities which are diminished as it moves through the social and material world. As a result, the expression of our body is reduced to a limited range of gestures, habits and movements. This project wonders about the infinite possibilities of bodies and how technology comes to determine or assist these possibilities.

Body extensions

As for the relationship between bodies and technology, Marshall Mcluhan's theory, one of the most important media and communication theorists of the twentieth century, proposes technologies as the increase or extension of some of the body's capabilities (1967). In other words, our bodies are prolonged by the technologies to which we have access. Today, with the existence of digital, mobile and always connected means of communication, places, people and times, both real and virtual, are at our fingertips. We are faced with the possibility of fragmenting our sensation and attention to places increasingly further away from our body. In short, more and more "our sensory field comes from and refers to another place" (McCullough, 2013) and it gives the sensation that we are actively seeking to move away from our center, to be away from the here and now. Faced with this reality of extension and abandonment of the body by means of technology, the fundamental question of this project is: *how can we turn these extensions toward the self, return to the visceral aspect of the body and be concerned about ourselves?*

The Body without organs

Thinking about the relationship of bodies with their surroundings and the technologies that surround them, the concept of the body without organs, introduced in Capitalism and Schizophrenia (1972) by Deleuze and Guattari, is relevant. Here, society is understood as a rigid structure, that seeks to control the behavior of subjects, in which the body without organs emerges as the one that rejects the standards of normalization and control by experimenting with itself. As a result, the body without organs is free to perceive the world in a brand new way and awaken all of its

potential to be affected. Another trait of the body without organs is its corporeality beyond the accepted limits and self-discovery for the reconstruction of a free body through the destruction of a normalized one (Deleuze and Guattari, 1972). In short, the body without organs is a state of freedom that we reach when we push the conventional limits imposed by the control of society.

METHODOLOGY

Based on the concepts presented, this project was approached with a mostly empirical methodology: to carry out body experiments that enable self-analysis by breaking away from the normality of the body and the sensory experience. With this purpose, a series of explorations around corporeality, daily life and the senses were carried out. There was also a gradual approach to the technological object and its relation to the body.

Body drifts

Body drifts was an experimentation of corporeality within public space. The aim was to understand how our bodies are limited or normalized. With the goal set on the search of an active sensation of the self, getting rid of the automatic corporeality in day-to-day life and, finally, finding and expanding the limits of the body, the main question that guided this stage of exploration was: *how can an everyday action be explored and questioned within its 'normality' and thus give way to a bodily and sensory analysis of the subject?* Hence, this approach focused on the repetition of

different mundane and everyday actions, as well as on finding the unexplored possibilities of bodies in everyday life.

The main lesson from these explorations was to understand the body as an object of study and, mainly, to understand that a body that feels limited, strange or uncomfortable gives way to a true bodily recognition. It is in strangeness, when we leave behind the limits of what is considered normal and explore the different ways in which our body can act, where it becomes possible to think about and know oneself.

Come to your senses

Come to your senses was an exploration focused around objects and sensation. It inquired into understanding the sensorial body and how it is affected by objects and instruments that mediate experience (Jones, Chavez and MIT List Visual Arts Center, 2016). It also sought to answer whether it was possible to find circularity in perception, that is, to use the senses to self-recognize and study oneself. Here, the creation of objects made it possible to give the sensorial body an inward perspective and to crystallize concepts in tangibilizations that allow a person to sense themselves.

Figure 3. Objects to feel yourself. To speak to oneself, to listen to oneself, to touch oneself and to look at oneself.

One of the most important findings of this series of explorations was the conception of the body as the point of reference from which we make sense of experience. It was possible to understand how experience occurs and gains meaning through the body. On the other hand, the objects used were facilitators of the body's experience and, in the same way, drivers and bridges of sensation. It was through these tools that a circularity of perception was found and the senses were given this inward perspective.

RESULTS

In order to make all the learnings obtained in the experimentation and reflection about the body tangible the purpose was to generate a dialogue around the technologies that fragment our being and move us away from the body on a daily basis. For this reason, questions and possibilities were raised about our relationship with these technological devices in everyday life: *how can the same technology that drives us away bring us closer to ourselves? and, more specifically, can this technology change the way in which we perceive the world and allow self recognition?*

As a proposed response, the aim was to bring the senses to a sensory clumsiness, which enabled new ways of relating to our body and generated a reflection on our relationship with technologies in everyday life. In order to achieve this, 3 devices were created that disorientate and discomfort the body and, as a whole, set forth new ways of perceiving reality from a technologically mediated body. Ultimately, some individuals were invited to use the first functional prototypes of each device in order to obtain feedback about the relationship of the devices with the bodies and the usability of each of these objects.

Figure 4. Devices No. 1, 2 and 3 (from left to right)

Device No. 1 (Object to lower speed)

This device was birthed from an observation of the accelerated rhythms of life that occur in the day-to-day urban life, in which bodies are in constant movement. In spite of this eternal transit, our relationship with the body is understood in terms of its productivity and useful capability (Augé, 2008). Consequently, the stillness or pause of bodies is associated with uselessness, laziness and incompetence. In the same way, information and communication technologies have served to accelerate the rhythms of daily life more and more; they have enabled an immediacy in which the virtual worlds have become something even closer than the physical reality that surrounds us.

In this context emerges the **Object to lower speed**, which limits the rhythm with which you observe reality, and allows the user to see the world from the slowness of the body. This object forces the user to change the automatic rhythm with which they move and to become aware of the speed with which they perceive reality.

Thus, making use of the words glitch or lag: a performance failure in the digital world, the dependence on the immediate availability of technology is evident and leads to an understanding of the world based on fragments that need time to be processed.

For those who used it, the change of rhythm generated discomfort and insecurity in their movements. Then, when they understood the functioning of the device and realized that only in stillness would they be able to see clearly, a struggle began in which the person resisted to move slower and sometimes preferred to lose the visual information of reality. Nonetheless, it was possible for them to find time of contemplation and introspection in the new rhythm imposed by the device.

Device No. 2 (Object to see with your hands)

This device is interested in how bodies are progressively limited to performing the same actions, in the same way and in the same places. However, this does not only happen with bodily movements. Perception is also formed and molded by society, without a doubt, we perceive reality mainly through the sense of sight and, therefore, the other senses are relegated to secondary perception. This is also evident in current technologies, which are almost entirely based on interactions with screens where sight acts as the main bridge of perception.
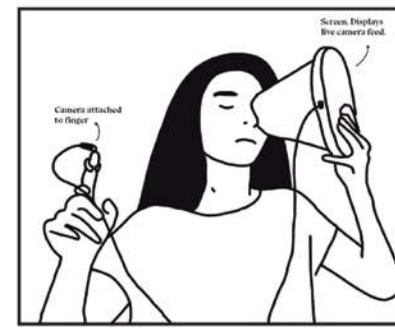
Although touch is presented as a way of freely and intuitively navigating the technological experience, the fact is that given the software and hardware design of the devices we use daily, the possibilities of interaction have already been determined. Therefore, there is a poverty and tactile precariousness in screen interaction even though this sense is a vital instrument for the creation of meaning and connections (Walters, 2014). As an answer, device #2 emerges: an **Object to see with your hands**, which moves sight to the hands and puts it at the service of touch. This is an object that seeks to complement and question the usual ways of seeing by enabling a new relationship between sight, touch and reality. Ultimately, this device aims to create a more active and exploratory relationship between bodies and reality.

Unlike the previous device, device #2 gave users greater freedom and control to look around. Exploring touch in a visual way led to the convergence between touch and sight, in which one could touch and see what was being felt enriching the process of communication with the environment (Walters, 2014). Thus, the reciprocity that exists in touch, in which the organ that touches can also be touched, translated into sight and enriched the vision of these people.

Device No. 3 (Object to see or to listen)

The third device is born from understanding attention as a limited resource (Mccullough, 2014). Certainly, there is a limit on how many operations can be performed correctly and simultaneously. However, the search for productivity has led subjects to devote less and less to a single action at a time. The foregoing generates a fragmentation of attention into multiple planes in which people are never completely dedicated to a specific task. This sensory over-stimulation and fragmentation of attention is often due to the mediation of technological devices. From time to time, software improvements have allowed us to

perform more actions simultaneously, due to this, rest or pause times are shortened and reduced.

Taking these reflections into account, device #3: **Object to see or to listen** focuses human perception on one sense at a time, either sight or hearing. In this way, it intends to offer respite from sensory over-stimulation. By offering the possibility of focusing on one sense at a time, it prevents the complete immersion of the subject in technology and challenges the postmodern discourse wherein being busy and doing many things at the same time is synonymous with success.

When using it, a struggle against the device was found again. Initially, people tried to listen over the noise generated by the device, refusing to sacrifice their sense of vision in order to gain a clearer auditory input from reality. However, upon closing their eyes in order to listen, they entered a moment of self-absorption and isolated visual reality so as to prioritize the acoustic component of the environment.

CONCLUSIONS

This paper proposes limitation as a tool in the process of design, as a means of finding new possibilities that are outside of what is considered normal. Undeniably, it was the bodily and technological limitations what enabled the outcome that proposes new interactions with the technologies that are used in everyday life. Thus, when bodies adapt to limitation and generate new ways of perceiving reality, it is possible to design objects that pose questions about the bodies that use them, their necessities and their role in society.

The empirical and experimental methodology used in this paper enables design to become a medium for the creation of objects far removed from the standards of creation and use of technological artifacts. The haptic, visual and auditory explorations in this

project are a starting point for subjects to claim agency over the artifacts that mediate perception. In this fashion, speculation about possible futures, in which the technological devices belong to and are molded by the bodies that use them, is generated.

Finally, these speculations are clearly framed in a series of limitations, such as setting forth with the exploration of a singular body to then design objects that are intended to be used by a broader audience, which leads to the objects being loaded with countless personal subjectivities and biases. In spite of this, the speculative process allows us to present deeper interactions with the technologies to which we have access, beyond the simple user experience or usability. This project enables the finding of interactions in which the devices that mediate our perception, lead us to be more human and more aware of the bodies we inhabit.

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PROVOCATIVE PLAYGROUND: CO-DESIGN OF URBAN SPACES IN CONTEXTS OF HIGH DEGREE OF MARGINALIZATION

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The school of Architecture, Art and Design of Tecnológico de Monterrey has worked for 3 years in a project called PlayLab. It works in real contexts to generate proposals in the area of social innovation, focused on discovering truth stories through ethnographic techniques, participatory methods along with territorial diagnoses.

In 2018, Play Lab worked in Menchaca, a community with a high level of vulnerability and marked by poverty and marginalization. The approach was focusing on children, who develop their design skills while finding their possibilities of community intervention, through modification of their own public spaces, applying a children-based method of intervention through games and play.

The result was the design of inclusive and resilient spaces, a flexible and provocative intervention from which the community self-learned. Children found in this space suggested, by an almost invisible semi-mobile structure, a provocation, a pretext for the participation and collaboration in an organic way for the creation, testing, experimentation, and validation.

The critical design, under an agonistic pluralism perspective, generates profound social changes while encouraging a discussion, rather than being a result, generating inclusion and expansion of collective power, through the recognition of difference and diversity, resigning the antagonist character at the center of the democratic discussion, where Play Lab process and proposal absorb conflict and legitimize it.

The proposed paper analyzes the methodology, the process and the results of this action or provocation through the design as a tool to get real social change and to build utopias in vulnerable communities.

Keywords: architecture, critical design, community, ethnography, participatory methods

INTRODUCTION

Questioning the answers that have been given to problems in cities, we encounter increasingly complex realities and there is a demand to seek new ways that we have not gone before, whether organizations, communities, citizens, government and in this case adding to the designers as actors in the articulation of possible solutions.

The role of the designer must be rethought. The School of Architecture, Art and Design in the Tecnologico de Monterrey developed a pilot project named Play Lab, an education model that consolidates one full-time semester into a real-world learning experience, providing a steady academic base for innovation in social co-design and constant adaptation to changing social and cultural contexts. Play Lab, with the intention of rethinking the role of a designer within a new educational model, allows students from different disciplines, mainly form Architecture and Design to come together to tackle the social challenges of a specific local community as a platform for social innovation, experimentation, and learning.

The understanding of these realities requires not a multidisciplinary approach but an understanding and openness Interdisciplinary, where the different languages are understood to work in a multidimensional way, specifically the understanding of the person, the stories, know what they do, think and feel to create empathy and at the same time visualize that these problems have a territorial sizing that replicates the patterns in space, giving greater possibilities of impact in the intervention. The professors provide ethnographic and participatory tools for students to implement into real-life contexts. The students are priorly required to be deeply involved in social and urban research before moving on to collaborative designs.

With the use of ethnographic tools and looking for a closer relationship with the community, the designer has a role in collaborative and interdisciplinary teams (Wilson and Zamberlan, 2015). The motivation is more designing and enabling careful assemblages and alternative pathways from connection and participation (Erling et al., 2010), using also participatory methods, as a tool for expansion of collective power (Harvey, 2008), of support for governance (DiSalvo, 2010), for the generation of social change (Apsan, 2016), generating more responsible results (Manzini and Rizzo, 2011) and the most direct relationship between designer, technical knowledge, and user practical knowledge (Van Hulst, 2018), (Ronald, 2011).

The application of ethnographic tools, participatory research and design focused on the person to discover the real and particular needs, allows the immersion of the student in a particular local

reality (Emerson et al., 2011), in its daily activities, understanding how people operate (Majoor, 2018) from an empathetic posture (Steen, 2012). From its complexity, it places the social problem in a spatial dimension, while analyzing the territory, discovering particular and local problems, within a global pattern (Hammersley and Atkinson, 2007), visualizing an added value from the motivations of people (Rhodes, 2005), (Wilson and Zamberlan, 2015). The ethnographic work can become a project themselves. Then, it, as a political issue, become a provocation and the conflict is assumed, motivating the discussion and generating the co-design.

It is demonstrated, in the critical design process, the need for recognition of difference, multiplicity, and diversity, from relationships of solidarity and trust (Apsan, 2016), evolving the concept of "conflictual" participation, where a political agreement can be reached (Miesse, 2010). Here, participatory design is understood as a practice of social mobilization and response that generates new meanings within the social production of spatial imaginaries (Fainstein, 2000). The conflict must be healthy and legitimized (Atilli, A. and Moufle, 1996), resigning the antagonist character at the center of the democratic discussion (Montes-Montoya, 2016). Co-Design, from its speculative and critical nature, is a tool to use from an agonistic pluralism to generate profound social changes while encouraging a discussion, rather than being a result of the discussion. The aforementioned accentuates a new designer's role also as an activist (Hansson et al., 2018).

Semi-ephemeral architecture/structure

Redefining the designer's role into a world in constant change, with an uncertain future, in a fast consumer culture (Kronenburg, 2008), from the critical nature of design, we have to ask ourselves if it is appropriate to think about a firmly anchored and permanent architecture, in order to provide a public service (Bayona, 2016). Architecture and infrastructure can be always temporary and ephemeral, depending on how it is built and on economic issues that sometimes are strongly linked to a planned dismantling (Kronenburg, 2008). It allows us to rethink how to inhabit space, to choose the best place and leave it without disturbing the environment, adjusting to new situations (Böhtlingk, 2012). The ephemeral generates reflection about the uses of public space, social participation and the meaning of durability (Bayona, 2016). It is able to offer the same functional, habitability, comfort and safety features as static structures, but from experimentation in terms of adaptability and flexibility, as a meeting point between disciplines from architecture, multimedia, design, art, and new ways and versions of design and occupation of space (Kronenburg, 2008). It offers the possibility to occupy temporarily public space

to transform it or to modify spaces, with the ability to energize, to change the perception of place, to excite, inspire and create new opportunities and provocations (Bayona, 2016). In this way, the different needs of the different users are better answered, who became a participant and active part of the configuration of the space, empowering themselves (Böhtlingk, 2012).

The objective of this paper is to analyze the process, methodology and results of the Play Lab project in its third edition, the insights that break the paradigms of design learning, the new roles of the designer, and the role of critical and speculative design as a new tool for social innovation within the academy.

METHODOLOGY AND DEVELOPMENT OF THE IDEA

"Encuentro Menchaca", the name of the third edition of the project Play Lab in 2018, was executed in Menchaca, an impoverished community in an urban area of Querétaro, México, a community stigmatized by delinquency and poverty.

The ethnographic research was obtained doing participatory design methods, depth interviews, social photography, narrative and prototyping to generate experience maps and structure needs, expectations and desires, mainly of children through all phases of the process to develop a vision for their community.

Participation methods simplify and distort decision processes and opportunities. The interventions on the city, therefore, are not made from a level of depth and adequate discussion between the different actors involved. In Menchaca, the team understands that social innovation happens at the root of the problems; that public

Figure 1. Participatory design process

and collective interventions imply conflicts and that a pluralist democratic society needs consensus. In this case, Play Lab seeks to rethink the dimension of conflict and antagonism, proposing processes of social change. The proposal must not nullify conflict but rather absorb it and legitimize it, seeking further depth in the process while using ethnographic tools and design focused on the person. It allows the immersion of the student in a particular local reality and the understanding of people's stories, their motivations, desires, and frustrations, to integrate them into the project.

In their iteration, the students identified influencers within the community through a non-structured open call. Due to the delinquency and untrusting neighbors, the students decided to approach children developing their design skills while finding their possibilities of community intervention through modification of their own public spaces.

Play Lab poses three challenges: discovering a truth, generating a diagnosis; developing alternatives with the community, implementing ideas backed by a short, medium and long term master plan.

FINDINGS

Play Lab embodies ethnographic research from its complexity, as a strategy that complements other types of research, as a project themselves, a tool to use from an agonistic pluralism and social innovation to generate profound social changes while encouraging a discussion, rather than being a result of the discussion. The results are more concerned with the process and the tactics than on the result, assuming the provocation, the critic as a dimension of the design.

Based on participation methodologies during the research process, it was found evident a lack of cohesion in the family nucleus, together with the lack of opportunities and positive aspirational models allows the development of a violent culture in young people, overcrowding, excess of work time, lack of positive aspirational models and opportunities. In the same way, this restricted development, also limits their potential for the future.

In "Encuentro Menchaca", Play Lab students created a children-based method of intervention through games and play, called "Juegología". It, like a methodology applied through an iterative process that motivates creativity, is meant to play and is played to create thus forming a virtuous spiral. This is reflected in the principles: Motivate to celebrate.

Based on the diagnosis made, four essential competencies to be strengthened were identified in the girls and boys of Menchaca:

collaboration, communication, critical thinking, and creativity. In such a way that four games were designed to be elaborated in Menchaca, each one with a set of significant experiences and with competence to be strengthened in the children.

"Encuentro Menchaca", was an experience that stands out for its work dynamics. Here the role of the designer is that of an agent of the intervention and motor of the interaction when it articulates the processes of creation, mediator, and activism. The constant presence in the field and openness allowed students to discover the creative force intrinsically present in the groups of children who frequent the specific intervention public space. All of the above was key to generate the idea of a playful and didactic tool to be developed and implemented. The concept of play means to "learn while playing," while at the same time creating objects to occupy public spaces and ignite interaction and community collaboration from below, from the little ones.

In the prototyping phase of the "Juegología", children from Menchaca created collectively some games with material such as PVC, wood, and cloth; the next day they found that the material had been stolen. Students found out that children have normalized this practice inside the community. Therefore, the option was to understand this dynamic and instead of pointing it out, the decision was to include it within the game dynamics. Children can bring recycling material, trash, material that comes out of some construction and use it to create a new thing. Over time we think that the community perceives this dynamic and instead of stealing, support and respect this space.

RESULTS

The result was the design of inclusive resilient spaces where delinquent activities such as robbery of public goods were

accepted and worked with to open other creative possibilities. This was a successful interaction based on a flexible and ephemeral intervention from which the community self-learned.

The product that was generated is the result of a desire to enhance the creative and construction capacities of the Menchaca community, focusing on children, who do not have enough space for recreation, meeting, and creation.

Children find in this space suggested by a semi-mobile structure, an opportunity of creation and participation in an organic way.

Children learn by playing, to intervene in the space suggested by the structure, which looks like a bug with long legs, where people dress and undress according to their needs, motivations and desires.

The proposed structure, as a system, is resilient, tolerating disturbances to it and compensating them creatively, opening possibilities for new creations. The proposed structure is a dynamic where new systems emerge, each time, always temporary, being inclusive, and finding how the community appropriates it. The structure works as a suggestion for a change to remain.

The object is the meeting point, as well as point of discussion, the children have managed to maintain this balance, naturally, they regulate themselves and what they require is any material so that their creativity and imagination find a common space. Children do not operate alone, they are inside a family dynamic that can make parents integrate into the same process. Neighbors, likewise, enter into the dynamics of implementation and creation, especially the care and maintenance of the space, perceive in one way or many ways the difference created between a playground and a space open to creation.

The difference between a prefabricated conventional playground

In a syntactic matter, it may be more attractive, but it does not allow the creation, adaptation, the process of imagining, conceiving, solving, building and proving. The need to solve only requires space and a suggestion of materials.

In a pragmatic matter can give each group or subject a travel different throw use, interactions always different or even recursive, and in the semantic matter is the symbolic construction of an identity that shouts that if they can do, they are able to create and transform the conditions they inherit.

CONCLUSION

Thinking about a type of space that oscillates between permanent and continuous change, leads us to the reflection that the focus is on the process, the intervention, the participants and the discussions generated by the object.

The process of materializing children's dreams can be ephemeral, as Chiquitectos does in their Río Malasaña project. They find new possibilities in public environments considering children as active inhabitants. Meanwhile, Fitekantropus, evolved an ephemeral event, to a project with permanent impact. Permanent interventions such as the Bamboo Park in Peru or the interactive structure of Polerama by Oomo, with the participation of children, can result in important action invitations. Encuentro Menchaca uses these qualities in order to find a middle point. As a result we can find similarities such as the use of permanent elements that

encourage participation, and ephemeral intentions to leverage possibilities.

The monitoring of the activities has continued with random visits. It shows that families use it at times that were not used before, mothers have been organized to give embroidery classes with raffia, opening a space of coexistence between generations.

This structure in the public space evidences the problems of the community, but also somehow solves them. In the play spaces, the children find a way to collaborate and discuss to understand each other and reach agreements among the structure.

Children in Menchaca bear the esteem of physical, territorial and also emotional marginalization, from outside the community but also from within, they grow up to hear that they "cannot". They cannot study, create, intervene, etc. because they do not have the power or rights. This space is meant to be a way of saying that they can learn, create, intervene, decide.

To continue a positive impact, design in its new mediator role has to stay focused on the processes where differences are understood, and find coincidences. Spaces that are open and without control of a leader to be directed. This opens up to many possibilities around the sustainability of the projects where the participants are provided with design capabilities to make the change.

The critical design then has to be developed around the objects that we have standardized and question whether they are generating a true social interaction. These issues result in different speculative design possibilities. By building, organizing, iterating, and testing, the imagination of citizens is broadened, interactions grow, and the diverse needs can be included.

The Play Lab believes that the intervention formula is in small, agile, resilient, organic actions that are found in local, are the most effective way to create the possibility of change, of new cultural construction.

People experience what it means to be a citizen, to intervene, to create and to administer a self-made space, defended and shared. This space does not support a single possibility but is open and adaptable to each of the needs of the people.

The bug created through the Juegología is an invitation to stimulate the imagination of the citizens and collectively to make it happen.

Design is a strategy to generate opportunities for participation, integration, and differentiation. During the diagnosis processes through ethnographic tools and territorial analysis, the protagonists use to dialogue and confront conflict in a staged

space. The diversity of each place and each group was assumed, the observed facts are described as contributing to transparency, the foundations laid for action and intervention. During the design and prototyping on the field, the expertise of the participants, both laymen, and designers are fundamental. Both became activists involved in the transformation of the conception of the public, understood as a physical and social condition.

A challenge faced by Play Lab -along with most university projects, is it that is temporal. By that we mean, are a project with a beginning and an end, a very short end when working into real social contexts. We are sure the students got the learning intended, but the pull out of a community which has accepted you, is never easy for the community. We can even argue that most political parties up to now go to people to get something out of them and when we also try to intervene many of the people in the communities do not believe or want to be involved, or believe and get disappointed by our sudden disappearance in the style of any other politician.

A fundamental aim for our Design and Architecture Department is to keep incentivizing action-research as we believe is the principle of good design. There is nothing more challenging to the students that placing them into a context where it is impossible to work without immersive research and accurate comprehension of the user and the context to move on to idea generation. And there is no more challenging context to understand the social context while the project backs up democracy and empathy.

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POSTHUMANWEAR EXPLORING POSTHUMAN IDENTITIES AND AESTHETICS THROUGH DESIGN FICTION

The integration between human beings and computers has become the backbone of contemporary daily life. The concept of posthuman becomes increasingly pertinent in the face of this growing convergence, as it allows for the proposition of all kinds of imaginaries regarding the course of civilization. There is, however a wide range of interpretations of the meaning and sense of being posthuman and conciliating them constitutes a point of interest, which is approached as the conceptual preamble of a creative exercise based in design fiction.

From this, a series of queries arise that invite us to question the possible ways in which computation could be integrated into human beings, thus giving way to the posthuman being. As such, the hypothetical development of a beta operating system called POSTHUMANWEAR was proposed, which, when downloaded into a human being would allow him/her to augment his/her identity through the intrinsic capabilities of computers, some of these being anticipation, compilation, history and translation. From this premise four of these hypothetical posthumans were imagined and subsequently, their visual language was developed.

Exploring the posthuman being from a speculative design standpoint allows for reflections on the type of relationships that could occur in the future between human beings and the technologies that surround them. This is mainly due to the possibility of entering future scenarios with dissimilar aesthetic proposals that converge around the same conceptual universe.

Keywords: posthuman, design fiction, aesthetics, computation, human identity

INTRODUCTION

The term posthuman has had an extensive range of definitions since its first appearance after the conception and development of cybernetics (Wiener, 1948). Such interpretations have often been in direct opposition to each other. Notable among these are, for example, those positions that approach it as a concept referring to a new type of species with abilities that considerably surpass those of an actual human being, either through genetic interventions or through the incorporation of certain types of devices into the body (Bostrom, 2001). On the other hand, the discussion of the posthuman has also been linked to ontological reflections regarding the construction of a new type of subjectivity in people, which is assumed as a consequence of the impact of technology in their lives (Hayles, 1999). This paper proposes that building an understanding of the posthuman from the disjunctive that exists between these two postures allows one to approach the human being of the future and his relationship with computation in a more sensitive and coherent way with the current zeitgeist (Krause, 2019). In order to give continuity to this idea, an exploration of this new notion of posthuman from speculative design standpoint was proposed, through which it is possible to devise futuristic scenarios that elude the technical limitations of their premises, based on the narrative conventions of science fiction.

THEORETICAL BACKGROUND

In order to address the new notion of the posthuman, it is first proposed to situate it at the intersection of human beings and computation. In this sense, it is sought to approach each of these two components separately, in order to expose what are considered as their constituent and essential factors, that are assumed as the set of characteristics on which it is necessary to build upon in order to maximize the value of their subsequent relationships.

Understanding the human being has been recurrently tied to the divergence between body and mind. (Chapple, 2014). According to this line of thought, the body is the main point of contact with the world and it is through it that a set of intangible traits associated with each individual is given physical form. In contrast, the mind is proposed as a kind of command center in charge of generating thoughts and directing the actions of the body.

Now, in this case it is proposed to understand the relationship between body and mind as an indivisible one, which as a whole allows to conform a person. Floyd Merrell coined the concept of

bodymind to describe the "an intricate range of selections and choices (...) that gradually become part of the activities we engage in as a matter of course - automatically". On the other hand, Antonio Damasio (1999) defines two prerequisites for the existence of consciousness. "Mind must be able to engender "images" (...) objects are mental patterns, fleeting images of happenings. Secondly, Damasio states that a " sense of self. To recognize that his thoughts are his own and that these have been formulated from his own perspective". Defining consciousness allows us to approach the concept of identity, according to which each human being is singular. Steven Edward Doran (2014) states that there are two dimensions of identity, the first as something specific to each individual and the second in relation to society. Doran concludes that "identity occurs at the intersection of the public social world and the private interior world of the individual".

It is here that the idea of the analogous, or qualitative, sensitivity of the human being appears, specific to each person and inherently complex to classify in form. Jake Buckley (2014) defines the idea of the analog as something that "is continuous, fluctuating, and qualitatively variable within communication". Buckley relies on the ideas of Gregory Bateson (1973), who defines the analog as "a way of conveying meaning through movement through movement, gesture, and varying physical quantities".

Faced with this, it is proposed to contrast the case of computers with that of human beings. It is understood that a computer contains "a processor (that carries out the instructions of a program), a memory (to store information) and a medium to exchange data with the external world" (Valvano, 2014). Now, addressing the characteristics of the computational condition allows for a closer approximation to its particular type of sophistication.

First, data is the raw material from which a computer is mobilized. Its origin is widely varied, insofar as each action or event can be defined in terms of data. Robert Gehl (2011) proposes that "data is sometimes said to drive programming; as computing expands to interpolate more aspects of life, life answers back with, and as, data. This condition of ubiquity of information gives computers vast faculties as to the type of activities they can perform. Such data infrastructure allows computers, for example, to digitally store enormous amounts of data to produce indexed repositories, a fact that Yuk Hui (2014) considers to represent a redefinition of the human processes of knowledge. Thus, computers are one of the main drivers of contemporary literacy processes.

On the other hand, the processing of information in a computer is carried out by algorithms. Bethany Nowviskie (2014) states that they are "formally defined as a finite and generalizable sequence of instructions, rules and/or linear steps designed to

guarantee that the agent performing the sequence will reach a particular, predefined goal or establish incontrovertibly that the goal is unreachable". In this sense, computers feature a staggered growth, to the extent that by increasing the number of algorithms a greater complexity is achieved and with it, a greater capacity to process data.

It is proposed then, to speak of a quantitative -or digital-sophistication in computers, by means of which it is increasingly possible to model reality and describe it in mathematical terms. For Buckley (2014) the term digital "concerns all that is discontinuous, boundary marking, and quantitatively controlling within communication". The ability to address problems in a discrete, controlled and parameterized manner allows computers to develop a type of expression that is foreign in any sense to that of a human being.

Now, from this approach, a need arises to address the impact of computers on people's lives. Mangen and Velay (2014) rely on the ideas of Raymond S. Nickerson (2005) to state that "The digital computer appears to be a cognitive technology par excellence in that it enhances cognitive functioning through directly affording cognitive support rather than as a side effect". What this group of authors proposes is that there is a profound relationship between human beings and technology, which extends as far as thought processes. An example of this is in the fact that it is necessary to subscribe to the limitations of a camera in order for the preliminary thought of an image to be translated into a photograph.

In the midst of the range of interactions between digital media and the human being lies the idea of posthuman. It is a process of negotiation between the scope of the computer and the range of human interests, according to which Adams and Thompson (2016) affirm that "the posthuman knows that adopting a digital technology means subscribing to its enhanced "eyes" but too, to its opinionated algorithms and complex decision-making structures". This process of negotiation entails tensions and important displacements for humanity that have brought all kinds of proposals regarding the possible directions it could take. Among these is the transhumanist idea (Bostrom, 2014) of uploads, according to which a person could potentially be downloaded onto a digital medium, through which it would be possible for him or her to live indefinitely.

There are two main issues regarding the viability of uploads. The first has to do with the simplification of human identity into algorithmic terms, according to which the human condition is conceived as a very complex descriptive problem that could eventually be addressed in mathematical terms. The second is the assumption of abandoning the body, a fact that would create an

important void that would radically redefine human experience. It has been sought so far to establish that tangibility is not an arbitrary trait, but instead responds to the central basis of the human being.

Gert Balling (2012) states that "both organisms and machines can be seen as cybernetic systems, and they can both be perceived as information processing systems which are in theory compatible". This would mean that if convergences are explored extensively, concrete bridges between the human being and computers could be consolidated and with this, proposals such as that of the posthuman could be accommodated. Now then, one of the main characteristics of digital media is its multimediality, in which any type of media supported under the same binary language can be manifested. For this reason, it could be imagined that eventually it would be possible to find a way to make the language of the human and of computers engage in dialogue in a consistent manner. This condition marks out the central concern of this project, in the face of the question of what would be the best way for this to be possible.

METHODOLOGY

It was sought to develop the approach that a posthuman being exists as a point of convergence between the analog sensitivity of the human being and the digital sophistication of a computer, so that both complement each other from their particularities. The way of doing this was based on the narrative resource of science fiction, a genre that is useful insofar as it allows the reader or spectator to be recontextualized in a world to which he or she is foreign. Miller (2012) defines narrative as "humanity's most basic tool for navigating and making sense out of reality - it operates as a kind of universal code that transcends linguistic and sociocultural boundaries and that lies at the very core of the human".

An essential element for science fiction stories is the presence of technology. While it need not be presented explicitly, the plots of this genre are mobilized from the relationships that its characters establish with the technological spheres of their worlds. Thus, science fiction narratives introduce the viewer to a foreign image of the world, a place and time that exists delimited by its own conventions. Through narrative it is possible to unite historical periods without complying with space-time constraints; narrative has the freedom that reality lacks.

The narrative condition allows to describe a group of intentions, motivations and fears that is set in motion by means of the character in a fictional world. The character is a means for the

spectator to project his or her values and questions, it exists independently to the extent that it is a fictitious instance, it is a personified laboratory for addressing the human condition. Faced with this, it was proposed to produce a science fiction narrative that would allow one to imagine the emergence of a future in which human beings converge with computing through a group of posthuman characters.

The central premise of the proposal establishes that, for it to eventually be possible to exist as a human being from computation, it is necessary to compile a large amount of data that allows for a characterization of the human condition in all its complexity. For this, the development of an imaginary beta program, called POSTHUMANWEAR, was imagined, which would have been created to fulfill an objective: breaking down the relationship between mind and body into quantifiable information that would make it possible to close the border between the analogous sensitivity of the human being and the digital sophistication of the computer. Later four characters were developed, each one in close relationship with a punctual capacity of the computers, so that these increased their desires and motivations after being part of the POSTHUMANWEAR program.

Thus, the first of these characters, Zeth, responds to compilation, the ability of a computer to accumulate and process large amounts of information and then find patterns in it. This is a character whose main motivation is to build an absolute truth from all the opinions generated around the events that make up human history. The second character, Pavel, departs from historicity, the condition of the computer to keep a record in time of the changes that have occurred in it, that is, the presence of a backup that can be navigated to find something concrete. This character wanders in the sensory memory of the experiences that have taken place in his life, seeking to find meaning in those circumstances of the past that do not seem to have it. In third place is Edna, who is closely related to the ability of computers to anticipate. This faculty comes from the possibility of simulating phenomena using controlled conditions and statistical models in order to predict their future result. For this character the idea of uncertainty is related to a profound deficiency in the simulation capabilities of humanity, her main objective is to be able to eliminate the notion of unpredictability through the use of mathematical models. Finally, there is Uma, a character who engages with computers' capacity for translation, through which it is possible to express different types of content in the same medium. Underlying this character is a strong desire to create a language system that allows all objects and actors in the universe to communicate horizontally, without the message being lost in translation.

RESULTS

Based on the development of each of these characters, it was sought to emphasize on their psychology in order to construct a panorama of how their posthuman identity would be expressed. In first instance, visual reference boards were used to display the aesthetics behind each of them. These references were the result of imagining the role that each character would occupy within this hypothetical world, to build a personal agenda around them. Visual identity became a way of communicating to third parties the conceptual intentions behind each character and facilitating their understanding.

From this work of art direction, the medium of the installation was chosen as the one suitable to materialize each character, this to the extent that it makes it possible to physically explore a conceptual world. In installations, a proposal is navigated both physically and at the level of ideas. The viewer is required to connect the dots and find meaning in what sometimes appears to be random, while at the same time becoming a pretext for addressing questions regarding the sense of becoming posthuman. Installations then, become portals through which it is possible to move into other people's worlds and establish a dialogue from there with reality.

It was proposed that POSTHUMANWEAR behave like a brand, adaptable to the aesthetic identity of each character and present in each of the objects that would be part of their world. Due to time constraints, this process was carried out with only two of the four characters. In the case of Zeth, the aim was to employ a typography in the POSTHUMANWEAR branding that would produce the sensation of movement and urgency, in relation to the fact that it would be a frenetic and obsessive character. One way to achieve this was through the repetition of the logo in the pieces, while the use of capital letters and italics contributed to communicate dynamism. On Edna's side, who is a character that describes measured and calculating behaviors, typographies commonly used in the text interfaces of editors for programming were chosen. It was proposed that they be used in a subtle way in the pieces, in places where they would not play a major role.

From this, a group of core products was created for these two characters. Thus, two performances were developed that sought to represent the material universes in which the characters would physically transit. The aim was to create an inversive experience, that the spectators could use to observe and study the behaviour of the characters and, with this, establish relationships with the objects that formed a part of their world. These installations were later documented in short films that were accompanied by a monologue where each character explained his/her point of view, motivations and desires to the viewer.

CONCLUSIONS

The course of this project was focused on approaching the idea of the posthuman as a way to find a bearing on the possible instances of humanity in the future. The definition developed is broad and malleable, although it responds directly to the impact of technology on people's lives, it also concentrates on a reflection on the very notion of being human in the present.

Technology is a conceptual resource that is cross-cutting through many disciplines, such as art, history and science. Confronting it implies understanding the ways in which they articulate with each other, in order to construct a personal discourse that is supported by their respective aesthetic languages. This, in turn, leads to the development of a wide range of possibilities for visual and conceptual creation.

Now, by focusing the project on the creation of characters, over a narrative that linked them together, it was possible to center the attention exclusively on the individual of the future. When only a few traits are specified and the character is set free, the viewer has the option of creating their own narrative around it. After all, the posthuman has as many facets as can be conceived and maintaining a degree of ambiguity allows for the scope of the four proposed cases to be broadened.

Figure 1. Edna staging. Laser engraved plaster chess boards with mapping projections of some of the most famous iconic games in chess history. Acrylic glasses and bronze rivets.
Figure 2. Edna staging. Laser engraved plaster chess boards with mapping projections of some of the most famous iconic games in chess history. Acrylic glasses and bronze rivets.
Figure 3. Zeth staging. Parametric graphics developed in Processing with silver engraved rings and digitally sublimated silk scarves.
Figure 4. Zeth staging. Parametric graphics developed in Processing with silver engraved rings and digitally sublimated silk scarves.

The resource of science fiction narrative allows one to approach case studies that would require a very high level of technical development and address them from the conditions of the present. Doing this leads to contrast these future scenarios with the current state of the world, so that it becomes a means to assess how the relationship between computers and humans might manifest in the future.

Finally, while this project sought to find a way to reconcile the differences and parallels between the computer and the human being, it is clear that its scope is so far at a very early stage of development. In order to face this, the possibility of extending this project to a greater number of characters that allow for a more complete exploration of the identity of the proposed posthuman has been contemplated. Likewise, the idea of expanding the means used to materialize their expression constitutes a point of interest, particularly so that the characters interact more closely with the audience that observes them.

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RE-THINKING THE DESIGN ROLE: EXPERIMENTING NEW NARRATIVE & RHETORIC DESIGN METHODS

In thinking objects and spaces design produces symbols, cultural and aesthetic codes as a "cultural system", which spreads innovation, embodied in new knowledge, products, values and lifestyles. It creates new meanings and, at the same time, it absorbs and modifies its rites and traditions; it renews the sense of things, it produces new mentalities. New visions of the world. Design is placed at the centre of a network of complex relations where the dominant features are "narrative" and "rhetoric", which legitimize its products and modify design methods. In doing so, design elaborates and re-elaborates those design methods able to go beyond the dimension of technical gestures and of pure formal research, and access the unprecedented from within the routes traced by the ordinary. Many concepts developed within the design community have the strength to produce effects of meaning that transcend the boundaries of the discipline and spread to the wider socio-cultural system, bringing expert knowledge closer to the system of the collective imagination. The practice of planning is able to combine the richness of traditional techniques with new languages, redefining their characters and meaning. This article intends to focus on Design Storytelling as a true narrative expedient called upon to unify the objectual micronarrations in a single great story and, at the same time, to experiment with new cognitive, strategic and practical processes. Design guides the new processes of meaning (Csikszentmihalyi, 1991; Krippendorff, 2006) and introduces new design methods of innovating not only the form-function, but above all, the form-meaning.

Keywords: Storytelling, Metanarrations, Design Rethoric, Sense Making, Design Identity

THE BRAND SCENARIO & NEW DESIGN NARRATIVE DEVICES

As a result of a continuous dematerialization of the market (Semprini, 1993) the brand represents the framework of meaning, capable of containing, amplifying and conveying the symbolic and cultural aspects of production. The sales space, up until recently the only place for economic exchange, is at this point part of a more complex *omnichannel* system, where the sales process is split into several different sales areas. In this context, the narrative aspect underlying the brand takes on even more value, precisely because it is capable of triggering those symbolic-relational practices that are able to act as an "adhesive" between the different formats and concepts in which the company today makes itself accessible. From the flagship store to the temporary store and through online stores, including new social media contexts, the element of cohesion is increasingly entrusted to the construction of narration that is capable of conveying, within the social context, an extended network of meanings, symbols and stories, that feed the everyday life of new atmospheres and rituals through articulated metaphors and new rhetoric. With the aim of enhancing their material and immaterial heritage, companies implement relational aspects and construction of meaning (Csikszentmihalyi, 1991; Krippendorff, 1989, 1990, 2006) found within the retail space. Starting with the initial studies by Hirshmann and Holbrook on the hedonistic experience of consumption, the recognition of the experiential and emotional variable (Schmitt, 1999; Pine and Gilmore, 1999) launched the transformation of the retail space into a place where the brand finds full expression (Aaker, 2003; Aaker and Joachimstaler, 2003). If the store becomes the narrative context of the brand, design takes on the role of a system capable of bringing together production and consumption. Design translates strategies, expectations and discourses into as many scenarios of meaning which, in the contemporary panorama, become articulated scenarios of meaning. The use of metaphors, the invention of images and narrative hypotheses is the design response to what would be impossible to say otherwise. The more complex articulation attributed to the activities of brand enhancement requires the implementation of more experimental actions for the development of new narrative-design concepts as a guide for setting up new Retail spaces.

THE NARRATIVE DIMENSION AS A HERMENEUTIC DESIGN FRAMEWORK

If we consider narration - in the form of myth, legend, fable, story, of epic poetry but also painting, cinema, photography, in all its many forms - as one of the greatest categories of knowledge (Barthes, 1969) and as the first interpretative and cognitive device that man uses in his life experience (Bruner, 1988), the narration unfolds from within as a peculiar epistemological connotation (Striano, 2005). The act of narrating implies an activity of codification and definition of coordinates - in the sense of "putting in order" - useful for framing events, occurrences and situations in order to explain them, confer significance, according to a logic of meaning. If therefore, on the one hand, narration is a tool to "give form to the disorder of experiences" (Eco, 1994), on the other hand, contextually, it becomes a generator of knowledge by activating processes of elaboration, understanding and interpretation of the reality undertaken (Bruner, 1991). While the "narrative thought" acts at a subjective and interpersonal level, translating experiences, facts and events into a plurality of meanings, the "narrative discourse" organizes these meanings and makes them "communicable", transferable; it makes them "collective speech" and, as such, subject to multiple possible interpretations.

Within the context of this paper, the "art of storytelling", which accompanies the evolutionary history of mankind, starting from oral narration, then transiting from written narration to the contemporary ubiquity of visual narratives (Falcinelli, 2014), is intended as a tool for sharing a common sense of horizons, and takes on a collective and generative dimension. And this should not to be confused with the increasingly *popular* practice – which began circulating around the nineties in the twentieth century - of management or marketing storytelling. If the narrative dimension contributes to the attribution of meanings and to the generation of meaning and relationships, marketing storytelling - in its most common current meaning - «glues artificial stories onto reality, blocks exchanges, saturates the symbolic space of adaptations and stories (...) designs behaviours, directs the flow of emotions, synchronizes their circulation» (Salmon, 2008) creating narrative mechanisms within which individuals/consumers are led to identify and conform themselves.

Design, as a process of signification (Krippendorff, 2006), «of introduction of new meanings within cultural micro-worlds» (Bertola, 2013), can in all respects be considered narration. Design, which generates sign artefacts - whether they be products, environments, systems, communicative artefacts... - acts on the co-present and complementary dimensions of form/function and form/meaning, of meaning and significance, activating actual *narrative discourses*. Working through *narrative discourses*

means, as mentioned above, dealing with the "transferability" of narration: the design process, and more specifically the metadesign, informs *narrative sequences* capable of returning complex, multi-dimensional, individual experiences yet inserted in a framework of shared and collective meaning. These narrative sequences, in turn composed of micro-narrative signs, enter into a system of relationships that implies activating dialogic comparisons: all the products/events/environments - intended as design objects - are potentially semiotic in so much as they are capable of activating processes of response and interpretation, perception and judgment (Bonfantini, 2000). The design *sign* does not live autonomously and autarchically, rather it enters into a continuous system of relations with its own context - social, economic and cultural - made up of production, sales, communication and consumption systems that find total confluence and completeness in the retail space. Within this context, the elements/signs that contribute to composing the brand's universe - of which the *store* represents the main narrative opportunity - behave as functional actants (Greimas, 1979): the single sign-object micro-narratives no longer have reason to be defined in an ontological manner - as bearers of a single and univocal message and/or function - but rather in a relational way, thus clarifying *what relationship they trigger*. «Thinking of the world as a set of objects seems to work less and less. An object exists as a bond of a set of interactions, of relations, and these can be described in terms of relative information of systems (or processes): information that a system has on another system» (Rovelli, 2014). As in physics, design shifts its focus from the object to the relationship between objects, from the design of the form-function-meaning to the direction of relationship systems. Object micro-narratives are replaced or integrated by the project of the narrative sequence where design intervenes primarily in the information process - in the sense of giving semantic, sensitive, material, experiential form - of the relationship.

NARRATIVE BOXES. NARRATIVE AND METAPHORIC ARTIFICES AS TRANSLATION PLATFORMS ORIENTED TOWARDS THE PROJECT

The strength of the project lies in the ability to give shape to what does not yet exist, other than in the mind of the designer, placing visual thoughts in front of our eyes. The strength of the project lies in the ability to give meaning to what is new, anchoring it towards a common feeling. Giving shape and giving meaning are inextricably combined in the acts of design configuration and pre-figuration. In fact, the innovation introduced by the design belongs, prior to the material dimension, to the symbolic and

cognitive dimension, and the objects that derive from it, even before being material, technological and instrumental objects, are cultural objects. Design works through continuous acts of decoding, coding and re-coding in a process of continuous translation of contextual disengagements of elements which recombined, transmuted and reinterpreted re-enter the context that generated them by carefully placing the elements of innovation on the linguistic, expressive and formal domains of tradition. In this sense, design implements processes very similar to the series of linguistic artifices - which in literature are considered estrangement - used by writers to present new aspects of a, more or less, known reality. Or, vice versa, it is the outflow from a context known to give ordinary elements an extraordinary character, in the etymological sense of out of the ordinary.

In order to be accepted, that which is new always needs to be tamed, made familiar, or rather inserted into the enclosure of what is already known. The sensorial boxes, which we present here, constitute "experiential cases", containers of elements wisely taken from a context that have the role of evoking, separate cultural elements, bringing them closer together and mending them, that are capable of reifying a complex context, through salient identity traits.

The box, being a container, takes on simultaneously the symbolic role of a fence and a frame. The enclosure also unites and makes daring combinations familiar. It normalizes them, it makes them obvious (Morin, 1966). The frame elevates the mere objectuality of what is contained in it and turns it into a metaphor; it allows to add, remove and modify the sense of things, it enables design thinking: the act of re-interpretation at the base of all creative processes.

The frame introduces "a vision, a reading, a look, a point of view" (Baule, 2011). A narration that here loses its mimetic connotation and instead looks toward linguistic devices capable of abstracting and opening up to meanings that transcend specific material, working on the symbolic terrain - as occurs when using metaphors - yet also capable of objectifying or transforming abstract meanings into shared images as in the use of types and stereotypes.

There is a rich linguistic apparatus in the design; a field of continuous experimentation, in particular in the area that we define as meta-design.

To this, we attribute all the "translation" operations of multidisciplinary knowledge that collaborate in the ideational process. As well as those regarding visualization which are necessary, for example, to transform the description of behaviours and needs into useful analysis tools for the design. Or the

abstraction operations that lead to the visualization of the design problem. Or the description of intangible facts such as lifestyles, formal and expressive languages or the visualization of pre-project artefacts which are the scenarios in which new values, behaviours and ways of use are proposed.

There are, as well, the narrative expedients needed to make visible not only the physical qualities of the object but also the qualitative elements - sensorial, communicative, value, emotional, relational, memory etc. - that are decisive in the construction of the product's identity.

The "narrative boxes" incorporate and stratify the possible acts of understanding, interpretation, construction, coding and translation that take place in the processes of finalizing the design's intention. They constitute an actual re-writing intervention of a system of detected signs. They shape them, but not as a closing act, rather as a platform for building new worlds.

METHAPHORICAL BOXES SPECULATION AS NEW EXPERIMENTAL NARRATIVE & RHETORIC DESIGN METHODS

The revaluation of the sensitive element, as a vehicle of mediation between scientific knowledge and collective imagination, leads to the pre-figuration of imagination and narratives. In this context, a number of artistic experiments, including the art series The Future of Demonstration (2017-2018), have critically investigated - through a transdiciplinary approach - the relationship between reality and its multiple narratives and representations. Through storytelling, the company seeks exclusive relationships with its audience; it investigates techniques, languages and designs specific narrative contents, defining the set of speeches that give rise to symbolic and cultural productions. This requires the designer to undergo a continuous search for innovation of the meta-linguistic criteria and connection fields. If, from the point of view of the user experience, the consolidated techniques of Personas and Scenarios represent an outstanding design expedient, as far as the relationship between brand-narrative-retail is concerned, the design of storytelling requires new tools of rhetorical innovation. The narrative effectiveness appears to be connected to the search for narrative-communicative artifices capable of creating new alliances between the material and immaterial value carriers.

In the work presented here, the narrative *expedient* is represented by the construction of the *Metaphorical Boxes speculation*, a limited place, yet not closed, capable of containing and conveying the meaning of the material and immaterial variables innate within

possible narrative contexts (if related to the company, then connected to the brand identity) and at the same time aimed at feeding new creative-design processes. The *metaphorical boxes* present themselves as boxes inside which objects, sound, olfactory, tactile materials are found; elements which, however, still need to be "discovered" and, only after their manipulation or transformation, do they reveal their meaning. The individual elements take on value, not so much in relation to their individual meaning, rather exclusively if interpreted in relation to the context of the entire box, as Morin (1983) reminds us, «the whole is greater than the sum of the parts», the relationship with the other elements of context activates a relationship of tension between *adaptation and the structure of internal identity*, such as to lead to an interpretative transformation.

Initially they appear almost like the aesthetic result of an advanced moodboard, yet in fact they are the result of a careful and systematic collection of material and immaterial elements aimed at activating a creative design vision and, therefore, like the pre-figuration not only of a possible design story, but also of the behaviours it encourages. These boxes are inserted, in a nuanced and fluid meta-design moment, at a "pre-scenario" level in which the single significant units are subjected to a process of semantic, sensorial and imaginative translation.

From the point of view of the metaphorical boxes' purpose, we observe at least two operational levels. The first refers to their construction, launched within the context of intransitive relations connected to the area of *design conversation* aimed at defining the "thing that does not exist". In this context, the activation of heuristic and metaphorical procedures enable to produce translations of meaning and hybridizations between universes of different meaning while, at the same time, they also restructure relationship (Penati, 2018). An activity that finds conceptual synthesis inside the box and that is necessary for the subsequent abduction processes. With regard to the second level, this refers to the use of the Methaphorical Box as a starting point for the interpretation of design hypotheses, capable of generating the novelty starting from the metaphorical stimulation contained in the box.

The *Methaphorical Boxes* are therefore the semantic and emotional link of a hypothetical narrative-set-up filter around a specific theme (on which works the person who defines the box, but does not reveal it to the person who eventually interprets it). The metaphors recreated seek to stimulate the ability to "see otherwise" with the aim of developing new and unpublished narrative-fitting experiences for the user. They are conceptual proposals which not only enable to show and synthesize a vision of aesthetic-functional meaning, but also enable to perceive them sensitively and perceptively.
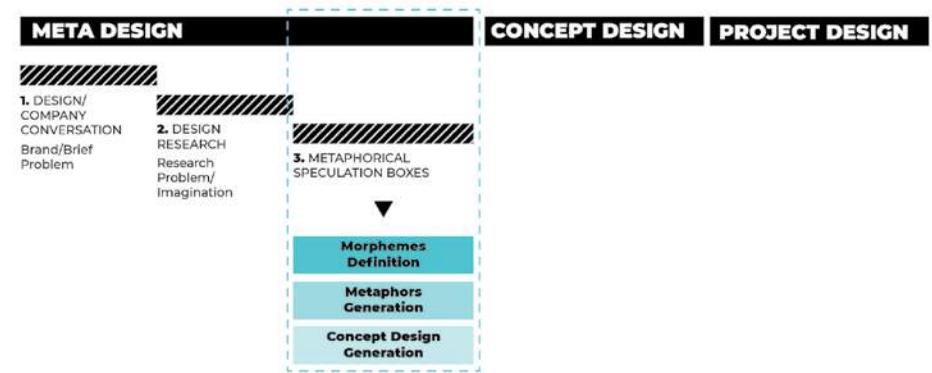
The Metaphorical Boxes develop along a path that we can explain as characterized by three main phases set in synergy between them (Fig.1). From an **initial phase** (Design/Company conversation) of activation of design thinking, where the research theme is identified and addressed from the point of view of the aims and the constraints placed, we pass, through a selection and filter activity, to a **second phase** (Design research) aimed at activating the "narrative thought". A phase where, through recognition, selection and connection, but also transposition, coding/decoding, the design generates particular, surprising, unexpected visions and translates them into thought through images. In this sense, the design absorbs and shapes, through a non-alphabetic vision typical of *simultaneous and visual-spatial intelligence* (Gardner, 1988; Penati, 2018) material, sensory, synaesthetic allusions without establishing a hierarchy between them, rather operating by synthesis. Here, thought does not follow the linearity of logic, rather it moves by similarities, by anchors. The images blend together in similarity, content, sensitivity and atmosphere. The relationship between observer and observed fact establishes a self-creating, autopoietic effect, where confusion (programmed, explicit, conscious) leads to the inexhaustible circularity of self-referential paradoxes. The objective is not the search for the "real", but for the "possible". Narrative thinking tends towards the construction of visions where things, people and contexts are linked together by the plot of cause-effect relations, space-time connections and the set of emotional and sensitive thoughts. This phase represents, for the designer, the starting point for the next phase in which the actual process of construction of narrative metaphors begins.

In the **third phase** (Metaphorical Speculation Boxes), the designer turns his attention to the translation of knowledge in the sense of constructing the "narrative discourse". Within this context and, through a process of semantic translation, the defined visions are transfigured into as many design metaphors capable of conveying their identity through the minimal elements of significance

(morphemes) which, organized together, are able to restore their original essence. The vision becomes an "object" represented, organized, narrated, objectified and, as a sign, subordinated to the interpretation of the observer. The observer, who may not coincide with the person who processed the box, is entrusted with the last process of translation and interpretation towards a design concept. This third phase develops via three further moments. The first aims at **defining morphemes** (Fig.2), or rather the elementary units at the basis of narrative discourse, the second at **defining metaphors** (Fig.3), which construct specific units of meaning through the sign/symbolic, objective/visual and immaterial/sensorial organization based on sign and conceptual speculations. The third, instead, represents the relationship that is established between the **Metaphorical Box** and the subsequent phase of **generation of the design concept** (Fig.4).

Figure 2. Metaphorical Boxes Speculation: Morphemes Definition
Figure 3. Metaphorical Boxes Speculation: Metaphors Generation
**Figure 4.** Metaphorical Boxes Speculation: Concept Design Generation

CONCLUSIONS

The Metaphorical Boxes were used by the authors, within the didactic context, as input to projects related to Retail Design, at the academic and at an applied research level. The model experimented a change both in the transmission of new knowledge *within* the project and in the training of new skills *for* the project. The new narrative space becomes a relational place, a synthesis of a process in which imagination is organized, narrated and objectified and, as a vehicle of signs, subordinated to the spectator's interpretation. The transition from theoretical research to practical application has required continuous adjustments, especially with regard to sharing meanings at a level of different geographical cultures, where perceptual interpretation was not always homogeneous in the work group. The model has therefore placed increasing attention on the selection of morphemes and metaphors in relation to the specificity of the interlocutors, precisely because the meaning is never dependent on a single interpretation; rather it is determined in the relationship between observer and observed fact.

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THE EXTENDED PRAXIS OF DESIGN: TOWARDS A CHARACTERIZATION OF THE ADVANCED DESIGN CULTURES

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The praxis of design is becoming broader: it has been extending to both new practice territories and topics of interest, and moving from the development of new products to practices that approach new landscapes, such as the organizational, the social, and the territorial. These diverse practices can be understood under the paradigm of Advanced Design (Celi, 2010), and require us to rethink the way we understand the discipline of design.

This paper goes from the literature review analyzing the roots and sources of Advanced Design and its relation with future studies, towards the factors that these broader territories of design are stressing on its practices, with the objective of characterizing them. By so doing, we can shine a light on the phenomenon and analyze its modus operandi.

This paper presents the notions of time, culture and process that can be used as a reference framework for the understanding of Advanced Design cultures and discusses the key points of these new approaches: these approaches act more on a strategic level in organizations and communities, creating new visions and paradigms, being more anticipatory, expanding the time horizon of the projects by including a longer-term perspective of goals.

Keywords: advanced design, anticipation, design cultures, futures, design processes.

ROOTS AND SOURCES OF ADVANCED DESIGN

Reflection on the concepts of anticipation and futures in modern sciences is a relatively new phenomenon (Barbieri Masini, 1997; Sardar, 2010; Son, 2015). It is possible however to break down this idea into four significant elements, each of which testifies to a multi-part journey comprising phases of renewal and periods of oblivion and abandon.

At the end of the 1940s, the foundation of the Rand Corporation coincided with the American movement towards research into the future, a movement characterized by the Delphi method of Theodor Gordon and Olaf Helmer. The years 1965 and 1966 saw the American Academy of Arts and Sciences set up the Year 2000 Commission, chaired by Daniel Bell, later theoretician of the post-industrial society. In 1966, the World Future Society, a non-profit educational and scientific organisation, was founded in Washington. In 1961, Frederik L. Polak published *The Image of the Future*, a pivotal text in the new field of futurology. Simultaneously the pioneering phase of the French prospective was taking place, thanks to Bertrand de Jouvenel (*L'art de la conjecture, 1964*) and Gaston Berger (*Phénoménologie du temps et prospective, 1964*), who launched the *prospective school*. Also dating from the same period are the studies carried out by the Gruppo Futuribili Italia, founded in 1967 by the Istituto di Ricerca di Economica Applicata (IREA) of Rome.

The third phase of the discipline was characterized by research related to the founding of the Club of Rome, in addition to the publication of a report that triggered a large part of the debate on the distinction between "growth" and "development". *The Limits to Growth* (1972) by Donatella and Dennis Meadows, Jorgen Randers and William Beherens - which came about largely due to the efforts of the Italian industrialist Aurelio Peccei in collaboration with the Massachusetts Institute of Technology (MIT) -, predicted, as Eleonora Barbieri Masini (2000) stated, a setback in this field of study, due to a general weakening of optimism about the future and trust in those who should have studied it. During this period, the anticipatory role of design, which had accompanied the affirmation of progress in capitalist society, implied a renewed cultural, social and ethical dimension. As Kjetil Fallan (2014) asserts, during the 1960s the often blind trust in progress and unlimited prosperity which had fed modern design since the industrial revolution seemed to waver. In the field of design, what had begun as a form of activism on the part of consumers was transformed into environmentalism, which had significant commonalities with the global perspective of the ecological movement. The signs of this change were felt internationally, as demonstrated by the volume *Design for the Real World* by Victor Papanek in 1971, along with other events like the publication of the *Whole Earth Catalog* by Stewart Brand in 1968, the research

carried out by Richard Buckminster Fuller in *World Game* and the reflections contained in the 1970 *Speranza progettuale* by Tomás Maldonado.

Re-reading the alternating fortunes of futures sciences, in the 1990s a renewed need for research emerged, and over the course of a decade a new system of knowledge came into being, strengthened (Barbieri Masini, 2000) by the adoption of a plural view of the future (probable, possible and preferable) and the development of a disciplinary reorganization (forecast, foresight and anticipation). This latest stage of evolution introduced the term 'anticipation' to indicate a set of actions generating the future in the present (Poli, 2010; Miller et al., 2012; Arnaldi & Poli, 2012). The latest phase, which has brought back the term "anticipation" to indicate the set of theories and practices of interaction with the plural concept of future, took place at the same time as the development of an international discussion linking design cultures, particularly around the specific research fields of Advanced Design and futures studies, two areas that had not been linked previously (Sterling, 2006; Thackara, 2006; Margolin, 2007; Zamenopoulos & Alexiou, 2007; Norman, 2008; Dunne & Raby, 2013; Celi, 2015; Formia, 2017). This integration took place in a broader context and gave unprecedented attention to the time, culture and process factors in design, as outlined below.

A FRAMEWORK FOR THE ADVANCED DESIGN CULTURES

Advanced Design has been described by Celi (2010) as a practice that imagines future perspectives by envisioning future products and processes, this definition links design with the notion of futures where time becomes a central construct, it also clears the way to the understanding that the advanced design practices are not just oriented to products but also to processes and this two constructs (time and processes) changes the way design operates in the praxis, they transform and give diversity to the design culture.

The main hypothesis of this paper is that Time, Culture and Process factors might all be constructs involved in building a framework for understanding Advanced Design cultures, a framework that could lead to both observations and characterization of emergent (and not so emergent) practices. The existence of a framework adds perspective to discussion of the discipline, and we would argue that a new perspective is clearly required. The three factors described in this paper can be used to create a didactic reference for the narrative of advanced design cultures.

TIME AS A DESIGN FACTOR

After over a century of design being concentrated on the spatial variable (prehension, effort, morphology, aesthetic perceptibility, dimension of things, and relationship to the human body), Advanced Design now focuses the designer's attention on the time factor. It does this in various ways:

Anticipation

It pays attention, for the first time knowingly and instrumentally, to the consequences of future studies on the designer's actions. Since the beginning of the 2010s, the re-activation of scientific debate on the future has been termed "anticipation" (Arnaldi & Poli, 2012) and has had significant influence on Advanced Design researchers (Celi, 2010). The idea revolves around the usefulness of adopting practices and activities oriented towards the future - previously relegated to a few specific sectors (fashion with haute couture, and automobiles with dream/concept cars), and extending them to transversal practice and the productive sectors that are the object of design, in this sense anticipation has set a plural dialogue with the discipline of design, a dialogue that produces more than the traditional already mentioned advanced prototypes, it is also getting in a very diverse range of industrial sectors, and creating a totally new approach that goes from strategies to processes inside the design praxis.

Transient condition

Design activity is no longer automatically carried out to generate goods destined to last and pass on for posterity. The focus of designers can be on products and facts based on a single moment of ephemeral life, such as events or objects that transform themselves into something else and reflect a particular transient condition, i.e. objects of trans-design (Ceresoli & Sgalippa, 2008).

Here and Now

The change in the awareness and use of time is perceived with the pervasive radicalization of digital technologies that cross-objectual and behavioral universes, destroying distance and modern time. What is in force is the "here and now", which is the factual translation of the concept of digital. Design can also exist purely in digital form and the designed objects no longer need to really exist; 3D printer production even dissipates the historical distance between the act of production and the act of consumption. The consumer can create the item, indeed becoming a producer him/herself. It is the destruction of the "just in time" phenomenon that has characterized decades of industrial strategies and processes from the Toyota system onwards (Celaschi & Deserti, 2007).

In summary, in the notion of time as a design factor, time thus becomes the raw material for the project and anticipation brings to the design process those new pre-active and proactive tools referred to in the following paragraph. Marketing suffers because listening to the customer becomes an active design practice. This requires professionals who are prepared to build scenarios with the user, capable of materializing ideas and stimuli, communicating the future and making sure it is perceived by the highest possible number of actors, both upstream, in the production process, and downstream, in the consumption process. Processes of fragmenting the productive sectors and shifting positions are more efficient than marketing. The producers of capital goods (B2B) no longer wait for their client (producer of B2C consumer goods) to order innovation. They go beyond this point, and begin to study user behaviors (client theory) up to the point of anticipating their needs (Celaschi, 2016). No actor in the traditional value chain remains in their historical place; rather roles become grafted into one another. Some disappear; while others, like that of the designer, stretch out of all proportion to saturate the production scene.

CULTURE AS A DESIGN FACTOR

The praxis of design has a transformational capacity, because the processes and approaches that introduce it create a cultural change. This transformation has been described from both management and strategic design perspectives (Borja de Mozzota, 2006; Best, 2006; Brown, 2009) as the changing of the organization from one which initially used design for product configuration, to one which understands design as a process, to the final result where design mastery becomes an explicit organizational strategy. This cultural transformation has also been observed from the perspective of designer agency:

Cross (2011) described this as the way in which the professional designer goes from novice to expert, a process in which the skill of the designer is enriched and expanded through learning-by-doing and the accumulation of experience. More recently the seminal Advanced Design work of Celi (2010) describes the cultural transformation from the process-innovation perspective, analyzing how Advanced Design practice creates innovation avenues and portfolios with an unbroken dynamic, resulting in continuous innovation. These three approaches, the strategic-organizational, designer agency and continuous innovation, can form the foundation for understanding the cultural transformation that is the Aadvanced Design phenomenon:

- Strategic: from problem solving to opportunity-finding (project multiplicity)
- Designer agency: from learning-by-doing to learning systems (Advanced Design competencies)
- Continous Innovation: from product development to visions of the future (paradigm shifting)

Project Multiplicity

The design project tradition is oriented towards problem-solving, the starting-point being a given situation requiring improvement. The methodological approaches to the design process include problematization and the resulting steps taken to resolve the problem: this is how design operates. Design problems however are becoming increasingly complex, with the level of uncertainty associated with the need for a clear problematization framework growing in ambiguity (Thackara, 2006). With this complex and fuzzy condition (Koen, 2002), Advanced Design practices anticipate the long term and pre-visualize opportunities which represent a map of possibilities capable of helping organizations (and society) create frameworks that can be used for more effective future design projects, this frameworks describe (graphically or physically) opportunities, this opportunities are innovation portfolios that can be potentially developed; the iteration between opportunity portfolios and specific developments brings a certain kind of project multiplicity.

Advanced Design Competencies

The creation of competencies in design processes has been described as an incremental phenomenon characterized by its learning-by-doing nature (Schön, 1983), a process where praxis and reflection increase the skills and knowledge of design practitioners, thus creating a learning environment. Within the practice of Advanced Design, this process gives rise to some distinguishing features resulting from the emphasis on continuous innovation. Advanced Design requires the systematization of design practices, and some organizations (or research units) do this by installing systemic strategies for knowledge management. This strategy helps the organization move from "traditional" learning-by-doing approaches to a learning-systems dynamic where the individual, the team and the organization develop new skills that fit the definition of advanced design competencies (Iñiguez et al., 2014).

Paradigm Shifting

The practices of Advanced Design are extended in two ways: in the sense of time horizon, and in the topic that they approach (Celi, 2010). They are not always guided by actual social (or market) requirements but are future oriented, forming an arena in which radical change can take place. This could be social change or the technological opportunities thrown up by Advanced Design practices at systems level. These practices envision future possibilities by questioning today´s status quo and creating possibilities for new paradigms (social and technological), since they are design-led and able to represent new models with graphic communication and prototypes. These representations make accessible the debate on a potential future to both users and society (Dunne & Raby, 2013), thus enabling speculation on possible paradigm shifts.

PROCESS AS A DESIGN FACTOR

We could begin this section by returning to the concept of time as a determining factor, as previously mentioned, the contemporary notion of time is characterized as being a space of programmed obsolescence. This has been gradually changing however, along with the paradigms of production and consumption. The ephemeral becomes the truly perennial and stable and the constant adaptation to a changing context becomes the lasting.

This phenomenon, framed by the information age, has also become a space for the awakening of collective consciousness around the progressive loss of resources essential to the preservation of life on the planet.

Within this framework, from the viewpoint of the design discipline, we have promoted reflection about the role of the designer as a source of transformation, one who promotes change and creates processes in new practices, which extend the disciplinary field of action to the development of competencies addressing uncertainty and complexity. Design is a discipline based on the principles of complex thinking: everything is related, interconnected, any factor can help to establish a possible solution to a possible problem (Arámbula, 2016).

In this sense, and following up on the work undertaken with different private enterprises and government institutions interested in incorporating design as an added value, we can discuss ways in which the designer can take on the role of protagonist in the construction of a strategic organizational vision:

Strategic new knowledge and guides to innovation

The designer functions as a researcher who systemically combines elements of the company/organization in both local and global contexts as well as those variables implicit in differing trends, in order to achieve the following objectives:

a. Anticipate changes and propose methods of innovation. This involves not only proposing methods of development, but formulating specific projects for each of the methods proposed. The projects resulting from this process in turn create new business models as well as new opportunities for growth and adaptive development in line with the both change itself and the degree of complexity involved.

b Defining strategic management models.
The above would be defined through phases and activities, interrelations, resources, objectives, organizational structures, action plans and tools for process measurement and evaluation. It is not about the value of design in terms of achieving corporate objectives, but rather how these objectives can be reached through the implementation of design.

Industry transformative processes or transformers of industry

The designer as a driving force behind the fundamental changes linked to the achievement of sustainable development objectives. The foundations of the sustainable industrial design process need to simultaneously address multiple aspects of the system while minimizing environmental impact and improving the sustainability of the final design (Pérez & Silva, 2013).

Within this panorama, design navigates highly complex processes from an anticipatory standpoint, considering both production and technological variables on a small scale and within an international business framework.

In addition to the above, the ideation of new products, services and systems has, in itself, become much more complex as a result of changing lifestyles. Faced with these challenges, the designer has a key role in networks promoting the relationship between local cultural practices and sustainable development.

These processes reflect the diversity of new focal points for the designer which, when taken to a strategic level in organizations and communities, emerge as a creation hub of new visions and

paradigms and extend the project horizon and the design process to fields of action based on new competences.

Participatory processes

The individual creative instant of the designer-artist loses consensus and, together with it, the private action of designing. For example in the designer's studio, in jealously-guarded methods and processes. The process opens up to the observation and participation of the user. User studies become living labs and the designer's despotic and personal act becomes co-design and participatory design, enabling the consumer to enter the hidden mechanisms of production.

The historical role of clients is progressively but rapidly disrupted. From being protagonists of the "What to do?", they increasingly become the actors of a problem-finding process that requires the designer to produce questions rather than answers. The project goes upstream from the process and the different roles that the designer plays in the production system are extended.

CONCLUSIONS

Advanced Design emerged as a concept at around the beginning of 2010, when master's degree courses carrying this title proliferated, the amount of scientific literature increased and countries involved in the new production scene (firstly BRIC and finally global economies) began to place designers in roles which differed from those they would commonly be expected to occupy in the traditional technical design studio. These included R&D divisions, strategic marketing, strategic design, design driven innovation, consulting and CEO staff, and management training. It is precisely in the field of executive-level managerial training (updating managers and entrepreneurs) that Advanced Design is perceived as key knowledge and sits together with the study of enabling technologies and human resources strategies (human intelligence) by legitimizing design thinking, but above all, giving body, real function and dignity to the design scene.

One weakness of Advanced Design is that it cannot be anchored to a specific role, for example the one which it currently occupies. As the designer, the engineer, the manager, the researcher and the economist progressively take possession of these tools and practices; the destiny of Advanced Design is to move elsewhere, onto the edge, towards an increasingly exposed frontier of change.

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BIODIVERSITY-DRIVEN DESIGN

Unique and unexplored ecosystems offer an opportunity to spark designers' imagination and push practices to search for new solutions to everyday needs. The rapid exploitation of natural resources has accelerated climate change, making us question: how can we redesign our relationship with the environment without placing its biodiversity at stake? How can the intersection between science and design take research one step further? Is it possible for science and design to question how their knowledge can be better integrated to solve real world problems? Is it possible for designers to incorporate scientific processes in their design practice to widen the scope and impact of their projects?

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WALKING IN THE AGE OF ANTHROPOCENE: AN INTERDISCIPLINARY LEARNING EXPERIMENT FOR A SUSTAINABLE FUTURE

The future of a bio-diversified ecosystem is in the hands of the generation that is sitting in our classrooms. This paper introduces an educational framework to shake us loose from the inertia caused by the tension between our concern for the environment and the increasing demands on natural resources in the Anthropocene. Art and design today are facing a "social turn" through creative activities often labeled as relational aesthetics or post-studio, socially engaged or community/participatory/contextual practices. In extending such practices, education plays an important role in democracy by cultivating an informed, engaged, and empowered citizenry.

The process of walking outdoors, through the method of LPP (Legitimate Peripheral Participation) learning, allows a possible collaboration to emerge that aims to establish or transfer an interactive relationship between environmentalist scientists and designers. Here, walking is introduced as a form of inquiry; together, designers and scientists explore the continuum between the classroom and its surrounding community and environment. This pedagogical experiment includes faculty, students from both art and science schools. Each presents information about various aspects of the urban terrain and natural environment they have traversed and experienced outdoors. Using walking as a starting point, LPP initiates dialogues and organizing working methods that combine art and science, and develop creative solutions for shared ecological concerns. At its best, the conceptual framing of tomorrow's design thinking will loosen the instrumentalization of science, and heighten the social value of scientific-centered inquiry.

Keywords: Walking, LPP learning, pedagogy, design and science, ecological art

ART EDUCATION AND SUSTAINABILITY

As we sit in the classroom, with all our intellectual, scientific and creative knowledge, and talk about critical environmental issues, we often fail to act. Business goes back to normal when class is over. The recent UN report that warns of the extinction of as many as 1 million species leaves us in dread and awe. Its findings are confirmed on a personal level when looking at or breathing the smoggy air of Beijing or wilting in the extreme spring heat in London.[1] How can art and design education propel us and play a proactive role on these matters? Education plays a crucial role in democracy by cultivating an informed, engaged, and empowered citizenry. In the age of Anthropocene, an epoch defined by the human impact on our ecosystem, the future of a bio-diversified, sustainable ecosystem is in the hands of the generation who are now sitting in our classrooms and labs. We believe that ecological concerns can serve as a unique prism with which to develop pedagogical tools that align environmentalism with creative practices like art. Art has long served as the imaginative conscience of a culture. It is also self-conscious, offering access to an awareness of how knowledge is made. Art not only induces contemplation, but also imparts information and makes meaning, provoking a different kind of awareness of how the world functions.

Human perception is activated, but also questioned through art. Art connects people to practices and realities in the actual lived city of, in our case, Beijing. We do so through aligning environmentalism with creative practices, ranging from art to design and science to technology. Creativity's inspirational capacity can activate the behavioral changes and policy reforms of custodial care for our planetary home. As educators of art and design in institutions of higher learning, we are haunted by the following questions:

> How do each of the disciplines from our universities respond to ecological crises, the singular challenge of our current era?
> How can art's astute power of creativity and alternative imagination disseminate existing sustainable strategies of reform and preservation to form a greater consensus, at least within our campus as a model for our larger society?
> How can the creative ingenuity that is the special province of art be directed to life-sustaining problem solving for all students and faculties?

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1   According to the conclusions of 455 experts and contributing authors from 50 countries who drafted the report for the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) issued in May 2019, up to 1 million species of plants and animals are now threatened with extinction, some within decades, including 40% of all amphibians, 33% of marine mammals, and another 33% of shark, shark relatives and reef-forming corals.

CONCEPTUAL BASIS: WALKING AS ART

Throughout human history, walking has been a spiritual practice and a tool of inquiry. In almost all religions, pilgrimage is a form of meditation, and a spiritual and physical achievement. Beyond the ancient Greeks, we have Immanuel Kant's "the philosopher's walk" of the Enlightenment and in Heidelberg, Germany, there is a "philosopher's way" that inspired Friedrich Hölderlin's writings during the Romantic period. The relationship of reflection and walking has persisted into the modern era. In the past, walking has become a social movement: Gandhi's Salt Walk in the 1930s shook the foundation of British colonial rule, a political walking later adapted by Martin Luther King Jr. in the Selma to Montgomery March in 1965. More recently, it has becoming a tool for environmental struggles. W. Benjamin's *Arcades Project* has a far-reaching impact in art for its discussion on how walking became a poetic and mythic experience of space and society. John Dewey, in *Art as Experience*, calls for an art that is embedded in rather than "apart from human experience." Numerous artists over the course of the 20th and 21st centuries agree and have incorporated the art of walking as an artistic material embedded in life. As many other contemporary pragmatism scholars explored the spatiality and performativity of body-minds in act of walking, Michel de Certeau's book *The Practice of Everyday Life* considers the various mediation that allow certain cultural practices like walking to articulate complex, perhaps even contradictory effects:"Walking, which alternately follows a path and has followers, creates a mobile organicity in the environment, a sequence of phatic *topoi*".

Figure 1. Richard Long: A Line Made by Walking 1967.

In the domain of art, acts of walking reflect views of reality, observed and expressed through color, design, scale, and vocabulary or incidence of form. Richard Long's famous *A Line Made by Walking* photographed the trace left by repeatedly walking on grassy land. The ephemeral nature of the work assumes a philosophical, meditative and Zen-like quality. Geometries suddenly surface in such devised walks, integrating the act of walking with the act of sculpting. A human-constructed geometry has intervened in the natural landscape, invoking refection on the purpose and meaning of the one who made it. Such a line is the contemporary version of Nicolas Poussin's Et in *Arcadia Ego*. (Even in Arcadia I, Death, hold Sway)

In the domain of art, walking acts as an incompletable state of knowledge. Walking opens questions concerning the center and the periphery, the point of view, and the limits and piercing of borders and boundaries. Through a line of green dripping paint, Francis Alÿs' 2004 version of *The Green Line*, makes the 1948 armistice border in Jerusalem visible in a new way, through an individual endurance act rather than through a state imposition. The performance and its documentation attempt to interrogate the boundary's meaning and impact.

In the domain of art, walking acts as social commentary, considering hierarchical structures and embedded ideologies. Tehching Hsieh's *One Year Performance* 1981-82, in which he stayed outdoors in New York City for one whole year. Hsieh's walking, just like the figure of flâneur in Walter Benjamin's *Arcades project*, was a mundane way to elude sheltered spaces and their conventions of social interaction.

In the domain of art, walking acts as psychological/physical experience, involving dualities of subjectivity/objectivity and clarity/ambiguity, as well as poetics and emotions. Ulay and Marina Abramovic's epic 1988 walking piece *The Lovers*, chose literal and symbolic destinations: the Great Wall of China. Departing from each end of the wall, they completed the performance piece by ending their relationship upon meeting. It was a dramatic finale to a long-term personal and professional partnership.

EDUCATION FOR SOCIALLY ENGAGED ART & DESIGN

There is an interesting chiasmus between artistic and educational domains in our present moment. While educators are redefining schooling by making it more like art, artists are redefining aesthetics by making it more like school. Art has been taking a "social turn" over the past few decades, often labeled as relational aesthetics, social or contextual practice, post-studio art, community art, participatory art, and public art. Within the field of visual art, the embrace of the social is partly characterized as an

embrace of the relational. That is, personal and social encounters, exchanges and transformation become the working materials of the artist, just like paint or clay. As the famous walking artist Hamish Fulton's book *An object Cannot Compete with an Experience* has suggested, in the discourse of contemporary art, objects are displayed not only to induce contemplation, but to impart information and to provoke a different kind of awareness about how the world functions. Now social relations can be manipulated, shaped, presented and experienced to do the same.

In ancient Greece, a pedagogue was not an educator, but rather a servant who escorted a child to school. We as teachers might rethink the traditional image of the authoritarian pedant in front of the classroom, and choose an alternative model. We can become guides who accompany students on their journeys of creative and academic inquiry. The allegorical shift of the educator's role easily recalls Aristotle's "Peripatetic School"[2]. A peripatetic method, or a pedagogy of walking, therefore can be loosely framed as a series of teaching activities (lecturing, presenting, discussing, experimenting) that revolve around the act of walking (within a group). This educational strategy may help reduce the dilemma of "knowing too much and too little"[3] about our ecological problems.

Inspired by this tradition and our environmental realities, I encourage our students to get a little exercise, talk with people, and examine the environment that we live in-up close-and to explore the continuum between the university and its environs. This alternative learning experience allows knowledge and ideas to be shared through engaging with people in the know and problems in the present. It can start to shake us loose from the inertia caused by the tension between our concern for the environment and increasing demand on natural resources in the Anthropocene.

METHODS: LEGITIMATE PERIPHERAL PARTICIPATION

I teach a course called "Introduction to Ecological Art Practice" in my university, the main goal of this course is simply getting the students to react on the surrounding environmental problems, through the means of art making. This interdisciplinary course consists a couple dozens of students from both humanities and science, it adopts a pedagogy of walking. Like Rebecca Solnit's *Field Guide to Getting Lost*, this pedagogy builds on the peripatetic

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2   Legend has Aristotle lecturing while walking back and forth between the columns (*peripatos* in ancient Greek). "Peripatetic" means "one who walks from place to place extensively."

3   The contradiction between the seemingly "Knowing" all the information and statistics of the environmental problems, and "knowing" almost nothing about what the actual situation may look or feel like.

tradition by taking a decisive step outside the rooms. These pedagogies privilege the act of drifting over any straightforward pedestrian path. The trajectories of these walks emphasize the journey, not a single destination, whether it is within an institution's walls, a city's borders, or a set of traditions. Such walks resist the all-knowing, bird's eye view-from-above kind of knowledge, but stress an immediate and local awareness. Such experiences also aesthetically and philosophically favor horizontal and open-ended structures of consensus, avoiding hierarchical structures of authority. Therefore Legitimate Peripheral Participation (LPP), a form of situated learning, is a natural fit for a peripatetic process. According to LPP learning, knowledge can be passed on within a community consisting of members with different skill levels. Newcomers eventually become experienced old timers through a community of practice and collaboration. Here, I use LPP to identify learning as a contextual social phenomenon, achieved through participation in a community practice. With the help of LPP as a theoretical construct, the substance of the class became a mutual stimulating process, where experts(students with different training background) can act as a centre role in teaching as a particular issue occurred. Here, what you see, what you smell and what you sense can combine with the different scientific information, then we reconstructed a mind terrain, from which the relationality and environmental concern may merge. Therefore, walking provides an opportunity for people from different training background to have their individual take on the same physical terrain, so something magical could occur: it's not just the physicality of things, it's art, design and science collectively giving us an unique experience.

In class, the experiment of walking introduces a sense of community and the idea of the peripheral aspect. Here, the community consists of multidisciplinary students with different skill sets, and the peripheral aspect. The peripheral aspect is to alter their sense of where the lines between the center and the periphery are drawn—by re-siting the class in both natural and urban environments. In this way, students learn how art and

design can engage with the community, what sustainability might mean to both local inhabitants and artist/designers, and most importantly, how art and design might reap the educational benefits of participating in the legitimate peripheral sphere. Therefore we can initiate dialogue and organize working methods that combine art and science to develop creative solutions for shared ecological concerns. Recalling the ethos of the ancient and contemporary alternative classroom, educational efficacy is heightened by situating and experiencing encounters on sites where relevant issues and histories are palpable and pressing.

COURSE ACTIVITIES: CITY/CAMPUS HUNT AND MAPPING

Our pedagogies can help open up alternative possibilities, ideas that may privilege slowness over speed, stasis over progress, amateurism over professionalism, and experimentation over established practice. Borrowing the concept of the *dérive*[4], we asked students to practice walking in groups, to carry out:

- "City Hunt" or "Campus Hunt." Each group chose or was assigned to a certain area of the city/campus, where wandered about, guided by random environmental signals and cues: the sound of a flock of birds, smells coming out of someone's kitchen, a red balloon floating across the sky, etc.
- Over the course of the walk, participants took notes and made quick drawings in order to complete a mind map. This mind map presented all the ideas, data, and incidents that occurred during the walk. All the collected information was processed through brainstorming, divided responsibilities, and spending time together.
- Through mind maps, creative design thinking is introduced, in which interdisciplinary students, faculties and community members all can present information about various aspects of the natural and urban environment they have traversed. The presentation is a result of direct collaboration between artists and non-artists. This participatory model allows people to become more deeply invested and engaged with projects than conventional audience dynamics allow. Its lessons are relevant and apply across disciplines and demographics. Such exercises eventually developed into an interactive interdisciplinary

Figure 4. Traversing different terrains
Figure 5. Walking into an abandoned baysalt farm

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4   In the 20th century, Surrealists created chance excursions or "dreambulations" that spontaneously explored Paris and its outskirts, translating the concept of "automatic writing" into a moving, corporeal form. Later, Situationists sought to politicize the act of alternative walking, developing the revolutionary practice of the "*derive*", that more self-consciously sought to upset or resist the spatial habits of urban space to imagine new psychogeographical relationships.
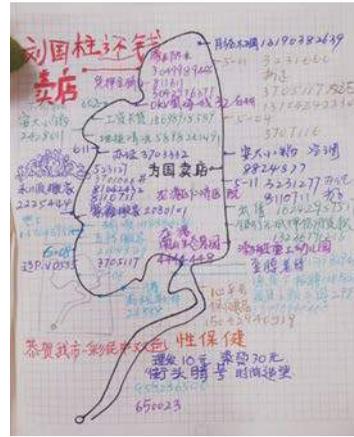
practice. The human journey is a process of "creative growth" and evolution, with movement and observation as fundamental aspects of our "unfolding" and "growing into the world."

In figure 7 and 8, a group of students collected all the phone numbers that had written or sprayed on the apartment buildings during their walk in a residential compound. All these phone numbers are contact information for small business owners or even possible scams. The students categorized these phone numbers by different line of business, then displayed them in different colors on the mind map. The dominance of health and medical related phone numbers (presented in color blue and purple) shows that the residence's well being is the biggest concern of the community.

For figure 9, in one of the "Campus Hunts", a group found that our university's simple-minded solution for the elimination of pervasive crow excrement quite problematic. For centuries, Beijing has been a traditional habitat for crows. Today, every winter, they "invade" and gather on the trees along the school's main roads. Certain areas suffer the consequences of their excretion. The school management implemented many expelling devices that automatically broadcast high frequency noises or cries of raptors among the canopy. These sounds dispel the crows, but only temporarily, or simply shift them to a neighboring site. The problem remains not only unsolved but creates a new problem of noise pollution from the constant artificial sounds. Furthermore, in an age where the need for sustainability and bio-diversity are increasingly commonly accepted, this backward, anthropocentric solution doesn't reflect the university's progressive values.

The class group working on this issue consisted of students from art, design, math, medicine and psychology. Their project

aimed to reverse the common reaction to the birds as filthy pests. The practice of walking transferred the knowledge of the negativity of this gentrifying politics of the university into an actual feeling and experience. The perceptions came out of this peripatetic experience act as multidimensional understanding of the situation. As a result and response to this experience, they re-branded the university as "Tsingcrow University,"(as a parody for "Tsinghua University") honoring the fact that crows have been here much longer than us. The artists and designers then made individualized fake student ID's for each crow by printing crow images and insignia identical to the design of real student ID's. They then left these crow ID's on sections of the road where crows have been expelled. At the same time they posted Lost & Found information on social media, to initiate a campaign to draw people's attention to the problem—both in perception and

practice. At the same time, multicolored stickers of guano were produced and distributed around campus. When picked up, the parody would make one wonder about the owner of the ID, raising issues for discussion like "Who owns the environment?", "Do humans have priority over other species?" and "How committed is our campus to bio-diversity?" As a side project, the engineers from the group, using their coding skills invented a virtual lottery system: each time someone gets hit by bird poop, they become eligible to win a lottery. And for the medicine and psychology students, they researched the living habits of the crow, figured out on the dates when maximum number of the crow can be expected. Based on their finds, the group propose a "Homecoming Day" for the students. On that particular day, at "Tsingcrow University," the lottery winners would become board members of the university for a month. The news of new board members would be posted on a parody university website.

CONCLUSION

In my walking project, several sacred cows of the art world—singular authorship, careerism, and politics of copyright—are set aside for the sake of sharing, access, and collaboration—and perhaps a more effective approach to the problem. The focus would be on the heightened senses. With the participants being put in the heightened senses, they would develop a closer relationship with the environment, and more empathy for the environmental destruction and problems. Walking would prepare them to take more actions in the future: not just acknowledging the problems on the intellectual level, but to take more actionable practices. That's why walking is an agenda of this more action oriented class. It is also an example of effective and satisfying approaches to learn through direct contact with people who are knowledgeable across disciplines such as art, design, biology, and environmental studies and through involving people who actually experience the problem and its consequences. The tactility of the different senses (the touch, the smell and the sound) one receives from the walk is hard to get simply by reading from academic reports. Eventually, the scientific understanding shared by the environmentalists/scientists, and the other set of inquiry that comes from the artists and designers would be combined, providing more specific information about the experiences during walking. In such scenario, walking is just a starting point to initiate dialogue and collaborative investigation and exploration, it's an action that will generate more actions. Such educational strategies promote and encourage interdisciplinary methods to change attitudes and develop creative solutions for shared ecological concerns.

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TRANSDISCIPLINARY COLLABORATION MEDIATED BY DESIGN: AN INITIATIVE FOR RURAL ADAPTATION TO CLIMATE CHANGE

Tropical ecosystems and their associated human communities are considered the most vulnerable to current and future increases in temperature associated with climate change (IPCC, 2018). In the tropics, it is expected that warming causes losses in diversity, rises in sea levels, increases in the incidence of vector-borne diseases, and a considerable reduction in the supply of potable water. During the last 40 years, a transdisciplinary approach to address complex environmental-societal problems has been developed and applied by academic and non-academic communities. However, connecting these two heterogeneous groups has presented considerable challenges (Jahn et al., 2012). This paper reports how design's integrative methods can be applied to address some of these challenges based on a series of research and educational interventions that researchers implemented to address problems related to climate change in rural communities in Colombia. In the paper, we show how a transdisciplinary initiative has helped to articulate rural communities and researchers in design, biology, sociology, and law. Specifically, this paper explores and proposes design-based methods to bring academics and non-academics together by leveraging the expertise of each discipline and participant involved. Our findings show how future and long-term research in climate change could use design-based methodologies to articulate various disciplines and non-academic actors. By following this transdisciplinary approach, it is possible to propose participatory adaptation strategies to mitigate the effects of climate change in rural communities inhabiting tropical ecosystems.

Keywords: transdisciplinary, climate change, design methods, rural communities, tropical ecosystems

INTRODUCTION

Tropical regions are recognized as the home of the most diverse ecosystems on earth and home for almost 40% of the planet's population. There is a broad agreement that tropical regions will be affected the most by climate change. According to the Intergovernmental Panel on Climate Change (IPCC), it is expected that warming leads to significant increases in the frequency and intensity of heat waves, drought events, and climatic anomalies in the tropics (IPCC, 2018). Current and possible effects of warming in the tropics include losses in biodiversity (Urban 2015, Beaudrot et al., 2016, Molinos et al., 2016), increases in vector-borne diseases (Campbell et al., 2015, Ogden and Lindsay 2016, Garchitorena et al., 2017), and reductions in ecosystems services (Scholes 2016). Therefore, there is a broad consensus of how climate change is affecting the tropical region negatively on its biodiversity and also on human's interactions with their ecosystems.

Scientific evidence shows how human populations in tropical developing countries will suffer drastic and harmful transformations as a consequence of climate change. In the tropics, it is expected an increase in natural disasters, such as flooding and landslides (Walsh et al., 2016; Lin and Emmanuel 2016). Natural disasters could promote migrations and reductions in water supply and food production from agriculture and fisheries (Hannah et al., 2013; Bunn et al., 2015). It is also expected that reductions in both potable water supply and nutritional wellness will negatively affect human health and countries' political and economic productivity systems (Noi 2016; Seymour and Bush 2016; Berlemann and Steinhardt 2017). Nowadays, many of the adverse social, economic, and public health effects have not been appropriately mitigated yet. Therefore, the negative impacts of climate change on tropical populations will increase the economic gap between developed and developing countries, which can reduce the possibility of the latter to address appropriately the challenges related to climate change. Overall, these effects point out the necessity of integrating different disciplines and communities for understanding climate change adequately and identifying pathways to mitigate and adapt to its effects.

The later necessity motivated a group of researchers in design, biology, sociology, and law at Universidad Jorge Tadeo Lozano to join efforts to bring academic and non-academic communities together and explore and propose alternatives for mitigating and adapting to the effects of climate change in rural Colombia. Universidad Jorge Tadeo Lozano is a private university in Colombia recognized by the tradition of its design school and its commitment to the environment, for which it positioned itself as an ideal scenario for exploring design-based strategies to address environmental challenges. As part of this joint initiative, a series

of research and educational interventions were implemented to cross disciplinary boundaries and connect with non-academic communities to address challenges related to climate change. However, bringing together these diverse communities pose in itself complex challenges at the ontological, epistemological, and methodological levels.

Transdisciplinary work often has to deal with issues such as tensions between conflicting paradigms and worldviews, uncertainty about the process and the outcomes of the work, institutional structures that poorly support inter-departmental collaboration, and the lack of a shared language (Jahn et al., 2012). To address these challenges and bring these diverse communities together, the interventions that were implemented applied design-based methodologies that, according to Mejia et al. (2018), have the potential to promote and ease transdisciplinary collaboration. These authors argue that design-based methodologies are especially well-suited to address complex challenges from a transdisciplinary approach since these incorporate mindsets, techniques, and knowledge from diverse disciplines, and involve actors from all backgrounds and profiles. In this paper, we present a synthesis of the research and educational interventions that were implemented, the role that design methods played in them, and the potential use of these methods to develop strategies intended to mitigate and adapt to the effects of climate change in rural communities inhabiting tropical ecosystems.

THEORETICAL FRAMEWORK

The interventions presented in this paper were informed and inspired by the exploration of body of literature addressing three main areas: transdisciplinary research, transdisciplinary approaches to climate change, and design for complex societal problems. These explorations are presented in the following pages.

Transdisciplinary Research

Natural and social sciences have had their major development during the last 300 years, thanks to their subdivision in different disciplines (Buchanan, 2001). However, the sub-specialization of natural and social sciences has created exclusive languages, methods, and technologies that, in turn, has led to reducing the capability of collaborative work in complex societal challenges as climate change (Steffen et al., 2006).

As a response to the challenges posed by the sub-specialization of the sciences and the incremental involvement of scientists in addressing large and complex problems, since the 1950s several

authors started discussing new integrative modes of producing knowledge. However, just in 1970, the term "transdisciplinarity" was coined at the OECD conference "Interdisciplinarity: Problems of Teaching and Research in Universities," as a way of doing research characterized by focusing on real-world problems, aiming at integrating diverse disciplinary paradigms, and involving academic and non-academic communities through a participatory approach (Gibbons et al., 2009; Hadorn et al., 2008; Jahn, 2012).

Since its inception, transdisciplinary research has explored questions regarding "life-world" problems, societal changes, and the transformation of current practices at the technical, social, legal, and cultural levels (Hadorn et al., 2008). Several lines of evidence show how collaborative work between sciences and disciplines have promoted societal problems solution. Some examples of interdisciplinary collaboration leading to science and societal developments come from military and aerospace industries, computational and cognitive sciences, and biological and environmental sciences (Etzkowitz 1986; Alcamo et al., 1996; Klein 2000; Stehr & Weingart 2000; Leemans et al., 2009; Mauser 2013).

Transdisciplinary Approaches to Climate Change

As mentioned in the introduction, the integration between different disciplines and stakeholders comes with numerous challenges. In the case of addressing the socio-environmental problems associated with climate change, these challenges to transdisciplinary research manifest themselves as an enormous lack of participation in these issues of social scientists and other academics whose activities are based on co-creation and/or co-design with stakeholders (Lahsen, 2010; Wainwright, 2010; Turnhout et al., 2012; Barnes et al., 2013; Beck et al., 2014; Carey et al., 2014 and Castree et al., 2014). Likewise, few examples of transdisciplinary and climate change adaptation initiatives show the relevance of this approach in water and food security, (Pradhan et al., 2018; Sapkota 2019), energy production (Fazey et al., 2018), and entrepreneurship (Lundgren-Kownacki et al., 2017).

Given the profound negative impacts of climate change on nature and on human populations, addressing them require the participation of all members of society and radical collaboration between researchers and stakeholders. An example of these integrative initiatives includes the "Heat Initiative" at Lund University (Sweden) that encompasses several lines of work as ecology and biodiversity, urban planning and architecture, human health, migration and behaviors, and socio-economic vulnerability and resilience (Błażejczyk & Kuklane 2018).

As in the case of the "Heat Initiative," all current climate change-related transdisciplinary studies are focused on temperate zones with some studies in tropical areas from Asia and Africa. Therefore, new transdisciplinary studies have to be developed in tropical zones, which are considered the most threatened by climate change. Likewise, future studies in climate change require a transdisciplinary scope reducing possible epistemological biases, integrating social scientist, and using alternative methodologies based on co-creation and co-design.

Design for Complex Societal Problems

In the design field, complex socio-technical and socio-environmental problems such as climate change have attracted the attention of individuals, educational institutions, and design consultancies for more than a decade, but only until recently we have seen the emergence of a series of initiatives that explicitly declare their intention to address these issues from different perspectives and approaches. For instance, Donald Norman and a group of colleagues from different universities are proposing a new approach to design, DesignX, which aims to address this kind of problems by adapting and proposing new design methods—with a human-centered approach—and by fostering radical collaboration with other disciplines (The DesignX Collective, 2014; Norman & Stappers, 2016).

Likewise, the School of Design at Carnegie Mellon University is introducing in its curricula and research program the concept of 'Transition Design' as a design approach that promotes "societal transitions to more sustainable futures" (Irwin et al., 2015), with the purpose to re-conceive systems (e.g. food, healthcare, education), policies, infrastructures, and lifestyles.

Additionally, Tim Brown (2016) recently announced that IDEO—the renown international design and consulting firm—has joined forces with the 'kyu collective' to design complex systems and tackle complex problems (e.g. poverty, healthcare, food systems, government) from a multidisciplinary and collaborative approach.

Overall, there is a tendency in the organizations and individuals at the cutting edge of the design disciplines to advocate for a transition in the role of this field towards the resolution of the most pressing and complex challenges facing humanity. The authors acknowledge the need for collaborative work to tackle these issues and highlight the capacity that design has to articulate mindsets, practices, and principles from many different disciplines.

INTERVENTIONS ADDRESSING CLIMATE CHANGE IN TROPICAL AREAS

A set of sequential interventions to inquire and analyze how academy could contribute to non-academic communities were implemented to understand the effects of climate change and explore pathways to mitigate and adapt to its effects. We worked using both learned lessons and design thinking approaches. These methodologies connect the diversity of knowledge and experiences, generating complementarity and synergy. Additionally, these methodologies facilitate the co-production of knowledge based on complementarity. As these methodologies include autochthonous knowledge, then they empower communities in what to do in particular environmental scenarios, like those associated with climate change.

Workshop "Education and Adaptation to Climate Change in Colombia"

The workshop "Education and Adaptation to Climate Change in Colombia" took place in the middle of 2018 and was intended to bring together a diverse group of participants to discuss strategies to communicate and adapt to the challenges of climate change in Colombia. Specifically, the objectives of this multidisciplinary and collaborative workshop were: (1) to evaluate how academics are transferring knowledge on climate change to novice, non-experts and/or non-academics, (2) to explore what is relevant in teaching and research on climate change, and (3) to determine what kinds of research and pedagogical strategies are necessary to inform academics and non-academics about climate change.

Figure 1. Participants at the workshop "Education and Adaptation to Climate Change in Colombia."

Context and participants

The group of participants was comprised of almost 50 undergraduate and graduate students, academics from STEM disciplines, social sciences, humanities, arts and design, and international cooperation institutes. Participants came from local and international institutions such as the Purdue Climate Change Research Center (Purdue University), Stockholm Environment Institute (SEI), Conservation International (CI), Alexander von Humboldt Biodiversity Institute (Colombia), and Universidad Jorge Tadeo Lozano (Colombia).

Methodology

The three-hour workshop was facilitated by the authors and a design instructor who guided the activity, solved questions for the participants, and collected their reflections and responses. Participants collaborated in small groups that were interdisciplinary, interinstitutional, and international composed of people from diverse origins and different levels of expertise. Methodologically, the workshop was organized as a design sprint in which participants addressed challenges related to communicating the risks and opportunities associated with climate change through the following four phases:

1. Identification of specific problems related to communicating climate change science to the general public.
2. Generation of ideas (i.e., ideation) to address the identified issues, which included tangible and intangible elements such as products, services, experiences, technologies, systems, and strategies.
3. Materialization of selected ideas (i.e., prototyping) using drawings, diagrams, comic strips, and role-play to convey the solutions to the group.
4. Sharing the solutions with the whole group by focusing on how it addressed the specific issue that each team identified and highlighting the role of a multidisciplinary approach to develop and implement the solution.

Results of the workshop

Participants focused on three main challenges to identify specific issues related to communicating climate change science to the general public: (1) educating professionals in different disciplines who are sensitive and responsive to the challenges associated with climate change; (2) transferring research findings related to climate change to non-academic organizations such as public institutions, non-governmental organizations, and industries; and (3) communicating relevant, reliable, and actionable information about climate change to the general public.

Specifically, participants discussed a variety of topics framed by these challenges and, using ideation and prototyping methods, proposed the following strategies and approaches to addressing them: (1) promote cleaner production methods in highly pollutant industries; (2) adapt scientific language so that the general public can understand it; (3) explore the uses of new media to communicate scientific information related to climate change to the general public; (4) educate rural populations about the implications of agricultural practices that harm the environment; and (5) educate urban communities about the environmental impact of current waste disposal practices on local waterways.

In presenting these strategies, participants highlighted the importance of educating young researchers in collaborative settings within cross-functional and interdisciplinary groups to promote this type of practices to address climate change and other associated environmental issues. Likewise, participants discussed the importance of approaching these issues from a holistic perspective that included and involved all types of communities and social actors. As an example of this, a group of participants proposed involving former guerrilla combatants as stewards of biodiversity. The group argued that their experience and knowledge in rural and forested areas could be leveraged to protect local ecosystems of difficult access. Additionally, participants also recognized the importance of traditional knowledge from indigenous and rural communities as a keystone for promoting adaptation and mitigation processes to climate change in Colombia.

Conclusions from the workshop

Using design thinking and working in multidisciplinary and different levels of academic experience groups, several diagnostic and feasible ideas emerged from this academic experience. It was widely accepted the necessity to work in climate change as a transversal problem to be addressed from a transdisciplinary approach. This holistic view could enable professionals and scientist to work alongside non-academic communities, from a collaborative and inclusive perspective, by adapting and opening their practices and language.

In the workshop, the use of design thinking facilitated the process of identifying the strengths and opportunities for enhancing the social and collaborative role that universities ought to have under the conditions imposed by climate change. Likewise, the use of design methods enabled us to connect and include different disciplines and non-academic communities, which is required for dealing with very complex issues such as climate change and other associated environmental issues.

Workshop "Perceptions of Climate Change in La Vega, Cundinamarca"

The workshop "Perceptions of Climate Change in La Vega, Cundinamarca" took place in the first semester of 2019 and was intended to establish the perceptions and knowledge about climate change by rural communities in Colombia, starting by exploring these perceptions in the town La Vega (Cundinamarca, Colombia). Specifically, the objectives of this workshop were: (1) to probe the perceptions of people in rural areas regarding climate change, (2) to explore how these communities perceive the effects of climate change on their context, (3) to identify actions that people in rural areas consider that they can take to reduce the impacts of climate change on their ordinary activities, and (4) to develop a common language that would allow researchers to communicate with non-academics regarding climate change.

Context and participants

The group was comprised of 45 participants who regularly attended educational events, lectures, and training sessions organized by the local Rotary Club. Most of the participants were high-school students, ranging from 15 to 19 years. The group of students was accompanied by five school teachers and by five senior members of the Rotary Club. The students and teachers mostly came from rural areas near the town of La Vega, and most of the senior members of the club came from Bogota (Colombia's capital) and other urban areas.

Figure 2. Participants at the workshop "Perceptions of Climate Change in La Vega, Cundinamarca" (Imagen: Autor).

Methodology

The three-hour workshop was facilitated by the authors and a group of four undergraduate students in environmental biology who guided the activity and worked alongside the participants throughout the workshop. Participants were organized in five groups of nine people with the support of a facilitator and, in some cases, of one of the school teachers. Methodologically, the workshop was organized as a participatory design session in which participants expressed their understanding of local problems associated to climate change and proposed actions and strategies that could be implemented by them and in their context. The workshop had the following four phases:

1. Introduction to climate change, its causes, and consequences, in which participants shared their understanding about these topics and facilitators built on top of their ideas to clarify and expand the notions expressed by them.
2. Guided discussion to identify how climate change is manifested in the local context of participants and discover how their actions and domestic activities could be harming the environment.
3. Generation of ideas (i.e., ideation) to address the harmful activities and situations that were identified in the previous phase. Also, participants identified specific actions that they could accomplish to reduce their negative impact on the environment.
4. Presentation of ideas to the whole group and feedback of the facilitators and the senior members of the Rotary Club.

Results of the workshop

In the introductory discussion, all participants agreed that climate change is associated with increases in global temperatures. However, they misidentified its causes by connecting it with the growth of the ozone layer hole. In the face of this confusion, facilitators explained the mechanisms behind global warming by avoiding the use of extremely technical language to promote students' participation and interiorization of scientific knowledge.

When discussing the local manifestations of climate change, older participants agreed in that temperature has been increasing in La Vega and in that the rainy season shortened and became unpredictable. As a consequence, the water supply became unreliable, which has affected domestic and agricultural activities. Participants reported a decrease in agricultural production, which has affected the family income, has forced them to incorporate new and more expensive processed foods that come from adjacent urban areas, and has reduced their access to fresh, affordable, and nutritious food. As a consequence, the health of children and the elderly has been impacted, the incidence of vector-borne diseases

such as dengue or influenza has increased, and the already precarious health system at La Vega is collapsing.

However, participants did not see themselves as mere victims of climate change, but they recognized that some of their activities and habits might contribute to this environmental problem. Specifically, they reported that their use of fossil fuels for transportation and agriculture, as well as their use of disposable plastic products could contribute to increasing the local effects of climate change.

As a response to these activities, participants proposed mitigation strategies that could be implemented at the individual level, as well as at the community level. They all agreed on the importance of recycling to reduce their environmental impact, but also included other strategies such as reducing the use of fires during the agricultural expansion, increasing the use of bikes for transportation instead of using fuel-based vehicles, and sharing with other members of their community what they learned in the workshop.

Conclusions from the workshop

The use of human-centered design methods in the workshop, helped us to approach rural populations in the town of La Vega (Cundinamarca, Colombia), and collect information about their perspectives on how much climate change has affected their lives and how they are adapting their activities to address these changing conditions. Likewise, these methods helped us to propose collaboratively strategies for climate change mitigation and adaptation from a transdisciplinary approach that involved the community's knowledge, needs, and expectations.

As a consequence, the use of design-based methods that involved co-creation and participatory practices, helped us to get closer to rural communities, adopt their perspective, connect with their situation, and learn about their traditions and their current possibilities of adaptation to environmental change.

NEXT STEPS

All information we collected is now the raw material for start working in mitigation processes, from a transdisciplinary perspective with communities. Together, the transdisciplinary group at Universidad Jorge Tadeo Lozano and communities could delineate strategies that promote reductions in fossil-based fuels usage and their emissions. Together we are able to propose strategies for increasing agricultural production under the challenges that climate change poses. Receiving

environmental education from communities to academics and vice versa will help to cope with the climate change challenges in a collaborative and inclusive way. Let the communities what their legal rights are is important to have their representation in the lawmaking process. All these mitigation measurements could promote adaptation to climate change according to communities' idiosyncratic reality and necessities from an inclusive and transdisciplinary way where co-production and co-creation as the design methodologies propose.

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TECHNO-AESTHETIC SPACES OF FICTION

Techno-aesthetic spaces of fiction is a creative practice-based research, which aims at the conception of an artwork that generates a poetic reflection on the relationship between the human being, technology and nature. This is shown through the process of conception and development of Lapsus Trópicus, an installation whose origin lies in the fictitious hypothesis of what would happen if a glitch -a computer error - began to transform a specific ecosystem. The research considered the conceptual, formal and technical aspects of a creative process that dialogues with references such as art, design, architecture, science fiction cinema and key historical moments in the development of science.

Lapsus Trópicus was materialized as a digital forest, an ecosystem transformed by technology; an artificial, sensory virtual world, where the symbiotic, organic and invasive, that provides an immersive experience to the spectator. The artwork gives the feeling of becoming an explorer in a world to come, to decipher the possible consequences of the Anthropocene era. A territory altered by a glitch, generated from its own means of production in which each botanical element is cloned and digitally mutated again and again towards another and more complex element. This forest aims to be the matrix between a virtual world and its simulacrum: the biologically real.

Keywords: art, science, technology, parametric design, science fiction

INTRODUCTION

Techno-aesthetic spaces of fiction is a creative practice-based research. which aims to generate a reflection on the relationship between the human being, technology and nature, through the process of conception and development of *Lapsus Trópicus*: an artwork whose origin is found in the fictitious hypothesis of what would happen if a glitch -a computer error- began to transform a subtropical ecosystem.

The synergy of concepts such as the phenomenon of "syntropy" (Fantappiè, 1941), and the "technoesthetic experience" (Couchot, 2003) marked the way for the realization of an installation that, through its poetic subjectivity, points to a reflection about the causes and consequences of human evolution through the technologies that it has created, its impact on nature and the possible consequences of the Anthropocene era.

This article aims to clarify some of the conceptual aspects derived from the formal and technical processes relevant to the creative process carried out for the conception of the artwork, which dialogue with references such as art, design, architecture, cinema, science fiction and key historical moments in the development of science.

DESCRIPTION OF *LAPSUS TRÓPICUS*

Lapsus Trópicus was developed for the El Faro de Tiempo Foundation space in Bogotá, Colombia in 2015. It consisted of a site-specific installation which stimulated the spectator's senses to reconstruct in his mind an imaginary universe that would give an understanding of the conceptual aspects of the work.
The walls of the space were extended to the ground by organic forms, like imaginary shadows of an infinite and artificial place, that by continuing through the mirrors located at the ends of the room, distorted the image of the main sculptural piece. The large piece was displaced in an invasive way through the space as a kind of mutant vegetable organism in a constant visual movement, which seems to come back out of the floor at the other end of the space, through a second sculpture that ascended like a plant in search of the light.

The experience was complemented by a soundscape[1], conceived from recordings made in a subtropical forest at the time when the daytime fauna began to give rise to the nocturnal, and the sounds to be transformed as a result of the light change. The recording was modified using as a base the genetic code of the *Light*

1   The sound design was elaborated in collaboration with Alejandro Zuluaga and Pol Moreno.

Harvesting Complex[2], which works as light processing antennas in the *Monocotyledons*[3] - botanical class of the species used for the design of the sculptural work -, in order to have a numerical base to modify the sound under the same logic of parameters of the sculptural pieces.

Each formal element presented in the work responds to a communication axis. The fluorescent bright yellow acrylic, to the photosynthesis through plastic; the artificial plywood, to the bioethics; the morphology of the spiral form, to the transformation of DNA; the concave mirrors, to the mutant duality of the *doppelgänger*[4] and its symmetrical continuity in the virtual space; the gray space as a shadow, to the infinite space of a render; and, finally, the sound as an echo of the DNA of the plants.

Figure 1. Karen Aune. Lapsus Trópicus – Installation Main piece view. Space: 153m². Medium grey painting on the wall and on the 3mm MDF, plus 16 boards of 2mm concave acrylic mirrors. Main sculpture: 95 x 182 x 1.600 cm. CNC cut on 12mm Plywood and 3mm acrylic. Fundación El Faro del Tiempo, Bogotá Colombia. 2015.
Figure 2. Karen Aune. Lapsus Trópicus: Plano. Digital Print on Hahnemühle Photo Matt Fiber paper 50 x 80 cm. 2015.
Figure 3. Karen Aune. Lapsus Trópicus – Secondary sculpture: 92 x 86 x 120 cm. CNC cut on 12mm Plywood and 3mm acrylic. Fundación El Faro del Tiempo, Bogotá Colombia. 2015.
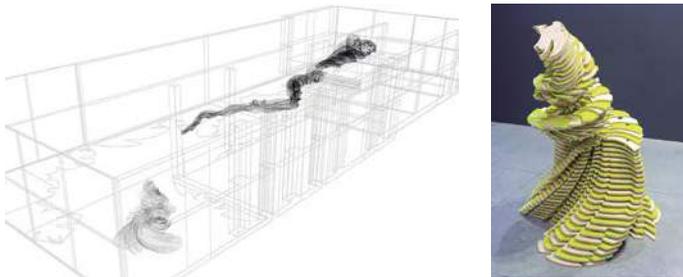
2   *Light Harvesting Complex* is a complex of pigment and protein that collects energy from light and converts it into exciton energy that can migrate to the photosynthetic reaction center where photosynthesis takes place. (Light Harvesting Complex, n.d.)

3   *Monocotyledonies* is one of the two classes of plants with flower (*Angiosperms*). They are herbaceous and belong to well-known plants, such as lilies, orchids, grasses (wheat, corn, sugar cane) and palm trees (n.d.)

4   The word *doppelgänger* means "double errant" in German, the term is used to designate any double (twin) of a person or the phenomenon of bilocation. The term is common in works of science fiction, in the form of cybergems, bots (computer programs that mimic our behavior), in this case it could be our virtual information trail (Krotoski, 2016).

BEFORE THE *TRÓPICUS*

During the last years I have developed a visual reinterpretation of problems related to the encounters between time and space: the virtual and the real, the organic and the mechanical, and the links between digital and biology. Technically, I have worked on the photographic and videographic appropriation of the pictorial, sculptural and spatial constructions of my artwork using, among other resources, design and digital fabrication to enhance the translation of the manual work to the technologies of image reproduction : from the immaterial to the material; from creation to replication; from the human mind to artificial intelligence.

Through the design of pictorial and sculptural pieces that are similar to the natural processes of repetition and procreation, the biological beings are broken down into manipulated fragments, where organs and visual elements are apparently reduced to become resources of the mind and technology. The images are appropriated and manipulated, provoking aesthetic sensations, which lead to the stimulation of the senses and emotions in a rational manner.

My research has three axes from which several questions complement each other. The theoretical-conceptual axis, which supports the visual metaphors of the work; the formal axis, through the creation of aesthetics and communicational elements coherently to the concept; and the technical axis, that implies the materialization of ideas through the experimentation of materials and technologies, and how these dialogue at an aesthetic and conceptual level in a forceful way. Therefore, it is necessary to notice the diversity of material possibilities that directly affect the form and this to the concept, and vice versa, that is, the materialization of an idea ends up having a strong repercussion in its construction; there is no rigid border between thought and materialization.

The debates on cyber and techno culture, information society, biotechnology, post-humanism, virtual worlds and digital universes, focus on the development of both technologies and cultural disciplines and are the first vanguards of the 20th century that delineate very actual problems in culture and art. Philosophers like Marshal McLuhan and Jean Baudrillard give account in their works of these debates, but also do transversal references like: from art, Patricia Piccinini, Luigi Serafini, Henrique Oliveira and Olafur Eliasson; from comics and animation, Mœbius, Masamune Shirow and Renné Laloux; from design and architecture, Philip Beesley, Nery Oxman and Hernán Díaz Alonso; from science fiction movies, David Cronenberg, the Wachowski sisters, Ari Folman and Alex Garland; and from Science Fiction Literature, Isaac Asimov, Ray Bradbury, Philip

Figure 4. Karen Aune. Neoptiks Beta – Installation view. Space: 143m2. Fluorescent acrylic paint on the walls and 3mm MDF on the floor. Main painting: oil on canvas 210 x 189 cm, plus 20 acrylic semi-spheres 45, 35, 25 y 15 cm. Museu de Arte Moderno de Bogotá, Colombia. 2010.

K. Dick and Jeff VanDermeer. These artists, from different disciplines, have imagined, built, analyzed, dreamt and feared our current techno organic realities.

What is the place of the body or the technology? How to visually interpret our life experience in an environment dominated by technologies that deterritorialize us and lead us more and more into virtuality? How fragile or immersed are we in this parallel universe that we conquer and that conquer us each day? On which side of the *Matrix*[5] do we really live?

The invention of *Lapsus Trópicus*

Since 2001, my work began to incorporate elements that displayed a kind of fusion between the organic and the numerical space, the real and its expanded replica. In 2009, some pieces began to invade the space, as if this were the continuation of a virtual universe. By erasing these limits, a conversation begins about who we are and how we experience or inhabit the world. On the one hand, we have searched for the artificial as the paradigm of perfection, on the other, we question existence itself. Since 2012, my work understands reality as an expanded virtual universe which involves the viewer in a sensorial experience that mediates learning. Thus, the metaphor of the glitch, like a numerical accident, comes to point out the consequences of our actions

on the ecosystems, through the transformation of subtropical plants that give the illusion of mutating in real time through parametrized sculptural forms in an immersive space.

Di Corpo and Vannini (2005) rescue the publication of Luigi Fantapié[6] on the syntropic phenomenon, which represents the degree of order or predictability existing in a system, contributing to the balance and organizational development, being a symmetrical principle and at the same time opposed to the entropy that is the measure of disorganization, disintegration and chaos, in which energy and information are lost to self-destruction. In other words, syntropy is a converging force that leads to life, order and diversity and is present in living systems, while entropy is a divergent force that leads to chaos and death and is also present in physical systems. There are two interacting forces: one that develops and the other that breaks. Therefore, in the process of the conception of the work I understood that what I was looking for was to create a universe where the boundaries between the species were erased and also integrate them into a technology that would complement nature instead of fragment it, in a search for the constant balance between the syntrophic and entropic processes.

The Colombian biologist Brigitte Baptiste, in a conference, spoke in a very poetic way about the relationship we have with the environment and the plants as mediators of collective actions. The biologist reflected on the knowledge of the yagé[7], among other entheogens[8], used by different indigenous cultures and referred to this as a "technology of the mind", a Phyto therapeutic innovation, an incredible invention for its neurological properties, a technology for environmental management that is part of the

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5   The use of the word matrix in the text is a metaphor for thinking about the virtual space from the point of view of the movie *The Matrix*, which is a trilogy of science fiction films directed by the Wachowski sisters (1999-2003), which narrates a world dominated by machines and artificial intelligences that feed on the connectivity of humans living in a collective illusion immersed in a virtual space known as *Matrix* (The Matrix, n.d.).

6   Luigi Fantappiè was an Italian mathematician who worked with Einstein and discovered that the causal solution is governed by the law of entropy, while the retrocausal solution is governed by a symmetric law which he called *syntropy*, combining the Greek words syn meaning convergence, and tropes, which means trend. Entropy implies the tendency of energy towards dissipation, also known as the law of thermal death or disorder. On the contrary, syntropy implies the tendency to concentrate and absorb energy, the increase of temperatures, differentiation, complexity, the formation of structures and organizations. The law of *syntropy* explains the synchronicities and how these can be considered the fundamental causality that governs life (Di Corpo, 2015)

7   The ayahuasca or yagé, is a mixture of two plants: the ayahuasca vine (*Banisteriopsis caapi*) and a shrub called chacruna (*Psychotria viridis*), which contains the hallucinogen dimethyltryptamine (DMT). It has been used for more than 5.000 years by the shamans or healers of the Amazon as a way to obtain the expansion of consciousness (Que es ayahuasca ?, n.d.)

8   An entheogen is a plant substance used in ritualistic and shamanic contexts. It has psychotropic properties and can cause a modified state of consciousness. Its effect is to move to a reality, which is perceived as more authentic than the usual world, a dimension charged with deep religious meaning and impregnated with a feeling of the supernatural (Wagner, 2010).

Figure 5. Karen Aune. Yateveo – Diptych . Image appropriation from "Land and Sea, J. W. Buel, 1887", digital print on wood, 27 x 42cm each piece. 2013.

body, because it is a substance that dissolves the ego. Baptiste made clear that the vice culture, is really the addiction to the continuous feeding of the ego as the legitimation of social relations, and the need to constantly prove success and happiness as the notion of triumph from this overflowed ego. For Baptiste, these "mind technologies" promote cooperation and interaction between people, as well as an understanding of the environment. (Baptiste, 2011)

Lapsus is the Latin word for error or mistake, which could be seen as equivalent to the term glitch in the realm of computers and videogames. While the word *tropicus* has a Greco-Latin origin that means return. It also refers to the tropical zone, as a result of the combination of the planet's inclination and its return to the sun, which results in a region that has the greatest ecological diversity of botanical species. In this way, the title of the work, *Lapsus Trópicus*, speaks of a glitch in a subtropical, biological ecosystem, but also of artificial and virtual ecosystems, where the limits between the human being and nature are diluted in this imaginary universe.

The "technoesthetic experience"

The concept of the glitch as a digital failure that alters the organization of the pixel, by being the synthesis of the image and its calculation, is complemented by the theory of the "technoesthetic experience" proposed by Couchot (2003). The author reflects on the successive changes in technology and how these have modified the modes of perception, considering that the techniques are part of a complex knowledge of the person who operates them, always carrying his brushstroke or singularity.

Therefore, this process is based on an essentially sensorial experience, where the author shares the subjectivity of the work with a technology that contributes to and modifies it perceptually.

In sum, technology is not a mere channel for the solution of a creative problem, it is a living element with which an exchange is established, because it modifies, interferes and transforms not only the final product, but also the perception of the artist, as well as the spectator's. Couchot affirms that techniques are not just means of production, but of perception, because the author as operator, controls and manipulates it, having an intimate experience that transforms his perception of the world: the "technoesthetic experience". In this way, he consider the idea of the author as a unit with technology, an ensemble that evolves in the way of doing and creating.

It is important to remember the different technologies that have been transformed over the centuries and that are now part of the tools that artists use. The introduction of optical artifacts, between 1420 and 1430 as support for the painting processes, which evolved towards the materialization of the first photographic image by Niépce in 1826; the conception of various artifacts that sought to register the movement and make tangible the invisible by the scientist Marey and the photographer Muybridge between 1872 and 1890, who evolved towards the development of cinema; the creation by Kirsch in 1957 of the first digital image; and the conception of the first computer-controlled milling machine at MIT in 1952, with the aim of making more precise the manufacturing process of parts for the aeronautical industry during the cold war, today is widely used in the creative field.

These inventions radically transformed the history of image and three-dimensional object, even though their purposes were at times distant from art. However, the way in which these technologies were manifested not only exerted a great influence on the artists, but also showed their imprint in the works mediated by them, and this was more than a technical trace, but a statement of an era impregnated with its values.

Throughout the last years, different technological tools complemented my creative process significantly. For this reason, I understood that the process of making my work is a significant part of my own technoesthetic experience, which in collaboration with this technology and its imprint, extends to the viewer, who, in turn, is able to decipher poetically the aesthetic codes implicit in the created object.
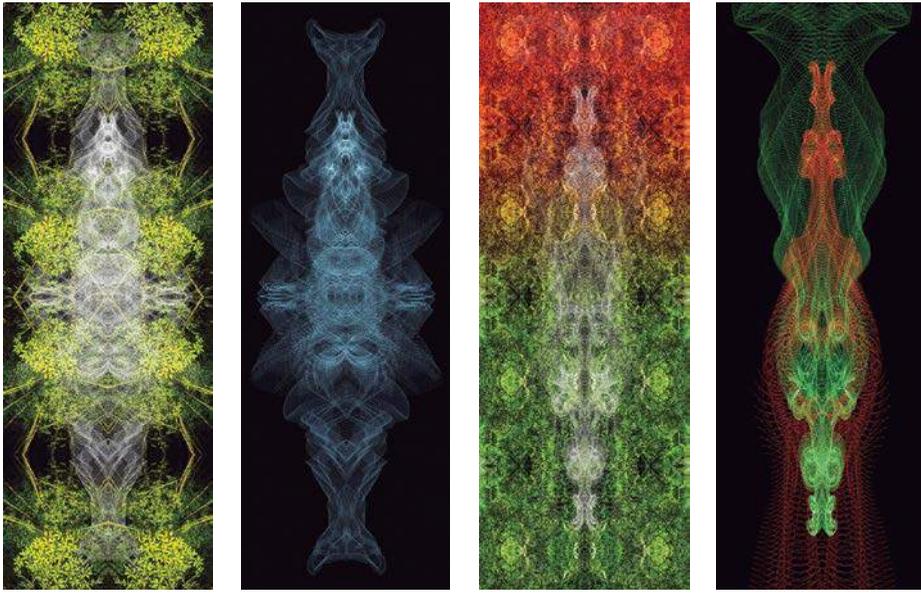
CONCLUSION

The reflection implicit in the creative process of *Lapsus Trópicus*, led me to understand how technology leaves its mark on what we create, and how the user lives an experience mediated by it. Thus, I consider that the technological effect is evident in the presence, influence and expression of technology in the contemporaneity and in how we see ourselves reflected in this imprint.

Bearing this in mind, the metaphor proposed by Baptiste is very powerful in defining the yajé as a "technology of the mind" capable of dissolving the ego, and making clear our current hyper connection to our insatiable ego, our *Matrix*.

If through the "technology of the mind", we reconnect through a "technoesthetic experience", amplifying the perception and dissolution of the ego, we would leave a different imprint on our environment, since by connecting our senses we would remember that we are part of a real world and responsible for our own reorganization and balance, our syntropy. If we allow our electronic bodies to dissolve in the virtual world of the desiring ego, the only thing we would have left would be entropy, disorganization without return.

Lapsus Trópicus seeks to emulate a learning from an entheogenic experience, by hacking the senses in order to understand in a poetic way the impact we have on nature, reminding us that we are part of it, and not merely a viewer that rationalizes its possibilities or utilities from the strange values of the

Anthropocene era, the current geological era that has suffered the impact of the activities of human beings on ecosystems.

In sum, *Lapsus Trópicus* materializes as a digital forest, an ecosystem transformed by technology; an artificial, sensorially virtual world, where a fragmented, symbiotic, organic and invasive space that provides the immersion of the viewer and at the same time gives the sensation of being an explorer in a world to come. A territory altered by a glitch, generated from its own means of production where each botanical element is cloned and digitally mutates again and again towards another more complex element. This forest aims to be the matrix between a virtual world and its simulacrum: the biologically real.

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BIOFORM – LEARNING AT THE INTERSECTION OF SCIENCE AND DESIGN

Our future designers have much to learn from the complex and highly functional systems found in nature. Creating design products that are not only human-centred but also in tune with the natural world requires our designers to be exposed to natural phenomena and scientific principles. To provide design students with a starting point, we have created BioForm: a bio-inspired design module run as part of the Product Design curricula at the National College of Art and Design (NCAD), Dublin, Ireland. The module is delivered by an interdisciplinary team of designers and scientists who expose students to biologically inspired theory and practice through a series of lectures, workshops and site visits, aimed at encouraging bio-inspiration in their design practice. The students, with their growing understanding of bio-inspiration, are then challenged to design a chair, which allows them to playfully explore form and function, and to consider its impact on their design. We hope that by encouraging bio-inspiration in students' practice they produce designs that are innovative and more environmentally sustainable. This paper reflects on the BioForm project's pedagogical approach, its impact on the student's design practice and proposes further developments for the module.

Keywords: bio-inspired design, biomimicry, product design, learning beyond the studio, design and science, cross-disciplinary team

BIOFORM – LEARNING AT THE INTERSECTION OF SCIENCE AND DESIGNS

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HISTORY MAY LEAD TO FUTURE: HOW CHINESE FIVE ELEMENTS THEORY HELP TO IMPROVE PRODUCTS' EMOTIONAL DURABILITY

This paper uses the Chinese traditional concept of Five Elements as a means of reviewing the present design in the inquiry that how the design help to keep the harmony and biodiversity of the future. China has a very long period of agrarian society in which Chinese people had developed a unique way of getting along with nature harmoniously. This oriental way of seeing the world is quite different from western scientific way, it infers that the balance of the five elements will lead to inner harmony for individuals and outer harmony between people and the nature. In this article, a model of the five elements is introduced to explain how each element is working and the relationship between elements. This model is quite enlightening to designers nowadays, because on the one hand, the model covers most factors related with modern product design, such as shape, color, smell, trend, location, etc., on the other hand, the inner and outer harmony correspond to products' emotional durability.

Keywords: emotional durability, Five Elements theory, product design, methodology, harmony

INTRODUCTION

Biodiversity is an important feature of nature, which inspires the designers to meet everyday needs in more diversified ways. However, with the rapid development of modern civilization, the ecosystem had been changed, and still being changed in a negative way at an accelerating speed. In 1960s, designers started trying to improve the situation with the viewpoint of green design, sustainable design, etc., Among these ideas of environmental materials, recycling, product life cycle, social innovation, etc., the emotional durable design emphasizes the emotional connection between user and the product, and tries to change the modern consumption mechanism [Chapman, 2014]. One of the possibilities of the relationship between product and user in emotional durable design is harmony, which corresponds to the Chinese traditional concept Five Elements. It infers that the balance of the five elements will lead to inner harmony for oneself and outer harmony between people or things. The harmony is the ultimate goal that could achieve by adjusting the relationship between the five parts. This paper uses the Five Elements as a means of reviewing the present design in the inquiry that how the design help to keep harmony and biodiversity of the future.

Oriental way of understanding the natural world

China has a very long history of agrarian society, in which the primary pattern is getting along with the nature harmoniously. Therefore, Chinese people observed the nature thoroughly and acquiesced to the nature generally, thus step by step, they had developed unique ways of understanding and interacting with the natural world. These ways include many important concepts, such as Yin & Yang (阴阳), Eight Diagrams(八卦), Five Elements(五行), heavenly stems(天干) and earthly branches(地支), Feng Shui(风水), etc., and each of the concept has a complicated inner structure, sometimes they are used separately and sometimes synthetically. In this article, only the concept of the Five Elements will be explored, with the main subject how the concept of Five Elements helps to improve the emotional durability in product design.

The concept of Five Elements (五行) first appeared in late Shang Dynasty (about 1600 - 1046 B.C.), the period from the Spring and Autumn Period to Warring States (about 770 - 221 B.C.) is crucial for the development of the Five Elements concept [He, 2013], during that period, the concept evolved from a basic idea to a comprehensive system that could cover almost anything, from actual materials to stars in the sky, from human morality to ruling a country.

Illustration of the Five Elements

The well-developed concept of the Five Elements is a dynamic system in which both the physical world and the spiritual world being classified into five interacting parts. The five parts are orderly named by five materials as follows: wood, fire, earth, metal, and water. The wood part represents plants especially trees that spreading straightly or in curves; the fire part is represented by a state of combustion that generates heat upwards; [Chung, Cha, Lee, Park, &Lee, 2017] the earth part provides a base for plants to grow, to matured, to harvest; the metal part follows the changes or transformation; the water part represents a stream of liquid that can humidify things and flow downwards. Each part doesn't merely refer to the literal name of the element, but a series of things with the same characteristic. Therefore, the extension meaning of the five parts are quite rich, take wood part for example, it represents the season of spring, the location of east, the color of green, the taste of sour, the feature of eyes, the organ of liver and gallbladder, virtue of benevolence, the emotion of sadness, etc., the rest parts are illustrated in Table 1.

Table 1. Extension meaning of the Five Elements

FIVE ELEMENTS	WOOD	FIRE	EARTH	METAL	WATER
Season	Spring	Summer	Last month of each season	Autumn	Winter
Location	East	South	Central	West	North
Color	Green	Red	Yellow	White	Black
Taste	Sour	Bitter	Sweet	Spicy	Salty
Form	Stripe or stick	Sharp	Square	Polygon	Liquid
Organ	Liver	Heart	Spleen	Lung	Kidney
Virtue	Benevolence	Manners	Sincerity	Righteousness	Wisdom
Emotion	Anger	Happiness	Anxiety	Sadness	Fear

ANALYSIS OF THE FIVE ELEMENTS THEORY AND THE EMOTIONAL DURABILITY

Comparison between Five Elements theory and epistemology of ancient Greek

As we know, Ancient Greek philosophers contributed the fundamental base for the modern science and philosophy, they have showed great interests in the origin of the natural world, and a lot of enlightening atomism came up, for example, in Heraclitus' theory the origin of the world is fire, there is a mutual transformation between fire and everything else. The series of analytical explorations lead to scientism.

However, the ancient Chinese thinkers seems show more interests in how the world is working rather than how the world is created. In the theory of the Five Elements, the world can be classified into five parts, things in each part share some common characteristics, and be represented by a typical thing, e.g. wood part. So, it is clear that, in the Five Elements theory, the world is not composed of the literal wood, fire, earth, metal, nor water. Joseph Needham believes there is no atomism in most ancient Chinese thoughts, he considers the Five Elements theory as a try to classify the specific things according to their nature, this kind of discretional thinking leads to phenomenalism. [Needham, 1990]

The relationship between the five elements

The relationship between elements is much more important than the nature of the elements themselves. Among the five elements, there are cycle of promotion(相生) and cycle of restriction(相克), which determine the main relationship between the five elements. In the cycle of promotion, elements go orderly as follows: wood, fire, earth, metal, water. That means the wood part promotes the fire part, the fire part promotes the earth part, the earth part has a promoting or positive influence on the metal part, and the metal part promotes the water parts, until the water part promotes the wood part, forming a dynamic loop. In the cycle of restriction, elements are going in order of wood, earth, water, fire, metal. For example, the wood part has a restricting or negative influence on the earth part, the earth part restricts the water part, and so on, [Ma, Jia, Guo, Gu, &Miao 2014] figure 1. Besides the two cycles discussed above, there are two more cycles in the five parts, the cycles of over-promotion(相乘) and counter-restriction(相侮), which will be effective only in abnormal circumstances.

Figure 1. The structure of the Five Elements (source: by author)
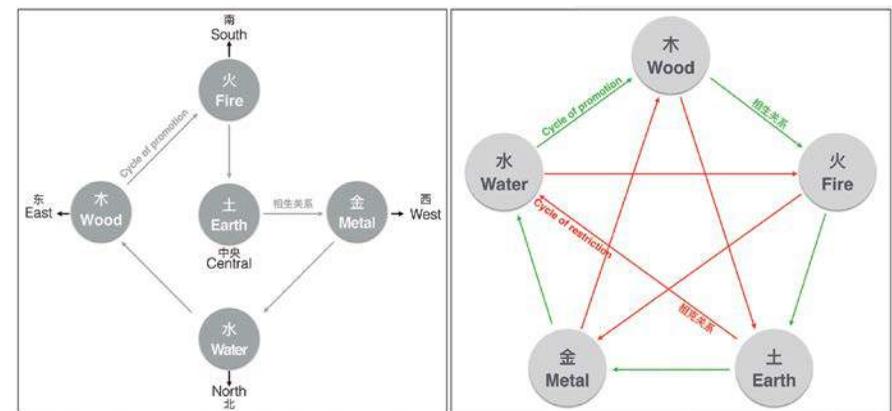
Harmony in the Five Elements and the emotional durability in product design

As mentioned above, harmony is the key word for the structure of the five elements, and the harmony comes from the balanced relationship between the five parts. There are promotional cycle and the restrictive cycle in the structure. In the promotional cycle, every part has a promoting effect on another part, in the meantime this part is being promoted to by the third part, and the promoting effect shall be appropriate, not too strong nor too week, if the promoting part is too weak, the promoted part will get too weak help to develop, if too strong, the promoted part will get over-promoted(相乘) to develop. In the cycle of restriction, the situation is the same, for example, the wood part has a restrictive effect towards the earth part, in the meantime the wood part is being restricted by the metal part. However, the restricting force should be in the right intensity, if the restricting force is too strong, the wood part will get too weak to develop, if the restricting force is too weak and the wood part previously being restricted will generate counter effects(相侮) on the metal part, which will restrict the metal part on the contrary.

Norman (2012) classified the activates of human brain into three levels: instinct, behavior and reflection, and the three levels corresponds to three aspects of design. The instinct level matches the appearance, the behavior level refers usability and experience, the reflection level refers to self-image, self-satisfaction and memories. He thought the reflection level is more related with the emotion. Through the experiments, Lacey (2009) proved that customers could accept higher price if the ceramic tableware with more emotional durability, and she believes providing a meaningful experience by different textual and form and leaving space in the design for the consumers' own interpretation are efficient ways to promote the emotional durability. In fact, commercially viable strategies should engage users on deeper and more profound levels, delivering intense and sophisticated experiences that increase the durability of relationship between users and products, people and things. [Chapman,2014] The harmony in ensemble of different materials, colors, forms could bring a lasting pleasure in sensory levels. That's as much important as a good memory related with a product.

APPLICATION OF THE FIVE ELEMENTS THEORY IN PRODUCT DESIGN

The value of the Five Elements theory in product design

The theory of Five Elements could be seen as a framework which is quite enlightening to industrial designers, because on the one hand, the model covers most factors related with modern product design, such as shape, color, smell, trend, location, etc., on the other hand, the inner and outer harmony correspond to products' emotional durability.

Application in ancient times

With the period of over two thousand years, China has developed a dedicate and sophisticated system that dealing with the relationship between humans and the natural world. Therefor this system was widely used around China in all kinds of activities, especially in important cases such as construction, marriage, giving a name, etc. The Forbidden City(紫禁城) is the imperial palace of the consecutive Ming (1368-1644A.D.) and Qing (1644-1911A.D.) dynasties. This magnificent architectural complex had been constructed under the strictest rules from the system mentioned above, and the Five Element theory is obviously included. One of the many buildings in this architectural complex is the Pavilion of the Source of Literature(文渊阁), with Chinese typical brick-wood structure, this building used to serve the function of storing books and documents for the royal families. The designers of the building applied the Five Elements theory in the fire prevention, the color of the glazed tile was designed as black, figure 2. In the Five Elements theory the color of black belongs to the water part which has restricting effect toward the fire part, in addition, the black part was placed in the higher position which will make the restricting effect more efficient. In flood prevention, stone statues of animals like cows, rhinoceros, dragons, etc., are made and put in rivers deliberately, hoping the earth-type status could restrict the water somehow. [Liu, &Hu, 2004] The same application could be seen in other wood-structure buildings, people in ancient China tend to add the patterns and

Figure 2. the Pavilion of the Source of Literature(文渊阁) (source: https://www.dpm.org.cn/explore/building/236513.html?hl=文渊阁)

small decoration that related with water or metal to the eaves. [Liu, 2013] It is easy to understand why choosing the patterns related with water, and the reason of choosing the small metal decorations is that the metal part could promote or stimulate the water part according to the Five Elements theory, and this indirect-adjust method is very important and often used.

Application in modern design

With the background of industrialization and information technology, the context of creating man-made objects is fast different from the ancient times. However Chinese and some oriental designers gradually learned the importance or the values of the traditional cosmetology. Many of them had tried to apply the Chinese traditional theory to design practice or to research it in academic way. [Liu, &Hu, 2004; Liu, 2013; Chung, etc.,2017; Zhang, 2017] A design application case of glasses is very enlightening [Zhang, 2017], this case based on the premise that different people have different combination of the five elements, and different combinations have different effects upon people, harmonious combinations will bring something positive, and the

combination could be adjusted, with a very complicated analyze regarding of the birthdate, appearance, gender, etc., it is possible to tell which element(s) should be enhanced or weaken in the combination to achieve better effects. So in this case, people could enhance certain element(s) in order to achieve a more harmonious combination by wearing glasses that particularly designed for his kind of combination. Glasses could be endowed with any characteristic of the five elements though the application of the corresponding color, shape and material according the Tab 1.

Another example is the Guan Shan incense burner from Chinese brand of Don Jon, Figure 4. The design of this incense burner has the image of mountains which represents the earth element, the material is copper which represents the metal element, in addition, the burner generates steams of smoke floating around which represents the water elements, the scented powder is from plants which presents the wood element, and the powder burns which obviously presents the fire element. As we know, the cycle of promotion goes in the order of earth, metal, water, wood and fire. The balance of the dynamic cycle endows the product with elegance and meaning.

The last example goes to taxies in Beijing China, the Five Elements theory has been applied in the taxi exterior color design process [Su, 2008]. In Beijing taxi exterior color combination, yellow is the main color, and other eight are auxiliary, in other words, there are eight kinds of color design in Beijing taxies, figure 5 is one out of eight. The design concept comes from the perspective of position in the Five Elements theory, Beijing is the capital of China, and could represent central of the China to some degree, the yellow represents the central in in the Five Elements theory, and other four colors respectively represent the four directions as showed in Table 1. However, in this case, the concept of Yin & Yang(阴阳) is considered, so each of the four color could be divided into two which are slightly different.

CONCLUSION

The Five Elements theory offers a framework of organizing different design factors to achieve harmony. The harmonious balance among the five elements will generate positive effects, which is the pursuit of Chinese people from earliest times to the present day. As discussed above, each element has abundant extension meaning, so the harmony among the five elements means the harmony between factors such as materials, forms, colors, locations, etc. These factors are also the key factors in modern design, according to Table 1, designers could use this framework as a reference.

Secondly, the Five Elements theory presents a multi-dimensional viewpoint of the relationship between human and products. A product possesses its own combination of the five elements, while it could form different new combinations with other objects or human. That means all the objects are systematically connected, the methods of direct-adjust and indirect-adjust could be applied to achieve different setups of the five elements on different purposes.

Thirdly, the Five Elements theory provides new perspective to the emotional durability in product design. Meaningful experience for users and interaction between users and products on deeper and more profound levels are valued in the emotional durability research, and the key word harmony has been introduced from the Five Elements theory to further explain the relationship between products, users and products-users.

DISCUSSION

There is a long way before the Five Elements theory becoming an easy-using tool for designers in product design. Far more research is needed, and limitation is obvious that could be concluded in at least three aspects.

Firstly, the technology background. As we know China has been agrarian society for a long time before and after the appearance of the Five Elements theory, that means the theory was created in the background without industrial technology or information technology with which modern life being glutted. Is the theory still effective or accurate in modern society? Is there any deviation?

Secondly, the location. The Chinese culture orientated in the middle and lower reaches of the Yellow River, where is named Central Plains(中原). With different longitude and latitude, or in different continents or hemispheres, it is probably needed to adjust the theory somehow, for example, in northern hemisphere, the direction of south represents warm, however it is opposite in southern hemisphere.

Thirdly, the classification of modern materials. In this theory, all the things could be cataloged into five types which are represented by wood, fire, earth, metal and the water. It is easy to classify the materials in ancient times, however it's becoming more and more confusing to have a clear classification of the modern materials, since more and more new materials are being invented.

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BATRACHARIUM – AN IN SITU PARTICIPATORY CONSERVATION AND EDUCATION PROGRAMME FOR AMPHIBIANS

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Human induced environmental change and encroachment on habitats are the major threat to global biodiversity. The has led to unprecedented rates of species extinction. Amphibians with an estimated 41% of species (8000 known species) being threatened with extinction are the most severely affected group within vertebrates.

India harbours 434 species of amphibians, which is about 5% of the global amphibian diversity. Interestingly, over 190 new species are recorded at a rate of 10 species per year from India since the year 2000. Despite such diversity of amphibians in India, the IUCN status for over 250 species are either data deficient or not evaluated, indicating a clear dearth of knowledge about habitat, population and ecology of amphibians in this country.

Conservation of amphibians requires an understanding of all these along with the participation of local people and scientists. A Batracharium is one such in-situ participatory conservation and education programme, now implemented in 3 localities in the Western Ghats of India. This paper discusses about the idea, participation and changes in perception due to the implementation of Batracharium.

Keywords: Frogs and Toads, Biodiversity, Design, Western Ghats, India

INTRODUCTION

Frogs, toads, caecilians and salamanders are collectively called amphibians due to their dual life style (Gk: Amphi-dual; bios-life). They are the first four limbed animals to set foot on land about 360 million years ago (Duellman and Trueb, 1994). Currently, there are over 8000 species of amphibians in the world (Frost, 2019), with a third of them are facing the threat of extinction. The reasons for global amphibian decline are many and complex. The key factors include rapid urbanization, changes and degradation of habitats, global climate change, chemical fertilizers and pesticides, invasive species and infectious diseases (Collins and Storfer, 2003; Stuart et al., 2004). With such large number of species amphibians, diverse life histories and equally complex reasons for decline, conservation of amphibians needs to be innovative and integrated approaches (Dodd Jr., 2010).

India harbors about 434 species (5% of the total) of amphibians belonging to three orders namely, anura, gymnophiona and caudata. Among them 17 are critically endangered, 33 are endangered, 24 are vulnerable as per IUCN status. However, for over 260 species, IUCN status is unknown. Interestingly, over 190 new species are recorded at a rate of 10 species per year from India since the year 2000. This is a clear indication that priority for conservation of amphibians in India is comparatively lesser than taxonomic and phylogenetic research (Gururaja et al., 2014).

Although there are many conceptual frameworks available for amphibian conservation that encompass landscape dynamics and long term planning (Lindenmayer et al., 2007; Gardner et al., 2007), but it has to be an adaptive management approach to cater to the needs of a particular region. Batracharium is a novel *in-situ* conservation plan was first developed in a protected area called Kali Tiger Reserve, Karnataka State, India (Gururaja and Ramachandra, 2012), however, it never got implemented due to various reasons. The initial plan was to identify few localities within a protected area and designate these localities for frog watch based on available species of the area. It was proposed to have a few sign boards on ground that can clearly depict the available species, details of seasonality and the type of area, where the frog occurs.

OBJETIVES

In the present study, there were three key factors namely, 1. Conservation of amphibians outside protected areas, 2. Involvement of people (citizen scientists) in amphibian conservation and education and 3. Seasonality and diversity of species have molded a new approach to amphibian conservation.

Protected areas are generally meant for mega-fauna or charismatic species like tiger, elephant or rhinoceros. Lesser-known species like amphibians, though considered as "canaries of a coal mine" are either ignored getting specific focus on conservation or generalized in large schema of things like protecting a large area. In addition, getting permits to work in the protected area consumes a lot of time (few months to several years). There are large tracts of natural habitats outside protected area, which have equal potential for conservation efforts. Hence, it was planned to work outside protected area for both ease of transaction as well as to include large private tracts into conservation areas.

There is a great need to involve people (citizen scientists) in conservation programmes as scientists themselves are not enough for conservation in action. This poses a great challenge as people need to get educated and trained about the species in focus. Batracharium was planned to cater this particular need of educating and training people about amphibians.

Finally, the owners of private lands (in the present study all three private land owners provide boarding and lodging facility for tourists and visitors) had no activities for visitors during rainy season (monsoon, from June till September with an annual rainfall ranging from 2500-7000 mm of rainfall). Rainy seasons are breeding time for amphibians and hence seasonality of amphibians were seen as an opportunity to engage with people about amphibians.

This paper discusses about the evolved Batracharium from its original plan, implementation, involvement of people and changes in their perception considering the above aspects.

Study area

Three private owned landscapes were chosen for the study. All of them fall within geographic boudnary of the Western Ghats of Karnataka State, India between 12.219-13.226°N and 75.143-75.661°E, with elevation between 250-1200m asl. Three localities are Hotel Taj, Madikeri (Figure 1); Mannapaapu Mane, Mala (Figure 2) and Honey Valley Estate, Yavakapadi (Figure 3).

Methods

Amphibian surveys were carried out between 1800-2300h. A time constrained (1-person hour each) visual encounter survey is adapted for amphibian survey (Heyer et al., 1994) in different habitats of each locality. Amphibians were searched by two people using torch lights in all possible microhabitas (small pools, puddles, crevices, below rocks/boulders, streams, edges, bushes/shrubs, tree barks, bamboo cavities, leaf litter, dead wood

logs and so on). Two to three surveys were conducted in each locality during March, May and July of 2016-18. On observing a species, it was identified using standard keys (Gururaja 2012) and photographs were taken. In addition to visual encounter surveys, bioacoustical recordings of amphibians were made using Zoom H1 handheld digital voice recorder. Sound records were made at 44kHz and 16bit rate. Latitude and longitude records were noted along with species observation.

Frog trails were marked using Google Earth® and QGIS ® ver. 3.6. These trails were based on species observed, frequency of occurrence and micro-habitat conditions. Please refer to Figure 1, 2 and 3 for frog trails in the study area.

Conservation education materials were developed exclusively for Batracharium covering the aspects of amphibians and their

importance in daily life, definition of batracharium, available species of the region, their description and photographs, how and where to see amphibians, ethical aspects while photographing amphibians and how to prepare oneself for frog walks. At least two frog walks were conducted in each region with citizen scientists.

RESULTS

A context map explaining the core ideas and spatial position of Batracharia is provided in Figure 4.

India's first Batracharium was set up in a private owned 5 star Hotel Taj, Madikeri. It was inaugurated by an esteemed guest to their hotel. Figure 5 illustrates the signboards and micro-habitats of batracharium.

As an improvisation over installing signboards, both at Honey Valley Estate and Mannapaapu Mane, frog trails and spots are shown only in the booklet and not on a physical space. One of the reason being that the signboards are complete distraction in natural environment. This is well received in both the places. Figure 6 depicts people involvement in Frog Trails at Honey Valley Estate.

Table 1 lists the species recorded from all three localities. There were 39 species of amphibians recorded during the study,
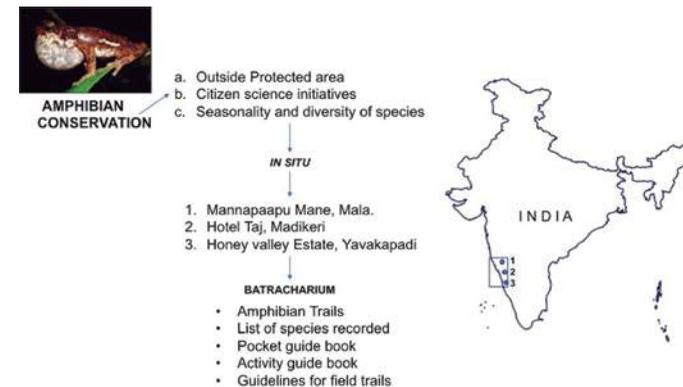
belonging to 9 families. IUCN Red List Assessment (Ver 3.1) was used to categorize a species as CR-Critically Endangered; EN-Endangered; VU-Vulnerable; NT-Near Threatened; LC-Least Concerned and DD-Data Deficient. Presence of a species exclusive to the Western Ghats are considered as endemics and species that are non-exclusive to the Western Ghats are considered as non-endemics. Habitat of adults are classified as A-Aquatic; T-Terrestrial; SA-Semi-aquatic and AR-Arboreal. Based on predominant micro-habitat and species availability, trails were marked. In Honey Valley Estate, there are two trails, Malabar Gliding Frog trail and Grandis Trail, named after predominant species of the trail. Among the 39 species observed, 34 species are endemic to the region. 2 species are Critically Endangered and 7 are Endangered species. There are three terrestrial, 7 aquatic, 16 semi-aquatic and 13 arboreal species. Each of the species observed were unique and description of the species alone is a great engaging activity. Occurrence of all four habitat specific species also indicates importance of landscape of the region.

The photographs collected during the field visits are collated and produced as a small pocket guide book for visitors (Figure 7 and 8). An ineractive handout was made for school children (13-16y old) that covers fun related activies of watching and observing frogs.

Reception from participants: Visitors at the Taj were mesmerized by diversity of amphibians observed along the two nature trails

Figure 7. The pocket handbook on frogs of a Batracharium at Honey Valley Estate
Figure 8. Inside pages of the pocket handbook on frogs of a Batracharium at Honey Valley Estate

FAMILY	SPECIES	IUCN	ENDEMISM	HABITAT	HTM	MPM	HVE
BUFONIDAE	Duttaphrynus melanostictus	LC	NE	T	+	+	+
	Ghatophryne ornata	EN	EN	T			+
MICROHYLIDAE	Microhyla ornata	LC	NE	SA	+	+	
	Microhyla sholigari	EN	EN	SA	+	+	+
	Uperodon triangularis	VU	EN	T	+		+
MICRIXALIDAE	Micrixalus elegans	DD	EN	SA	+		+
	Micrixalus saxicola	VU	EN	SA	+	+	+
NYCTIBATRACHIDAE	Nyctibatrachus minimus	DD	EN	A	+		+
	Nyctibatrachus kumbara	DD	EN	A	+		
	Nyctibatrachus grandis	DD	EN	A			
	Nyctibatrachus kempholeyensis	DD	EN	A	+	+	+
	Nyctibatrachus sanctipalustris	EN	EN	A	+		+
DICROGLOSSIDAE	Minervarya granosa	DD	EN	SA	+		
	Minervarya mudduraja	DD	EN	SA	+		+
	Minervarya caperata	DD	EN	SA	+	+	+
	Minervarya sahyadris	EN	EN	SA	+	+	+
	Euphlyctis cyanophlyctis	LC	NE	A	+	+	+
	Euphlyctis mudigeri	DD	EN	A	+	+	+
	Hoplobatrachus tigerinus	LC	NE	SA	+	+	
	Spaherotheca breviceps	LC	NE	SA	+		
RANIDAE	Indosylvirana intermedius	DD	EN	SA	+		+
	Indosylvirana montanus	DD	EN	SA	+		+
	Clinotarsus curtipes	NT	EN	SA	+		
RANIXALIDAE	Indirana tysoni	NE	EN	SA	+	+	+
	Indirana gundia	CR	EN	SA	+		
RHACOPHORIDAE	Raorchestes anili	DD	EN	AR		+	+
	Raorchestes ochlandrae	DD	EN	AR			+
	Raorchestes luteolus	DD	EN	AR	+	+	+
	Raorchestes tuberohumerus	DD	EN	AR	+	+	+
	Raorchestes charius	EN	EN	AR	+		+
	Raorchestes chromasynchysi	DD	EN	AR	+		
	Raorchestes glandulsosus	VU	EN	AR	+		+
	Pseudophilautus wynaadensis	EN	EN	AR	+	+	+
	Raorchestes ponmudi	CR	EN	AR	+		
	Raorchestes nerostagona	LC	EN	AR	+		+
	Rhacophorus malabaricus	LC	EN	AR		+	+
	Rhacophorus lateralis	EN	EN	AR	+		+
	Polypedates occidentalis	DD	EN	AR	+		+
ICHTHYOPHIIDAE	Ichthyophis kodaguensis	DD	EN	SA	+		+

Note: HTM – Hotel Taj, Madikeri; MPM – Mannapaapu Mane, Mala and HVE – Honey Valley Estate, Yavakapady.

Table 1. Amphibian species of the three study sites

Figure 9. Author explaining the use of book to the Owner of Honey valley estate.

within the property. They were ably led by Nitin, naturalist. Frog find App is currently being used to support the visitors. However, there is a request for customized booklet or handbook for Taj, which is in preparation.

Visitors at Honey valley have expressed their satisfaction about content given in the handbook (Figure 9). The design, content, preparedness and maps are very well received. Earlier, owner of Honey valley used to send staff member to support the visitors during frog walk and now after the handbook, visitors pick the batracharium handbook from dining area and do the frog trails on their own. Visitors report their findings to the owner of Honey valley.

Mannapaapu mane too has requested for a customized booklet for their region. So far the frog trails have brought in interest and requests for more frequent frog walks in the region.

CONCLUSION

Batracharium was conceived as a simple design intervention towards engancing people, educating and training towards amphibian conservation. However, with species diversity and based on the requirement of private landscape owners, Batracharium evolved in to more inclusive, non-distructive conservation design. Though, it appears to be a species oriented conservation with 39 unique species, in fact, it is a landscape related conservation. There are species that occurs on trees, in streams, and on land/wáter. Batracharium also helped in adding more landscape to protected area network, though it is a small portion but a significant contribution. Similarly, owners of these areas are now proud of Batracharium for being able to contribute to conservation as well as becoming a hotspot of amphibian conservation. Over 100 people have visited these three places exclusively to look at frogs. Their feedback clearly shows a marked change in their approach towards amphibian conservation. Over a period of time, I hope to implement Batrachariums in many places to cover larger areas for Indian amphibian conservation along with education.

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EXPLORING THE BENEFITS OF NATURALLY COLORED COTTON FOR FUTURE DESIGN SOLUTIONS

In the present scenario, there is a growing need for eco-friendly and protective clothing. Considering rapid exploitation of natural resources has led to global warming. Any Fabric made from eco-fibers is the need of the hour .This has provoked many cotton workers to develop eco-friendly and organically cultivated cotton and this has led to the revival of naturally coloured cotton in the recent years. Naturally coloured cotton has the potential to be a viable alternative to the environmentally hazardous synthetic colour dyes therefore lead lesser steps of chemical wet processes. Naturally coloured cotton has various advantageous properties owing to its uniqueness such as UV protection and higher fire resistance than conventional white cotton. All these properties of naturally coloured cotton are attributed to the presence of colour pigment and high content of heavy metals. In the recent past it has not gained popularity due to its limited and dull color palette at the same time high fiber cost. The study aims at experimenting with enhancing the intensity of available colours using natural mordants thereby broadening the design possibilities for the designers. This treatment with mordants has a scope of also imbibing herbal properties in the selected naturally colored cotton. Hence the above research targets at exploring design possibilities using nature friendly practices.

Keywords: Naturally coloured cotton, Eco-friendly, Natural mordants, Design solutions, Herbal textiles.

INTRODUCTION

All textile products exported today have to undergo expensive tests for the prohibited textile dyes and abilities. Fashion is a $2.5 trillion industry and is the second most polluting industry on Earth after oil (Vogue 2015) N.B. many synthetic fabrics are made from petro-chemical derivatives. An estimated 17-20% of industrial water pollution comes from textile dyeing and treatment and an estimated 8,000 synthetic chemicals are used throughout the world to turn raw materials into textiles, many of which will be released into freshwater sources (The Guardian, 2012). Processing of a conventional fiber in itself creates environment pollution. Therefore to meet the challenges of clean processing and current ecological requirements, an eco-friendly technology for manufacturing of eco fibers is the need of the hour. Eco fibers are the answer for green consumerism. For ecofriendly fibers, a cradle to grave approach is essential to control right from growing/ manufacturing of fiber to their disposal. For example, organic cotton and naturally coloured cottons provide some solution with minimal usage of artificial fertilizers and pesticides and eliminating the dyeing process, respectively (Bala and Bhatia 2002). Energy consumption and water usage in the textile industry in general and particularly in dyeing and finishing process are very high and costly. By saving energy and water, the textile industry can not only save a lot of money but also help to slow down climate change. After fiber production the dyeing and finishing sector is the largest energy and water consumer in the whole textile chain and has the highest potential for energy and water savings and efficiency improvements. Today the consumer is much more environmentally conscious than ever, therefore environmental friendly products are an important factor for success in the market. Naturally coloured cotton has the potential to be a viable alternative to the environmentally hazardous synthetic colour dyes as it eliminates the need for the dyeing and finishing steps, so less detrimental to the environment. At the same time naturally coloured cottons have some very important inherent properties owing to its uniqueness such as, UV protection, high fire resistance and higher insect resistance than conventional white cotton. However in the recent past it has not gained popularity due to its limited and dull color palette, shorter fiber length at the same time high fiber cost. The present study aims at experimenting with enhancing the intensity of available colours using natural mordants thereby broadening the design possibilities for the designers. This treatment with mordants has a scope of also imbibing herbal properties in the selected naturally colored cotton. Studies have already been conducted to develop range of colours in naturally coloured cotton using chemical treatments. However considering the hazardous and toxic effects of chemicals, this study was aimed at exploring mordants on naturally coloured cotton using non-toxic plant and mineral

sources. Mordants play a vital role while dyeing with natural dyes on any fiber. There are few natural mordants which are rich in tannins which increases its affinity for cellulosic fibers (Singh et'al 2017). Natural materials that contain tannin such as pomegranate, tamarind, catechu and myrobalan etc. do not need an additional tannin mordant. Some of these tannic acid rich sources may also contain dyes, and so this may affect the resultant colour after dyeing has taken place, resulting in darker and less brilliant colour (Bohmer, 2002). Since naturally coloured brown cotton gets its colour from the tannin present in the lumen of the fiber (Hustedt and Crews, 2005) , the selection of mordants for this study was done keeping in mind the presence of tannins in the selected mordants. Tannin as a mordant especially in combination with alum, can provide a greater colour range with more successful results on most vegetable fibers. Alum being safest mordanting treatment was therefore selected to be applied in combination bath with the rest of the chosen plant mordants as a second mordant. The research has been carried out keeping in mind the impact it will have on the biodiversity. Not only the outcome is sustainable to be used by the consumer, the left over bath of the natural mordants and natural dyes is also nutritious for any plantation and is completely safe to go in the drainage.

METHODOLOGY

METHODS	MATERIALS	
1. Sourcing of Naturally coloured cotton yarn	Naturally brown coloured cotton (Taffy, pantone-14-0940) hand spun yarn from Mahem, Rohtak, Haryana was sourced and used for the study.	
2. Selection and application of selected mordants on naturally coloured cotton yarn	A) Various natural mordants used for the study are listed below. All mordants were used in the form of extracts except onion peels. 1. Myrobalan (Terminalia chebula) 2. Catechu (Senegalia catechu) 3. Tamarind (Tamarindus Indica) 4. Pomegranate (Punica granatum) 5. Madder (Rubia Cordifolia) 6. Onion peels (Allium cepa) *Recipe*: Mordant : 15% owf MLR : 1:40 Temperature: 95-100 oC Time: 2 hours boil on low flame The bath was neutralized before dipping the yarn samples in the mordant bath. The samples were dipped inside the mordant bath for 24 hours after boiling. • For Mordanting with onion peels, first the colour was extracted through boiling onion peels in water for one hour, and then after straining the water the yarns were dipped in the mordant bath for 24 hours.	B) The above listed mordants were also applied to naturally coloured cotton yarn in combination with alum in the same bath. *Recipe*: Mordant-1: 15% owf Mordant-2: 15% owf MLR : 1:40 Temperature: 95-100 oC Time : 2 hours boil on low flame The bath was neutralized before dipping the yarn samples in the mordant bath. After 2 hours of boiling the samples in the mordanting bath, the samples were dipped inside the mordant bath for 24 hrs. The change in colour strength due to the mordanting procedures was measured instrumentally using the CIELAB coordinates for Lightness L*, Chroma C*ab and Hue Hab (AATCC Evaluation Procedure 7-2008). Colour strength of samples was expressed in K/S values using CIE 1976 L*a*b colour space equation.

METHODS	MATERIALS
3. Assessment of colour strength after mordanting	The change in colour strength due to the mordanting procedures was measured instrumentally using the CIELAB coordinates for Lightness L*, Chroma C*ab and Hue Hab (AATCC Evaluation Procedure 7-2008). Colour strength of samples was expressed in K/S values using CIE 1976 L*a*b colour space equation.
4. Assessment of Fastness Property	Test 3 (IS: 764-1979): After the wash fastness test, the samples were rated on grey scale for change in colour and staining.

RESULTS AND DISCUSSION

Selection and application of selected mordants on naturally coloured cotton yarn

All mordants were selected on the basis of high tannin content. Tannins are present in many natural plants and are considered as natural mordant in itself (Rebecca Desnos, 2017). The following mordants were selected to be applied on the naturally coloured cotton yarns and there colour strengths were compared with the control naturally coloured cotton yarn using k/s values.

Tamarind

Tamarind seedpods and their seeds contain around 20% tannin (El-Siddig *et al* 2006, 18). Tamarind has antibacterial properties that can help protect skin from infections. It also has potassium that is useful for someone suffering from hypertension and cardio vascular deseases. It was observed that tamarind as a single mordant displayed lesser colour strength (k/s- 3.59) than the control naturally coloured cotton yarn (k/s- 3.73). However Tamarind in combination with alum showed higher colour strength (k/s- 4.33) than control sample.

Fig 1. Tamarind plant
**Fig 2.** Mordant treatment with tamarind
Fig 3. Colours achieved
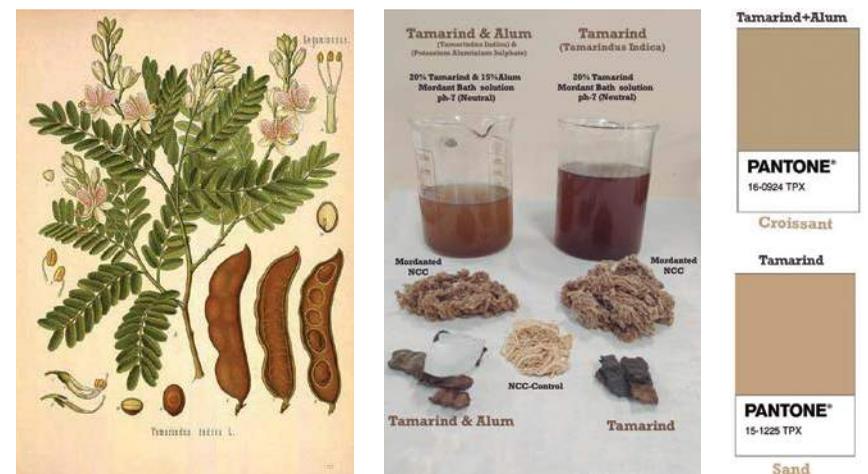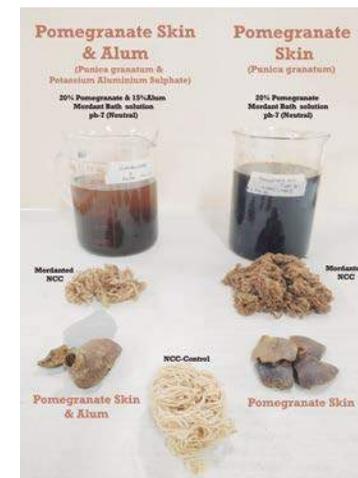
Myrobalan

Myrobalan has tannin content of 30-40 percent (Singh et'al 2017). Myrobalan is a mordant category of dye in natural dyes and gives yellow, khaki and gray colour. It has a property like anti-septic, anti- inflammatory, cures wounds and ulcers and anemia as well as brings a luster and shine to the skin (Jyotirmai, Panda, 2016). It was observed that Naturally coloured yarns when treated with Myrobalan alone and in combination with alum, displayed higher colour strength than control sample (K/S=3.73). K/S values of yarns treated with myrobalan alone were observed to be higher (7.02) than the values of yarns treated in combined mordant bath of myrobalan and alum (5.80).

Pomegranate

Pomegranate has tannin content of 26 percent (Singh et'al 2017). It is a mordant category of dye in natural dyes. It gives yellow, khaki and grey colour and changes with the pretreatment auxiliary in the process of dyeing. Fabrics treated with pomegranate impart many medicinal effects like antibacterial and antiviral. The plant being rich in tannin, acts as an effective astringent. Pomegranate when applied alone as mordant on naturally coloured cotton showed higher colour strength (k/s- 8.19) than in combination with alum (k/s- 4.20). However both the mordant treatments resulted in higher colour strength than the control sample (k/s- 3.73).

Catechu

Catechu has tannin content of 57 to 60 percent. It's mainly cultivated in India. Catechu treated fabric imparts many medicinal effects when worn in close proximity to skin. Due

to its antimicrobial properties, it helps to treat pimples and controls diabetes. Due to presence of toxifolin it has anti- viral, anti-inflammatory and anti-oxidant properties (Jyotirmai, Panda, 2016). Mordant Treatment with catechu alone displayed higher colour strength (k/s- 5.33) than in combination with alum (k/s- 4.23). Both the treatments resulted in higher colour strength than the control naturally coloured cotton yarn (k/s- 3.73).

Onion peel is rich in tannin content. Onion peel husk is a good source of antioxidants, helps reduce inflammation. Onion peels when applied in combination with alum displayed the best results out of all samples in terms of colour strength (k/s- 25.02). Onion peel alone gave the second best results in k/s values (k/s- 19.44).

Fig: 13 Onion root Plant
Fig: 14 Mordant treatment with Onion
Fig: 15 Colours achieved
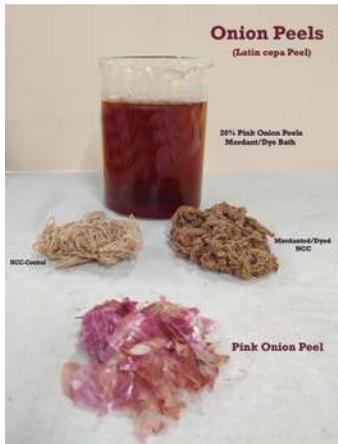
Onion Peels

Onion peel is rich in tannin content. Onion peel husk is a good source of antioxidants, helps reduce inflammation. Onion peels when applied in combination with alum displayed the best results out of all samples in terms of colour strength (k/s- 25.02). Onion peel alone gave the second best results in k/s values (k/s- 19.44).

Madder

Madder also known as rubia cordifolia is a natural dye extracted from roots and rhizomes of the plant and it is a mordant category of dye in natural dyes. It gives red, pink and orange colour. It has antimicrobial, astringent and antimicrobial properties. It removes blood impurities and cures various skin diseases. Madder alone and in combination with alum displayed comparative results with marginal difference in strength with k/s values of 5.47 and 5.09 respectively. However the colour strength achieved in both treatments was higher than the colour strength of control naturally coloured cotton yarn (k/s- 3.73).

Fig: 16 Madder Plant and roots
Fig: 17 Colours achieved
Fig: 18 Mordant treatment with Madder
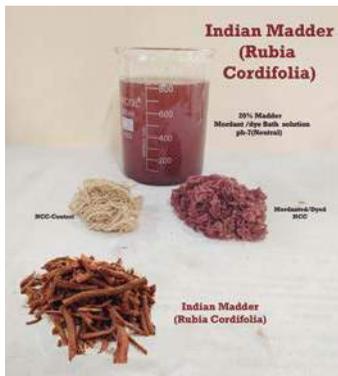
Assessment of colour strength after Mordanting

The samples were assessed for change in colour strength after mordanting with single natural mordant and in combination with alum as a second mordant. It was observed that Mordanting treatment resulted in change in colour of the naturally coloured cotton yarns with all the mordant types. The results for all the samples were compared with the control sample.

TEST PARAMETERS	COLOUR STRENGTH COMPARISON VALUE WITH CONTROL SAMPLE
Values	K/S value (Absorbance) at 420 nm
Control Sample	3.73
#1400 (Tamarind)	3.59
#1399 (Tamarind+Alum)	4.33
#1404 (Myrobalan)	7.02
#1401 (Myrobalan+Alum)	5.80
#1406 (Pomegranate)	8.19
#1397 (Pomegranate +Alum)	4.20
#1403 (Catechu)	5.33
#1398 (Catechu+Alum)	4.23
#1405 (onion peels)	19.44
#1408 (Onion Peels with alum)	25.02
#1407 (Madder)	5.47
#1402 (Madder+Alum)	5.09

Table 1: Effect of Mordanting on K/S value on Naturally Coloured Cotton yarns
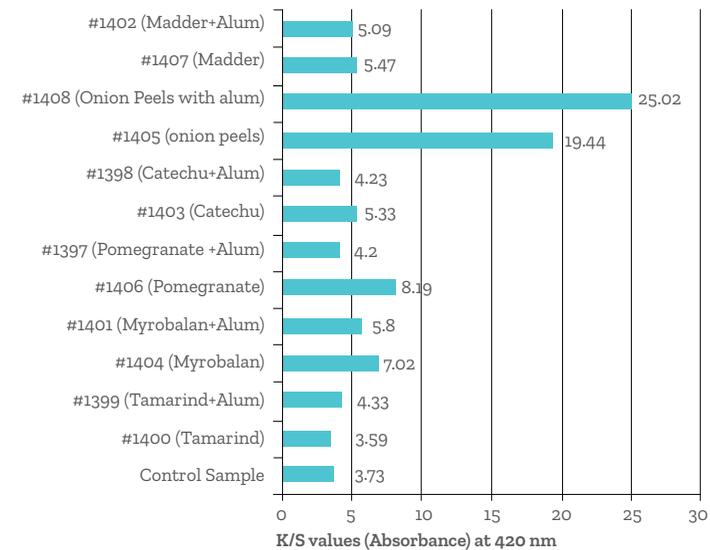
Fig: 19 Comparative analysis of colour strength using k/s values of treated and untreated samples

Results tabulated in table number 3.1 showed that onion peels with alum gave the best colour strength value out of all the mordanted samples. It was followed by onion peels alone, pomegranate, myrobalan, myrobalan+alum, madder, catechu, madder+alum, tamarind+alum, catechu+alum, pomegranate+alum and tamarind. Tamarind gave the least colour strength amongst all the mordants. It displayed lesser colour strength than the control naturally coloured cotton yarn.

Assessment of Wash Fastness Property

After the wash fastness test, the samples were rated on grey scale for change in colour and staining. The results for wash fastness for staining are given in table 3.2.

Table 2: Colour fastness to washing of mordanted naturally coloured cotton yarns

S.No.	BATCH No	CHANGE IN COLOUR	STAINING ON WHITE CLOTH
1	1400 (Tamarind)	5	4
2	1399 (Tamarind + Alum)	5	4/5
3	1404 (Harada)	3/4	4
4	1401 (Harada+Alum)	3/4	4/5
5	1403 (Catechu)	4/5	4/5
6	1398(Catechu+Alum)	4/5	3
7	1406 (Pomegranate)	4	2/3
8	1397 (Pomegranate+Alum)	4	4/5
12	1407(Madder)	2	3
9	1402 (Madder+Alum)	2/3	2/3
11	1405(Onion)	2	4
12	1408(Onion+Alum)	1	4/5

Wash fastness of the mordanted naturally coloured cotton yarn samples to staining gave satisfactory results. Tamarind+Alum, Harada+Alum, Catechu, Pomegranate+Alum, Onion+Alum displayed good rating (4-5) for staining. Madder treated samples resulted in moderate staining with a rating of 2-3.

Wash fastness to change in colour of samples treated with onion peels was observed to be poor with a grey scale rating score of 2 (for onion alone) and 1 (for onion+alum). These samples were then tested for colour fastness to hand washing. The results displayed with hand washing were good with a rating of 4-5. So it is recommended to hand wash the products made with onion peels treated naturally coloured yarn. However there is scope of fixing this colour with some treatment in future studies.

CONCLUSION

Naturally coloured cotton is a natural fiber that is better for earth, easier on resources, creates less pollution and is healthier for consumer. Though fast fashion is no match for the expansion of organically coloured grown cotton, it is still promising to see natural eco-friendly textile being re- born because of few designers and scientists working behind making this fiber commercially more successful in the market. Few international designers like Joao Pimenta, Christi Johnson have already worked with naturally coloured cotton and showcased their work in fashion weeks. But one of the limitations of dull colour pallet still exists. Therefore the present study was conducted to experiment with application of natural mordants on naturally coloured taffy brown cotton yarn to explore future design possibilities. Mordanting of naturally coloured cotton yarns with natural mordants resulted in change in colour of the yarn. It was observed that onion peels when applied as single mordant and in combination with alum displayed the best results in terms of colour strength. However the colour fastness to washing of the onion peels treated sample was observed to be very poor in change in colour of the mordanted sample. This limitation of the mordant can be worked upon in future studies for fixing of the colour. Since these samples showed very good results in colour fastness to hand washing, it is recommended to hand wash the products made out of onion peels treated naturally coloured cotton yarns. It was observed that other mordants like catechu,

Fig 20: Pantone shades of colour palette achieved
Fig 21: Mordanted yarns woven into hand tapestry: Showing different hues

myrobalan, pomegranate and madder showed very good colour strengths. Tamarind treated samples displayed the least colour strength out of all the mordants. All the samples treated with various mordants were woven into a hand tapestry to compare the pallet achieved. Future design solutions can be explored using combination of weaves, knits and textured surfaces. There could be a separate international trend forecast for naturally coloured cotton in terms of colour pallet which the designers and design students can follow in their practices. There could be a niche collection for fashion and interior textiles made out of these mordant treated naturally coloured cotton yarns.

ACKNOWLEDGEMENT

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BUILDING A BIODESIGN CURRICULUM

This paper explores the pedagogical approaches and collaborative team outcomes of courses developed at Parsons supporting participation in the Biodesign Challenge (http://biodesignchallenge.org/). Bio-informed/based technologies and approaches are spreading rapidly into every part of our daily lives. Today's designer must become fluent and engaged with this critical new domain that includes a range of transdisciplinary practices, from bioengineering/technology, to biomimicry, biofabrication, synthetic biology, bio-art and biodesign. The Biodesign Challenge is a catalyst and opportunity for students within our art and design undergraduate and graduate programs to develop capacities that allow them to critically engage and creatively contribute to its emerging discourse and practice, through intervention, speculation, or provocation, and often by demystifying and making accessible what is typically only available to or driven exclusively by scientific or technical experts.

In addition to building basic scientific and laboratory literacies, the course curriculum includes hands-on, systems-based thinking, and experiential engagement for students to develop new sensibilities and capacities for working with model organisms and living systems more ethically and with deeper respect for the environment and the natural world. The course prioritizes socioeconomic, political, ecological, non-human and critical perspectives and contexts, challenging biases and assumptions, the dominance of the human, and the unrestrained development and application of biotechnology and synthetic biology. A wide array of readings from diverse perspectives, with prompts for deep reflective thinking are provided to build a respect for and understanding of diverse cultural attitudes, social and environmental justice. Teams are encouraged to critically push the limits of current industries and provoke new ways to design for the future, using methodologies such as participatory futures, speculative design, and design fiction.

Keywords: Biodesign, Ecosystems, Speculative Design, Participatory Futures, Design Fiction

INTRODUCTION

While "biodesign" is as old as agriculture, there has been a recent resurgence in the scale and scope of its meaning, driven fundamentally by our growing knowledge of how genetics shape the literal forms that serve the functions of life. The culturally-problematic title: 'The Eighth Day of Creation' (Judson, 1979) features the work of two key Nobel prizes recognized in 1962: (1) the storage of genetic information (Frances Crick, James Watson and Maurice Wilkins, for their discoveries concerning the molecular structure of nucleic acids and its significance for storing information in living organisms); (2) the form that information takes when translated into protein (John Kendrew and Max Perutz, for their studies of visualizing the structures of globular proteins). These underlying principles are now actively used in contemporary design— "a way of thinking about existing biological machines and of constructing new ones" (Baker et al. 2006). An original application of this 'maquette building' integrating form and function can be found in projects such as Ron Koder's super slimmed down (read 'more efficient') synthetic hemoglobin (Koder et al. 2009). However, this biotechnological capacity is introducing a new element to design, which is the inherent *self-replication* of this bio-design with unknown repercussions (as compared to the design of glass cup that sinks to the ocean floor or the design of a plastic cup that floats in the ocean). Everything we know about 'life' is about to be transformed by our knowledge of biology, radically reframing Darwin's 19th century term: 'natural selection'. Design is always an act of selecting, and as with any human project, we must constantly ask ourselves: What compels our design? For whom do we design? Who benefits from and Who/What/Where is harmed?

Interestingly, there is still not a single Wikipedia page discussing the range of contemporary bio-design and ethical principles associated with bio-design. Biodesign is an incredible, awe inspiring and naively-human opportunity for exploration and creativity; it offers radically new ways of life-form creation. Documentation across the field, including but not limited to: Books: *Biodesign* (Meyers 2012), *Speculative Everything* (Dunne & Raby, 2013); Competitions: iGEM, Biomimicry, and Biodesign Challenge; BioArt centers: Coalesce in Buffalo NY, SymbioticA in Australia, or the BioArt Society in Finland; Biohacker spaces: Genspace, Biobus, and Harlem BioSpace in NYC, or global listings on Make Zine; Conferences: Society for Literature, Science and Art (SLSA), Taboo Transgression and Transcendence in Science and Art (TTT), or Global Summit of Community Biotechnology; Academically supported institutions: Arizona State University Biodesign Institute, Harvard Biodesign Lab, Stanford's Future of Healthcare; Local lecture series: LASER, NY Academy of Science, American

Museum of Natural History; Thriving companies: Modern Meadow, Ecovative, and Gingko Bioworks; Science fiction: Mars Trilogy by Kim Stanley Robinson exploring terraforming, Lilith's Brood by Octavia Butler exploring cross-species colonization; Review articles such as "20 emerging issues in biological engineering" (Wintle et al. 2017) or Human Rights declarations such as the 2005 Declaration on Human Cloning (UN 2005).

The authors of this paper met for the first time as Judges at the Biodesign Challenge held at NYC's MoMA in June of 2017. The Biodesign Challenge describes itself as offering 'university students the opportunity to envision future applications of biotechnology in a competition that highlights student work.' Later in their 2019 description they say 'Biotechnology is unique because it harnesses life. Life as a technology introduces new capabilities and raises new concerns. Biotechnology has brought about new medicines and greener modes of production. It has also created new risks. As the science finds its way into our world and our products, designers need a full understanding of these concerns, so that when they are asked to design with biology, they do so creatively, thoughtfully, and ethically.'

It was in the context of detailing the grand opportunities and generalizing the risks, that the authors —sitting next to each other during a keynote by Intrexon Chairman Randal J. Kirk — made biologically communicated eye-contact. Poised in front of what science fiction writer Margaret Atwood named a "pigoon" (genetically modified pigs that 'grow' bespoke organs for humans), Mr. Kirk (Figure 1) casually incited several radically beautiful futures where for example, animal organ mining saved us from the despair of human trafficking for organs, or energy intensive vertical agriculture biotechtopia deemed the free sun and soil systems of current agriculture (grown on the land) as outmoded and 'last century'.

It was from this vantage, that we, Jane Pirone (Dean of the School of Design Strategies - SDS) and Jenifer Wightman (scientist and artist), teamed up to co-teach "Biodesign Challenge Studio", a 3-credit elective at Parsons School of Design for its second year participating in the Biodesign Challenge (Sven Travis and Ali Schachtschneider co-taught the studio in 2017). Together with invited colleagues and guest lectures in 2018 and 2019, we forged a preliminary template for helping non-science-trained design students do what they do best: interrogate the assumptions presumed within systems and imagine new opportunities for creative intervention. This article includes a range of readings we share with our students and a selection of projects that resulted from two years of teaching. We offer an earnest report in an effort to illustrate the grave need for greater community discussion around the noble utopian futures (e.g. harnessing the functional essence of biology to 'solve' the litany of human crises such as cancer, human trafficking, climate change, and "Your Favorite Disorder"), or the dystopian Faulkernesque unfolding of biologically-driven drama, leaving us all to feel like "a wet seed wild in the hot blind earth" fumbling toward a tragic end that is only the beginning of something different [Faulkner, p64]. Whether it is 'natural' or 'synthetic', selection will always happen. In this aspiration of bio-technological solution-ing, what is wisdom? What do we really want out of a future as 'creators' of this 'livingness'?

FINDINGS / DEVELOPMENT / ANALYSIS / EVIDENCE

As invited judges to the 2017 two-day Biodesign Challenge, we shared a feeling of urgency and dismay that filled us both with differing but compatible desires to co-teach 'biodesign' so we could help frame its becomingness. We met to discuss the multitude of structures and readings; we quickly recognized a 15-week semester teaching upper level undergraduates and graduate design students with very little science background would be a superficial survey. We chose two major objectives: imbue our students with an increased comfort with science principles (so they could confidently collaborate with scientists, by a willingness to ask questions for what they didn't understand while contributing their design thinking) and an ethical engagement surrounding the use of science (so they could think/work/act critically as citizens). We both gravitated toward engaging the students' capacity to 'see the system' through their observation-creation-observation reflexive nature. By the 2nd year, we openly shared that we would be supporting projects that were not likely to win the Biodesign Challenge competition because of how we taught the course and our priority of problematizing biodesign rather than commodifying it. Because we feel the

issues at hand are so great and science literacy is so low, our real goal was to help 'grow' artists and designers interested in the discourse, as opposed to relegating their skillsets to an instrumental toolification for 'science communication' or 'biological productification'. That is, our course is fundamentally a speculative design course, mining our students' emotional intelligence to articulate, through creative and intellectual exploration, the issues of our time, so they can begin to anticipate and understand their position in a rapidly changing world. It is biology, it is life, that creates the masterpieces such as a mango or a three-fingered sloth, just as in humans, our 'livingness' creates monsters such as eugenics and climate change. It is the perceptivities afforded by life that has made what we 'understand' to be the world, a reality.

Findings A: The Range of Bio-related Design Thinking

By our second year of teaching we shared a non-exhaustive list of possible branches or terms to expand the notion of "biodesign" for our students: bio-art, bio-inspired, bio-mimicry/bio-mimetics, bio-innovation, bio-fabrication, bio-materials (biodegradable pigments, textiles, plastics, fuels), bio-computing, bio-synthesis, bio-robotics, bio-engineering, bio-tech/nology, synthetic biology, maquette building, bio-electronics, bio-signaling, bio-design, advances in health, bio-remediation, landscape architecture, biophilic architecture/living-architecture, food systems, sustainable design, bio-policy, bio-piracy, bio-law, speculative fiction, science fiction, futuring, backcasting, climate change, terraforming, astrobiology... the list goes on. We provide this list as a possible beginning framework for a Wikipedia page illustrating the range in which 'living systems' are being actively engaged and manipulated on behalf of some and to the disadvantage of others (human and non-human) in the current 'innovation climate' of asking forgiveness afterward rather than asking permission before (from me-too, to lack of FDA oversight of pharma, to fossil fuel companies de-frauding the public on climate change, to the 2018 CRISPR twins). We all experience this drive, but the question is, how will society balance this creative drive with the social contract. This drive for innovation explains why the non-unanimous 2005 UN declaration on Human Cloning was non-binding and therefore only called on countries to *voluntarily* adopt "measures necessary to prohibit all forms of human cloning inasmuch as they are incompatible with human dignity and the protection of human life" (UN, 2005). This line of text falls painfully short of the holistic and systemic design thinking required when designing with biology in the context of this singular and miraculous world, situated precariously in the universe with just enough heat, light, water, and carbon to afford capital-L Life.

Findings B: Our Biodesign course and expanding the curriculum

In our first year we taught a single 2-hour 40-minute, 3-credit course – a "studio" pedagogical approach centered around critique/expert feedback with invited guests for iterative development. By our second year, in an effort to expand the range of our creative students' participation in the larger conversation, we created a four-prong approach including: 1 week intensive biolab bootcamp before the semester started, 6 weeks of intensive readings coupled with team-identifying tropes, 6 weeks of voluntary seminar, and the final 8 weeks of "studio" with expert feedback and iterative process. Understanding how limited and insufficient these offerings are for students deeply invested and engaged in these approaches, Pirone, within her Academic leadership role, has leveraged the School of Design Strategies as the platform for five other elective courses for fall 2019, developed and staffed by a range of faculty with varying design backgrounds. By complementing the Biodesign courses with a broader suite of piloted electives we hope to develop student capacities through a curriculum offered across disciplines and infused throughout design education. Rather than develop a singular 'disciplinary' approach, the intention of building this programmatic area is to build an undergraduate and graduate minor, inviting more students to become versed in biology as it pertains to their major. The framing was intentionally situated within the School of Design Strategies, given its inflection and prioritization of systems thinking, ecological scale, collaboration, and transdisciplinarity as the core positioning of its programs.

Bootcamp highlights

Parsons has a Biological Safety Level 2 (BSL2) laboratory overseen by Dr. Katayoun Chamany. Chamany and Wightman co-designed a week-long 9am-5pm winter-session intensive lab course, derived primarily from Chamany's existing lab protocols. This course was created for a mixed class of Lang interdisciplinary science students (10 slots) combined with interested Parsons Biodesign Studio spring semester students (12 slots). This series involved several modules including ideas of identity through collection and extraction of one's own DNA using over the counter materials, an introduction to biosafety 101, transformation of bacteria with Green Fluorescent Protein (GFP) plasmid, antibiotic resistance, landscape level water quality testing to assess effectiveness of societal sewage treatment, PCR amplification and identification of GMO sequences in foods, and regeneration of planaria cells to introduce the idea of pluripotency and differentiation. Nine of the 12 biolab bootcamp students continued on to be one of the 26 students enrolled in the Biodesign Studio course (2019).

1	**BIOMIMICRY** Undergraduate 2000 level.
	This course will introduce students to the principles, theory, process and practices of Biomimicry. Examples from a broad-range of design perspectives will be presented and students will engage with Biomimicry through project-based explorations looking at nature's form, function and ecosystems and emulating these deep principles and patterns to create well-adapted human services, interventions, processes and goods that better "fit in" our planet. Nature has 3.8 billion years of problem-solving experience, many of these problems are the same challenges humans are facing today. The 8.7 million organisms (animals, plants, microbes, etc.) that reside on the planet today can serve as a "living library" of evolved strategies that can aid in a more sustainable design process. "Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time-tested patterns and strategies." - Biomimicry Institute
2	**HONEYBEE COLONIES: ART, DESIGN, SCIENCE AND CULTURE** Undergraduate, 1000 level.
	In the 19th century, the bee was a popular symbol of industry and co-operation. Caricaturist George Cruikshank's 1840 drawing the British Bee Hive, illustrates a diverse range of English professions within a stringent and divided pyramid-based social hierarchy. For thousands of years, humans have had a close relationship with bees. Honeybee colonies not only provide honey and beeswax, they are also a powerful metaphor for life; a lens through which we can explore art, design, science and culture. Bee colonies have complex systems for communication and organization, and a remarkably democratic decision-making process. Honeycomb is an astonishing feat of engineering and strength. Pots of edible honey have been excavated in 3,000 year-old Egyptian tombs. This course will investigate the world of the honeybee in all of its complexity. Through hands-on learning, readings, lectures, fieldtrips and design-led research, participants will explore a remarkable insect and how they relate to natural science, sustainable systems, social history, gastronomy, art and design. Informed by their research and learnings from the class, students will produce a final project inspired by bees in the medium of their choice.
3	**LIVING SYSTEMS & DESIGNING FOR EMERGENCE** Graduate 5000 level
	This course is intended as an introduction to the theory of living systems and the practice of designing for emergence. Living systems is a coherent multidisciplinary framework that integrates the biological, cognitive, social, and ecological dimensions of life. Through research, reflection and discussion, participants will engage with the material, philosophical and spiritual implications of this unified understanding of life, and its relevance to design challenges facing professions as varied as economics, law, management, medicine, media, politics and psychology. Anticipated learning outcomes include: an understanding of how deeply modern history and science have been affected by the fragmentation of knowledge based on a mechanical conception of life; familiarity with key principles and concepts underlying the integrated science of living systems; increased ability to see the interlocking aspects of contemporary societal challenges (and trace their roots to a lack of systems-thinking); a sense of new questions and possibilities for a range of professions, arising from thinking holistically.
4	ECONOMICS & ETHICS OF SUSTAINABLE DESIGN Undergraduate, 1000 level
	This course introduces students to the multiple meanings of sustainability for those in design and in business, including environmental stewardship as well as organizational, economic, and technological sustainability. Students consider the various pressures that globalization exerts on these multiple ideals of sustainability, and learn what kinds of structures, standards and (self-) regulations designers and industries may use to define and monitor their relation to these ideals. Students read texts on the cultural, technological, and business issues involved in sustaining growth and innovation, and explore the economic and ecological implications of "business as usual," in order to begin conceptualizing alternatives to traditional business practices.
5	**COMPLEXITY BY DESIGN** Undergraduate 1000 level
	The world is full of phenomena which is extraordinarily complex and not yet fully understood. From sand ripples on an ocean beach, to the ebbs and flows of the stock market, to the viral spread of a meme, complexity pervades in all areas of science, business, society, and our daily lives. This interdisciplinary seminar class will explore complexity science which includes fundamental concepts around emergence, resilience, chaos, self-organization, non-linear dynamics, innovation, simulation, and infinite realities. Students will engage with critical films and readings on the subject, create models and simulations, and transform the learnings into projects that reflect their interests using design-led research.

Table 1: The five elective courses being piloted for fall 2019

For Wightman, there were 4 salient outcomes from the class. First, there was a clear growth in the students' knowledge and comfort in the lab during the week, despite tiredness and the overwhelming nature of the week. Second, in the context of these lab-bench techniques, the students really began to understand that genes + environment = evolution. Third, while we tried to develop a scientific methodology to build on their design thinking, the speed and breadth of topics was perhaps too intense to really grow an individuals' application and capacity of the scientific method. However, one student said "This course definitely contributed to my prior knowledge of the scientific method, especially by challenging me to question everything and always ask "Why?" when faced with a puzzling result. A favorite quote of mine will be "Does science ever end? No!", which we discovered after realizing that strange results could be translated into an entire new follow-up experiment." In this way, our students began to see that iteration itself was a moving target of understanding. Fourth, when the students were questioned if they had asked the microbes for their permission to be genetically modified with GFP (not unlike the alien *Oankali* that selectively modify the genes of humans while they are in sleep-like-state in Octavia Butler's *Dawn*), the students had a variety of responses illustrating the beginnings of an inter-species consideration of biodesign. In a follow-up question, the students were asked how they stewarded their newly enabled GFP-bearing bacteria, they realized they hadn't considered the proper disposal of and/or care for their 'newly' constructed "GFP-Frankensteins". All of these points necessitate improvements in year three training, but were meaningful and transformative outcomes from a short hands-on biology intensive for design students.

Reading highlights

In year 1, we assigned *Cat's Cradle* (Vonnegut, 1963) and the first chapter of *Dawn* (Butler, 1987). In Year 2, we assigned the full book of Dawn to both our BioLab bootcamp and Biodesign Studio classes.

In both years, despite our significant increase in classtime (basically moved from a single 3-credit course to an optional 6-credit semester) we didn't have nearly enough time to unpack and truly discuss these readings. However, in their various levels of attention to the readings, we believe the students integrated a range of embedded vantage points into their design considerations. These readings were core to our own positionality illustrating our attempt to guide the students in situating their design thinking around biodesign. We feel, what is at stake in our 'biodesign' future is large and therefore presents an imperative for re-incorporating 'living systems' in at-large design curricula while potentially creating minors or majors in 'biodesign'.

MARGULIS & SAGAN	WHAT IS LIFE	CHAPTER 1
Richard Lewontin	Biology as Ideology	Preface, Chapters 1 & 2
Barry Lopez Editor, Bill McKibben	The Future of Nature Reader	Chapter: Designer Genes
Rebecca Skloot	Immortal Life of Henrietta Lacks	Book
Rebecca Kumar	'Open Letter to Those Colleges and Universities that have Assigned Rebecca Skloot's The Immortal Life.'	Letter
Bonnie C Wintle, et al	A Transatlantic Perspective On 20 Emerging Issues In Biological Engineering	Full Paper
Christopher D Stone	Should Trees Have Standing? – Toward Legal Rights for Natural Objects	Full Paper
Bruno Latour	Love Your Monsters	Essay
Catriona Mortimer-Sandilands & Bruce Erickson, Editors. Ladelle McWhorter	Queer Ecologies	Chapter: Enemy of the Species

Table 2: Partial list of core readings assigned for both years

Figure 2. Inspired by H.P. Lovecraft's short novel At the Mountains of Madness, this artwork depicts a shoggoth, a monster in the Cthulhu Mythos. (A Shoggoth created by Nottsuo (https://www.deviantart.com/nottsuo/art/Shoggoth-594261203), CC by 3.0)

Guest Lectures and Seminar highlights

As New York City is a hotbed of practitioners, we were able to invite doers and scholars from a delightful arrangement of disciplines and career paths. We wanted this to be an expanding survey of potential ways for designers to work within the sciences as well as create a diversity of topics to expand the notion of what constitutes 'biodesign' in contemporary culture. In 2018, we embedded this within and as supplemental overflow to the 2-hour 40-minute, 3-credit elective class (voluntary participation after the last half hour of our formal class period ended). In 2019, we separated the seminar out as its own 1-credit course (P/F) and opened it to the entire university.

NAME OF GUEST	TITLE OF TALK	CAREER
Amy Brady	The Art and Activism of Climate Fiction	Editor
Anna Lindemann	Evo Devo Art	Academic/Artist
Arta Yazdanseta	Performative Biophilic Architecture	Academic/Architect
Christine Filippone	Guided by Gaia: Eco-Art Solutions for the Anthropocene	Academic/Critic
Dalila Honorato	Soylent Green – 4 = iRecycle	Academic/Critic
Danielle Trofe	BioMimicry	Product Designer
David Gruber	Tracking other Lifeforms – Biodesigning for the Deep Sea	Academic/Biologist/ Practitioner
Davida Smythe	Superbugs Survival in the Built Environment	Academic/Microbiologist
Ginger Strand	The Brothers Vonnegut: Factual and Fictional Afterlives of America's Attempt at Weather Control	Author
Heather Dewey-Hagborg	Intimate Genomics	BioArtist
John Burns & John Roach	Symbiotext – Salamanders, Algae and Concrete Poetry	Biologist
		Academic /Artist
Madeline Schwartzman	See Yourself Sensing	Academic/Artist & Architect
Mark Moffett	Ants and Human: Building a Society	Writer/Practitioner
Marta de Menezes	Self and Non-self: defining yourself through the other you may become	Artist
Michael Sandstrom	Investigating past climates and sea level change. The past is the key to the future	PhD Candidate
Ronald Koder	Synthetic Biology is going to change your life	Academic/Biodesigner
Ronnie Almonte	The Science and Ethics of Gene Editing Technology, including CRISPR	High School Science Teacher
Ryan Morrison	Oyster Restoration in New York Harbor with the Billion Oyster Project	Practitioner, Non-Profit
Susan M Squier	The Playful, Speculative Landscapes of Graphic Medicine	Academic/Critic
Will McHale	Biofabrication	Product Designer

Table 3: Names and titles for our 2018 and 2019 seminar series

We were fortunate to be able to invite 2018 biodesign student Juliette van Haren to be our 2019 teaching assistant. The New School, comprised of 5 colleges, is also a rich resource of practitioners enabling us to invite many fantastic faculty and others to mentor/critique our students, including guest critics in 2018 and/or 2019:

Alison Irvine (Biodesign Challenge), Alexandra Kisielewski (Biodesign Challenge), Arta Yazdanseta* (architecture), Caroline Mees* (architect), Daniel Grushkin (Biodesign Challenge), Davida Smythe* (scientist), Heather Dewey-Hagborg* (artist), Jack Dinning (Healthy Materials), John Roach (artist), Katayoun Chamany* (scientist), Lisa Norton* (Design Leadership), Manoj Fenelon (Strategic Design and Management), Mark Randall (Strategic Design and Management), Martina Kohler* (Architecture and Design), Matthew Robb* (Design and Management), Michele Laporte (illustrator), Phoenix Lindsey-Hall* (Healthy Materials), Sheldon Krimsky (author, public medicine), Veena Vijayakumar (Biodesign Challenge), Will McHale* (Industrial Design).

In addition to those above with an *, the following faculty and others assisted with the judging (2018 and/or 2019):

Alison Mears, Allie Wist, Anette Millington, Catherine Murphy, Dylan Gauthier, Hala Abdul Malak, Jean Gardner, Jessica Walker, Jonsara Ruth, Lisa Norton, Luciana Scrutchen, Nadia Elrokhsy, Neni Panourgia, Ronald Koder, Sven Travis.

Findings C: Barriers to Growth in applied learning

One of the most significant challenges facing schools of Art & Design is the limited access to science staff and lab space. As these capacities and skills increase in demand and evolve as the art & design begins to re-define "lab based process", there will be a need for a range of "making spaces" to meet the needs of artists and designers engaging in these new practices, moving from the formal BSL 1 & 2 laboratory spaces to more experimental and playful creative spaces that push the boundaries of approach and practice. This tension – between the traditional rigors of strict science lab-based research protocols, to the more informal experimental spaces for artists and designers to "explore," will be one of the most challenging aspects of scaling these capacities within independent art & design schools and research universities.

RESULTS

While the course waitlist for both years was triple our upper limit of enrollment (30 students), we ended up with a class of 23-26 students. In 2018, we had 6 self-selected teams and in 2019 we had 7 self-selected teams of 3-4 students each. In 2018, we embedded several lab experiments and seminars into our 3-credit (2-hour and 40-minute) class period. In 2019, we broke out the Biolab Bootcamp (2-credit P/F, 1-week intensive during winter session) and Biodesign Seminar (1-credit P/F, 6-week course) from the Biodesign Studio (a 3-credit, graded semester long course). Select comments from the anonymous evaluation of the course (2018 and 2019):

For the Lab component:

- It helped to understand procedure and etiquette in lab but as far as analyzing outcomes, I was still lost. (2018)
- Lab safety habits, hands-on training was very important (2018)
- I got access to working hands-on with biology which I would not have had access to by myself. (2018)
- This course was incredibly challenging, but I can honestly say that I have learned more from one week with Jane, Jeni and Katayoun than all my high school science classes combined. I will remember the things they taught us for the rest of my life. Class time was used extremely effectively, and all three instructors made sure that we felt comfortable working with them, with each other, and with the UC lab facilities. The experiments were simple yet challenging, fun yet educational, and at the end of the week I felt very capable and more familiar with biology. (2019)
- The readings were wonderful and the labs were provocative! (2019)
- This course was extremely well designed in teaching and encouraging a deeper understanding of the scientific concepts behind the lab experiments; as someone who has very little background in science, I was able to grasp the concepts and apply them at the end of the course. I felt confident in conducting experiments using the scientific method. The integration of ethical questions of the experiments we were doing was well appreciated, as well as the references given to us, which were from diverse point of view. (2019)
- Keep doing it, please! Designers need this. (2019)
- I have certainly had to re-evaluate my positioning as a designer in the realm of science and technology. Additionally, I needed to embrace the fact that I can never be a scientist! This is incredibly (2019)
- This course DEFINITELY inspired me to think more about the possibility of engaging in biodesign projects/collaborations. I will definitely be more inclined to pursue these types of

projects in the future. I think the class did a wonderful job of breaking down the barrier between design and biology, and I feel comfortable enough to engage in a dialogue about it without feeling completely out of my depth. rich and challenging work that I would love to engage with, but I will leave the experimentation to the experts. :) (2019)

For the Seminar component:

- The different guest speakers were very helpful to increase and expand our understanding on topics in the field of biodesign. (2018)
- I'v[e] gained a lot of basic knowledge in divers[e] domains! I'v[e] learned to think in different pattern[s]! (2019)

For the Studio component:

- Make background in Biology as 'suggested' prerequisite and therefore spend less time lecturing in first half of semester (2018)
- The last few weeks we had a presentation per week with different guests. These were very useful in concretizing our ideas as well as practicing to present our work. (2018)
- I love how our team project has progressed because of the feedback we've gotten from so many different people from industries and diverse backgrounds and also [o]ur instructors. The most valuable part is getting critiqued by all these people. Also, the team formation part of the class was really great and fluid. (2019)
- The readings were lovely, the lectures were fascinating, the feedback was always (always!) wonderful and provocative. The encouragement to remain light, open, and changing, even up to the last 24 hours, was new, wonderful, provocative, and extremely effective!! (2019)
- To change the way we think about design. To be more inclusive, to question ethically and sustainably. (2019)

Results, Student Project A: Bactoyou (2018)

Students: Yuxin Cheng (MFA Transdisciplinary Design), Arian Ghousi (MFA Industrial Design), Ignacio Garnham (MFA Transdisciplinary Design), Juliette van Haren (MFA Industrial Design)
Video: https://www.youtube.com/watch?time_continue=2&v=k9SuHm7HtBM
Student Description: bactoyou™ is a microbial time machine that empowers you to collect, sequence, explore, and bac-up your previous microbial states; By creating a historical database of your microbiome over time, we allow users to "jump back in

time" and reconstitute their present gut microbiome based on specific previous states. bactoyou™ offers a solution to microbiome changes or depletion as a result of antibiotic treatments, chemotherapy, long term travel and many other threats and events.

bactoyou used the existing controversial outline of *23 & me or ancestry.com* to extrapolate similar issues with microbiome data gathering and sharing. In by proactively anticipating issues as applied to notions of microbiome health and well-being. While they recognized issues such as privacy and data-mining, insurance-based exclusion, the intellectual property (IP) of one's own personal microbiome and identity, cultural access and differences of 'health', ultimately this project functioned by monetizing a participants qualitative and quantitative data generation. This mildly speculative project attempted to create a sustainable business model while also exploring the empowerment of the "consumer" in the control of their biological and genetic data, through blockchain technologies.
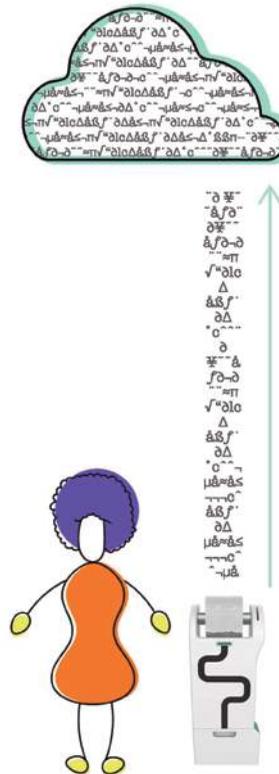
1. User data will be encrypted and send to cloud. Users retain all rights to sequencing and phenotypic data.

2. bactoyou™ will never sell, lease or share users' information without their consent.

3. Vetting of labs and partnerships will be done through a consulting group.

Figure 3. Still from Bactoyou presentation at the June 2018 Biodesign Summit

Results, Student Project B: Beyond 100% (2018)

Students: Tung Lin (MFA Transdisciplinary Design), Jae Kyong Cheong (MFA Design & Technology), Siho Chang (MFA Photography)

Video: https://www.youtube.com/watch?v=InkavVc1ntA

Student Description: Beyond 100% imagines a microchip that can genetically modify a human's capacity to acquire, manage, and share nutrition. The chip endows the user with the ability to receive nutrition from new food sources.

While technically problematic, this highly speculative future was born from an assigned 3-page speculative fiction written by a team member. This project engages current issues of trade, world population, scarcity, and genetic engineering to 'look' at our human insistence on 'growth' and 'efficiency'. It's title, *Beyond 100%*, employs Taylorism in a resource scarce future where the only way to 'feed' the population is to genetically modify them with genes from other species, thus affording humans an increased capacity or inclination to eat new sources of food. For example, humans currently cannot digest cellulose, so the gain of function of cellulose digestion from rabbits affords humans the capacity to forage in a way not previously useful (Figure 4). Ultimately this project identifies a limit of the finite earth, but questions what does it mean to succeed, especially if humans consume the ecological niches of birds/bunnies/bears; where do these animals now forage? Here we see an acceptance of genetic modification of humans —a gain of function— thus outcompeting the animals that originally evolved those capacities. Yet again, humans dominate, but at what cost? And does this result in a greater decency and diversity of mankind? Or is this a reduction in decency and diversity of life?

Results, Student Project C: Speculative Evolution (2019)

Students: Angela Bitar (MFA Industrial Design), Jesse Birdsall (MFA Industrial Design), Channing Corbett (MFA Transdisciplinary Design), and Christina Wong (BFA Fashion)

Student description: Speculative Evolution is a project that employs speculative design and story telling to show one of many possible futures as the world realizes its place in the "Plasticine." Our exploration started by questioning how the proliferation of plastic production and its careless disposal might affect human evolution. Our narrative centered around the rise of *Homo afflictus*, a future species, not only pushes viewers to reflect on the present with unease, but further prompts the fundamental question of what it means to be human.

While *Speculative Evolution* may have been illegible to many 1st time viewers at the Biodesign Challenge, the Project was born from a backcasting/forecasting design strategy. In their own words their method as briefly described:

"Speculative design is a practice borne within and between critical design, design fiction and futuring practices that not only questions the traditional design practices but furthermore uses things like imagined products, services and worlds to examine the role and impact of new technologies and social, political and cultural movements. Because it is a design practice ignited by triggers or signals of the "now" but focused on the future, the designed final product expands both time and technological possibilities."

By looking back at narratives of human evolution and looking forward from current triggers like plastics and climate change, this group created a future where *Homo sapiens* is no longer a viable
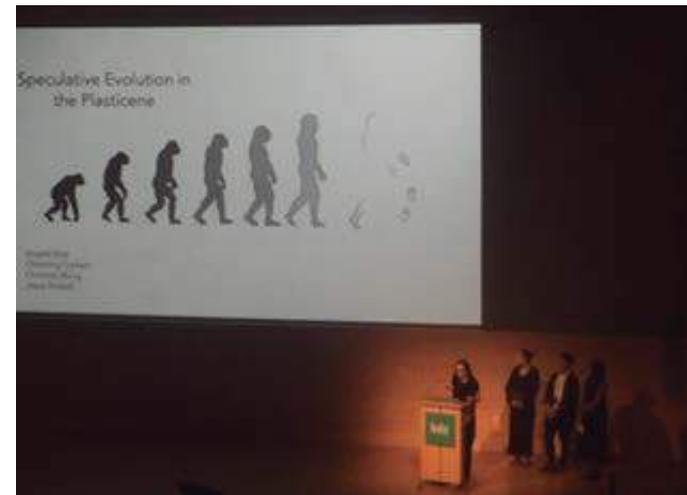
species as it is unable to survive its own created plastic wastescape (Figure 5). As a result, we see the rise of *Homo afflictus* – a species that has merged with and utilizes plastic in a future era called the *Plasticene*. In using plastic as a driver of evolution, this team engage the 'genes + environment = evolution' trope to speculate on how changing our own environment then changes the conditions and course of our own evolution. Fundamentally, this group created a dystopian future to ask the questions: *What does it mean to be human? What do we as a species want? How can we avoid seemingly de-evolving into Homo afflictus, and actually manifest the root of the meaning in our own given name: homo sapiens – man the knower?* Perhaps however, this project asked: is knowing enough?

Results, Student Project D: Betting on Baby (2019)

Students: Briana Bachew (BS Urban Design), Erin Lee Carman (BFA Integrated Design), Tess Dempsey (MFA Industrial Design), Molly Nelson (MFA Industrial Design)

Student Description: In November 2018, the first genetically altered baby was born after her embryo was genetically edited to remove her susceptibility to the HIV virus. *Betting on Baby* imagines a dystopic future in which gene editing has not just become a norm but the primary means of reproduction. In this speculative future, babies are created synthetically, and human gene-editing is regulated by the universal governing body to ensure that humans will no longer be born with rare genetic diseases or other undesirable traits. In order to prevent fully Designed Babies, chance has been reintroduced to reproduction by means of the CAS9NO. Future parents come to spin the roulette wheel that will determine their child's genetics, and the CAS9NO becomes the new answer to the question, "Where do babies come from?" As children are designed, classism heightens, reproductive rights are threatened, and genetic disorders are eliminated. *Betting on Baby* invites you to step up to the CAS9NO, collect your chips, play your odds, and consider what kind of future you are willing to invest in. What are you willing to gamble on?

Betting on Baby speculated that in 2051 the Universal Genetic Screening Law was passed, requiring preventable genetic disorders to be removed from embryos in order to qualify for universal free healthcare. The law states that parents are not allowed to hand-pick desired genes for their offspring, but playing at the Cas9no puts chance back into the equation. In their critique they feature a series of protestors that cover a range of associated issues:

- This Cas9no needs to be shut down now, before we raise an entire generation of elitist superhumans, our government should promote equality, but this government-run Cas9no is promoting rampant inequality.
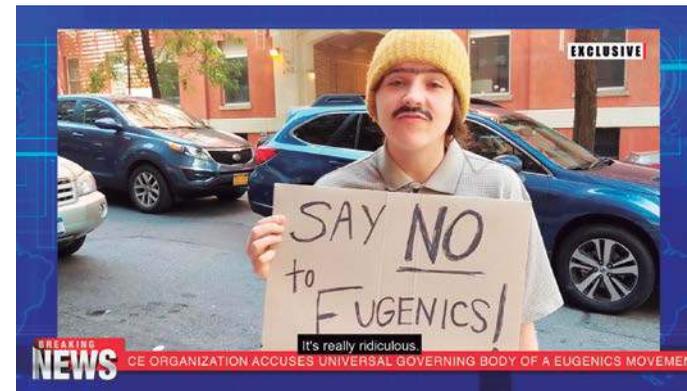
- Cas9nos are mining all our genetic information and selling it to the highest bidder
- They say they want to maintain diversity and make sure kids are healthy. They just want to control procreation. They want to decide who gets to be a human and who doesn't.

In Figure 6 below, the video still shows a protestor critiquing the Cas9no, explaining: "Cas9no's are promoting eugenics: They don't want impurities, they don't want my imperfections, it's really ridiculous, it's ******* ridiculous".

This project recognized the normalizing acculturation that grew out of outrage from the first IVF baby in 1978 (Sanders 2018) while connecting it to the current controversy of 2018 CRISPR babies simplified in this title "First CRISPR babies: six questions that remain" (Cyranoski 2018). This project then extrapolated into the future world of synthetic biology. In their playful way, this team introduced the complicated issues of 'making life' and then ended with four differing monologues asking the audience to consider the future we want to see for human reproduction and selection. "Through this project, we are looking to provoke a conversation that explores the ways this will become an issue of class, of accessibility, of data ownership, and of reproductive rights. And when you begin to select for certain traits and remove others, who will be eliminated in the process?" To the team's credit, each time they presented, there was a long pause before the audience rattled off a bunch of questions. During the Biodesign Challenge, the team was asked to present on July 10, 2019, at the World Economic Forum conference entitled "Precision Consumer 2030" where their invite defined the event as follows:

> The increasing desire for personalization and the race to remove friction from our consumption habits as we pursue positive outcomes in our lives has illuminated the desire for real-time,

precision-based products and experiences tailored to one's own specific needs. As a result, the topic of Digital Biology has been propelled to the forefront of culture and, more specifically, to the larger conversation around improving consumer well-being. From DNA to voice tech, image recognition to the microbiome, digital biometrics to retinal scanning – consumers are now starting to understand the value of their personal biological data and the implications that the availability of this data has on their potential future well-being.

It then lists a potential deliverable from the conference of "identification of consumer values today regarding personalization tied to digital consumer biology and wellness (including ideas like a 'Biodata Bill of Rights' for consumers).

CONCLUSION

The Biodesign Challenge has been one catalyst for our institution to engage in and explore the emerging and expanding realm of practices referred to more generally as Biodesign. The elective studio course "Biodesign Studio" and participation in the "Challenge" hosted at MoMA has succeeded in creating institutional awareness and support for increasing our capacities and curricular/pedagogical strategies in these areas. A distinct benefit to students has been our ability to expose and introduce a kind of love and awe for biological systems. Through a project-based framing, the students' imaginative and engaged explorations have challenged much of their understanding of what designing within such complex, multi-scalar, and techno-industrialized spaces requires. We have no doubt there will be an increasing need for these skill-sets, especially as the high-stakes nature of human induced climate change requires more sustainable design interventions. However, while we do believe bio-based skill-sets will become part of a designer's core competencies of the twenty-first century, we are concerned for the seemingly dominant focus of approach on the instrumental and technical aspects of "designing" over prioritizing and supporting a critical, systems-based framework that allows enough background in biology and critical theoretical perspectives to rigorously interrogate and critically engage the ethical, social, and environmental challenges inherent in biological-designing. We strongly urge science schools to require design thinking in their curriculum and likewise, we strongly urge design schools to require more science courses in their curriculum – all require more ethics, social science and humanities. Designers, will ultimately play the role of "designing" and bringing into reality the "futures" based on the application of current science and technology. Strategic design and design-thinking approaches broaden and expand the role of designers. "Thinking like a designer" throughout top-level decision-making is an opportunity to leverage design-driven business and organizations to make positive and socially just impacts. These possibilities require these roles to be sufficiently trained to understand the science while scientists will only be able to convey the import and consequences of their work if they cannot communicate their own work to the designers that design the next generation of our livingness. Just as climate change is forcing nation-states to work together, consumers and industry are engaged in resolving the supply/demand myth around plastics, our own biology is forcing us to return to the cyclical nature of our landscape and our place of moving within it. Biodesign is a contemporary topic, simply because our population keeps 'growing' while our landscape remains finite: it is causing us to question the killing of the albatross to re/solve the fog of our own purpose (Coleridge, 1834).

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SYMBIOGENESIS-BASED DESIGN: A NOVEL METHODOLOGICAL APPROACH TO DESIGN BASED ON COOPERATION AND INTEGRATION

The "cladistic", "phylogenetic" or "evolutionary" concept of biological species, understood as groups of organisms, considered to be all descended from the same ancestors or clade allows us to classify and characterize them, but it interferes and contaminates the understanding of how species arise.

For many, the study of the changes in life through time has traditionally been consolidated as the way in which species originate; For authors like Lynn Margulis, long-term symbiotic cooperation between complementary organisms is what led to the origin of new species through symbiogenesis.

Symbiogenesis is a process that requires the integration based on cooperation of at least two organisms with different denominations for the origin of a new specie.

Biomimicry has served as a means of inspiration from the natural world, but symbiogenesis challenges us to expand this bioinspiration towards a divergent observation of multiple organisms, which in an integrated and cooperative way, can guide the processes of ideation.

Symbiogenic-based design offers a design methodology based on the biological processes of cooperation and integration as a means of innovation in the design of products, services and experiences.

Keywords: symbiogenesis, cooperation, innovation, symbiosis, design

VARIATION AND INNOVATION THROUGH DOMESTICATION

The constant and unsuspected variability of the organisms that surround us, unlike those that inhabit natural spaces, is a condition described in 1868 by Charles Darwin in his book "The Variation of Animals and Plants under Domestication".

Although the conditions that can explain this phenomenon are manifold, there are two factors of interest to consider: the nature of the organism and the nature of the living conditions (Darwin, 1868). It seems that the most important, is that which is defined by the characteristics of the individual, since very similar changes can occur in different environmental conditions; On the contrary, dissimilar variations occur in almost equal environments.

It can be said that a variation will be determined when a considerable number of descendants, of individuals subjected to certain conditions, over several generations, are modified in the same way. This ability to select and produce new species for the purpose of obtaining a certain quality has been the key in the diversity of beings for human consumption. For example: a thicker coat, depending on the type of climate; different sizes, depending on the amount of food; more grains, through selective cultivation, among others, have been provoked under an efficient reason. If this condition is maintained over a long series of generations, over a large number of individuals, they will probably all vary in the same way; resulting in a new species.

ORIGIN OF SPECIES THROUGH COOPERATION AND INTEGRATION OF ENTITIES

Symbiosis is defined as the interaction between members of different species living in mutual relationship and physical contact. It is often a misunderstood concept, this misunderstanding is mainly due to our lack of knowledge of its prevalence in the world around us (Margulis, 1991). When we speak of symbiotes our first approach is that referring to organisms of different species that provide cooperation. This tacit act of coexistence can be exemplified in the relationship between a clownfish that inhabits between the tentacles of an anemone. In this case, both the host and the host protect and nurture each other. The tentacles of the anemone possess stinging cells that repel the possible predators by means of toxins innocuous to the clownfish. On the other hand, the fish feeds on small organisms that could damage its partner and emits a sound that protects the anemone from attack by butterfly fish, one of its natural predators. This is how we can recognize in this society, a relationship of mutual benefit (Lubbock & Smith, 1980).

Lichens are another example of this relationship of organic cooperation. Lichens are organisms made up of both an algae and a fungus. Fungi, such as animals, depend on plants as primary producers to meet their energy needs; they feed on live or dead plants, and in both cases, their food source is short life: will die or completely degrade (Goffinet, 2012). Some fungi, however, have adopted a life strategy in which they depend on and use an organism without damaging it, when this occurs and a fungus establishes a relationship with an algae or cyanobacteria, it is called lichen. This partnership of mutual benefit allows fungi to no longer be confined to the dark world under the forest and to colonize the logs or the surface of the rocks. While these algae, usually restricted to a thin layer under the surface of the fungus, get a suitable environment to grow, protect themselves from the herbivorous and harmful solar radiation.

A symbiotic partnership implies that both parties benefit from interaction. It is interesting to recognize that from this merger, new results emerge, unexpected benefits, not found in their individual versions.

Ivan E. Wallin, anatomist at the University of Colorado, announced that new species originate through symbiosis (Wallin, 1927). Although Wallin never used the word symbiogenesis, he clearly recognized the potential of integration as the foundation for species diversity. Lynn Margulis, American biologist, was the one in her book "Acquiring Genomes: a Theory of the Origins of species" emphasizes the dynamic relationship between complementary organisms as a precursor to the emergence of new forms of life.

For Margulis, symbiosis is crucial to understanding evolutionary diversity. Innovation based on cooperation, integration between incremental systems, is the entry point for understanding the emergence of new agencies.

If integration between organisms promotes the emergence of new species, the question arises as to what happens when systems that interact are not completely biological. Is it possible to extrapolate these evolutionary dynamics in the design of synthetic solutions?

Biomimicry has served us as a means of inspiration from the natural world, but the symbiogenesis calls us to expand this bio-inspiration to a divergent observation of multiple organisms, which in an integrated and cooperative way, can guide the ideation processes. Thus, through the didactic extrapolation of these principles, processes and premises, a design methodology based on innovation through cooperation is developed. The natural is guiding the design.

EXTRAPOLATION OF THE EVOLUTIONARY PROCESSES OF ARTIFICIAL SELECTION TO THE METHODS OF IDEATION OF NEW PRODUCTS AND SERVICES

The understanding of these biological phenomena associated with the evolutionary origin of the new morphologies and physiologies by symbiosis (Margulis, 2008), together with the exploitation of the dynamics related to the induced evolution of organisms, proposes the possibility of articulating a creative strategy that provides mechanisms of ideation from the cooperation and integration of organisms of different lineages.

While symbiosis in natural spaces requires specific environmental conditions that make it possible to meet and favour cooperation, in the case of assisted symbiosis, precipitating the merger of two complementary entities will depend on the specific qualities that the designer wishes to integrate. In this way, replicating this logic of cooperation will depend on the independent attributes of individual organisms, which in a specific ecosystem will be mutually beneficial.

In the case of design discipline and all prospective activities associated with the use of ideation techniques, incorporate cooperation between independent species, each with complementary qualities, as a means of innovation it can give us a renewed perspective for the processes of solving problems and generating new design opportunities.

SYMBIOGENESIS-BASED DESIGN: WEARABLE SWIM ASSISTED DEVICE AS CASE OF STUDY

Design Based on Symbiogenesis aims to structure: a strategy of identification of benefits; divergent observation; and cooperative adaptation of complementary entities, being a methodology oriented in the processes of designing and generating new design concepts. The phases of the model are described below (see figure 1), through a case study: Design of an orthosis for swimming of people with amputations or absence of their upper limbs (González & Durán, 2014).

Figure 1. Scheme with the phases of the Symbiogenesis-Based Design Methodology.

Phase 1: Deconstruction of the phenomenon (problem / opportunity)

The first phase of the methodology focuses on understanding the phenomenon and subdividing the benefits to be solved. From the problem or opportunity, the requirements to be met are analyzed and categorized in a subsidiary way. While there may be multiple requirements to be met, it is recommended to simplify complementary pairs.

For the design of the case study, objectives emerged that were transversal to any medical device in contact with a patient's skin. These elements, while set out in the Brief of the project, do not determine the priority qualities to be resolved. In our case, the key points refer to the biomechanics of swimming and adaptability to multiple morphologies.

The development process focuses on aquatic sports activities, which, thanks to certain environmental conditions, further enhance the benefits of physical activity. In this case, like most prosthetic and orthotic devices, swimming assistance devices require the manufacture of sockets (see figure 2) or customized adaptations of each person's stump, condition that increases the values of each device.

Understanding swimming as "the ability that allows the human being to move in the water, thanks to the propelling action carried out by the rhythmic, repetitive and coordinated movements of the upper, lower and body limbs and overcome the resistance that the water offers to move in it" (Navarro, 2012). We need to analyze how the factors involved in the case of people without a superior limb affect their performance. The first factor is the hydrostatic thrust that a body experiences, equal to the weight of the discharged fluid. In the case of people with amputations this factor does not

Figure 2. Socket fabrication process for prostheses (González & Durán, 2014).
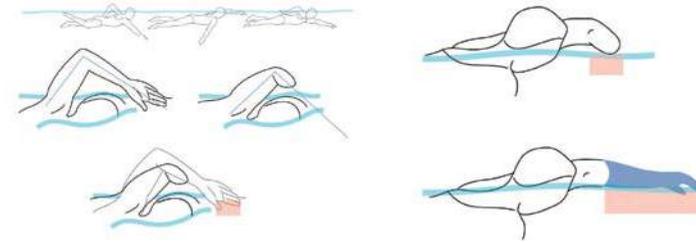
Figure 3. Comparison of the angles of entry of the upper limb during swimming between people with and without amputations.

vary radically, although they have lost some of their volume and mass, the primary thing to maintain buoyancy, is our ability to contain air in the lungs.

To swim, people move their limbs in the water, fractioning and pushing the middle. The propulsion techniques employed are directly related to the volume of displaced water and the speed of movement (González & Durán, 2014). In this way, the maximum propulsion force is generated when the hand is flat and with the fingers together. This posture increases the area in contact with water, achieving a greater displacement compared to an open hand. The higher the driving force and the lower the resistance, the higher the speed of movement in the water.

For people without amputation the angle of the elbow determines the arrival of the hand to the surface of the water, and therefore, a correct rupture of the surface tension (see figure 3). In cases of amputation, the absence of a push surface forces people to extend the arm as much as possible, preventing a correct entry into the water and generating injuries in the shoulder.

In this way, the initial analysis of the phenomenon and its deconstruction allows us to define two great performances to be solved: [1] To produce a device adaptable to the different morphologies of patients, adjusting its shape to the arm diameters and to the thrust areas that do not exist due to amputation, and [2] Generate hydrostatic thrust with a low resistance to the middle, considering the angle of entry of the amputated arm in the water.

Phase 2: Search for the state of the art

The second phase of the methodology proposes the generation of a body of knowledge based on an exhaustive search of the state of art. The purpose of this stage is to understand the field investigated from the characterization of the existing background. Categorizing products and systems allows the recognition of technologies and approaches, and thereby establish comparative metrics that will nurture the next phase.

In the case of assisted swimming, the analysis and categorization of the background allows us to recognize approaches that are repeated in the study: [1] projects that attempt to reduce the cost of production, [2] initiatives seeking simplification and universality of the stump connection socket, [3] biomimetic natal prostheses with resemblances to aquatic organisms and [4] support devices for swimming training processes (see figure 4).

It is important to note that starting the development process, while trying not to contaminate the understanding from the study of the state of art, promotes a critical reflection of the problem/opportunity.

Phase 3: Definition of benchmarks

Defining the evaluation parameters establishes a comparative rubric to compare future mergers with existing solutions. After the background characterization, the information is tabulated according to quantifiable fields. While this stage is subject to an early assessment of the performance of the solutions, if it is possible to have key informants, including a perceptual assessment of preferences, will enrich the comparison, including a symbolic perspective on the ideation process.

For the design of the swimming device, the initial parameters were related to the production cost, the thrust capacity, lower hydrostatic resistance and adaptability of different morphologies.

Phase 4: Scouting, search for complementary entities

The most important stage of the process is the free search for species that meet the defined benefits in the initial phase of the research. As independent organisms they can coexist in symbiosis; products or systems known and typologically distanced can nurture a solution based on cooperation and integration. For this we propose an extended search of referents using multiple sources of information. The inquiry must assume that references will be
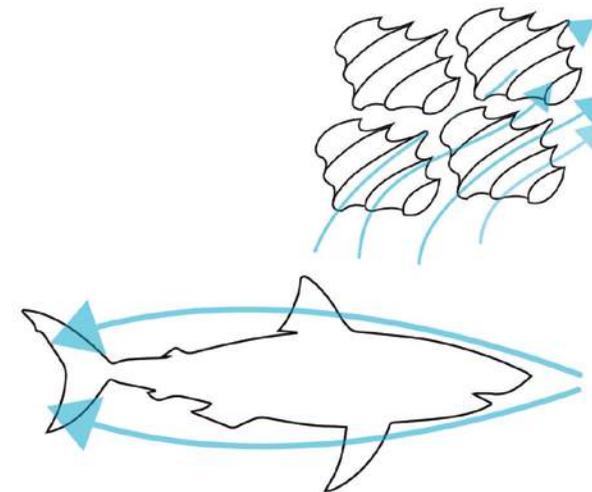
found in complex organisms that will not only respond to the specific benefit. In this way, the body to be merged will not be the entire entity but that sub-element that carries the expected benefit. If one of the features to be solved is the rigid filtering of suspended elements, it is not appropriate to use the crab seal as an entity, only the morphology of its teeth (see figure 5).

For the case study, the first search focuses on references of drag reduction and thrust propulsion. In this way, the references used were those associated with hydrodynamic forms, marine organisms and specifically to the surface of shark scales, which

exhibit structures with grooves aligned in the direction of the flow (Dean & Bhushan, 2010) and they reduce the body's resistance to fluid movement. This antecedent known from the Swimming Suit LZR of Speedo, establishes the first formal approach to a reduction of the hydrostatic resistance.

As shown in figure 6, the elevations and their direction in line with the water flow determine the initial geometry of the proposal. Although they exist in the search, other referents of resistance reduction, it was only those referring to geometric structures that prevailed in the process. On the other hand, the research extends to hydraulic push devices. We analyze fins, oars and hydraulic turbines. These are the ones that present the greatest diversity of possibilities, and when generating a cross of typologies, the Pelton turbines are chosen (see figure 7). Also known as tangential hydraulic wheel, it consists of a series of deflectors or blades located on the periphery of a wheel (Thake, 2000). Its efficiency in transforming the water thrust into mechanical motion makes it an entity of interest for the design of the device.

Finally, the provision linked to the adaptability of a solution recognizes the possibilities of sunscreen sleeves, belts and other clothing elements that take advantage of the elasticity of textiles to adjust to different morphologies.

Phase 5: Adaptation of entities

The adaptation of the selected organisms from the search for species poses a challenge of integration, typical of the discipline of design. During this phase, the parts and functions of the independent referents are integrated into a new entity. The

union of the precursor entities requires a process of resolution and iterative prototyping that takes advantage of the individual characteristics in order to achieve a common benefit. The degree of integration will depend on the complementary possibilities of its components. It is not necessary to show the precursors of a new species, only allow the complement.

In the case of the wearable swimming assisted device, the process of integrating the flake surfaces, the cups of the turbines and the elastic textile belts are summarized in Figure 8.

The adaptation proposal focused its development on generating a series of concave fins with furrows in line with the movement of water. Each of the fins made with an elastomeric polymer could retract when entering the water, reducing the hydrostatic resistance and expanding when the arm is moved in the water, taking advantage of the interior shape and generating thrust propulsion (see figure 9-10-11-12). The fusion with the elastic costumes made it possible to place these fins in ribbons that wrap around the person's arm, by means of a pressure adjustment.
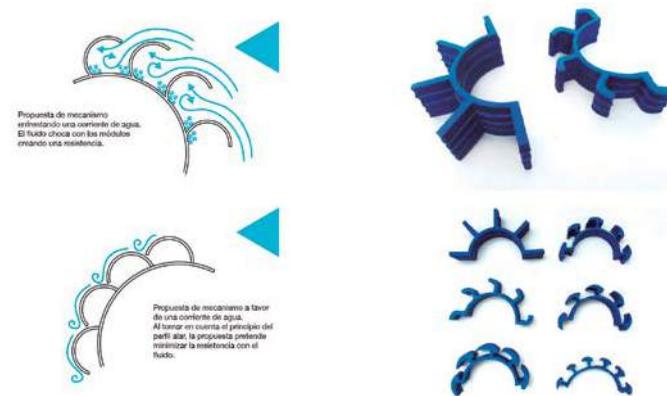
Figure 10. Proposal of propulsion mechanism and drag reduction.
Figure 11. Usability testing of the assisted swimming device.
Figure 12. Schematic drawing of the simbiogenic generated product.
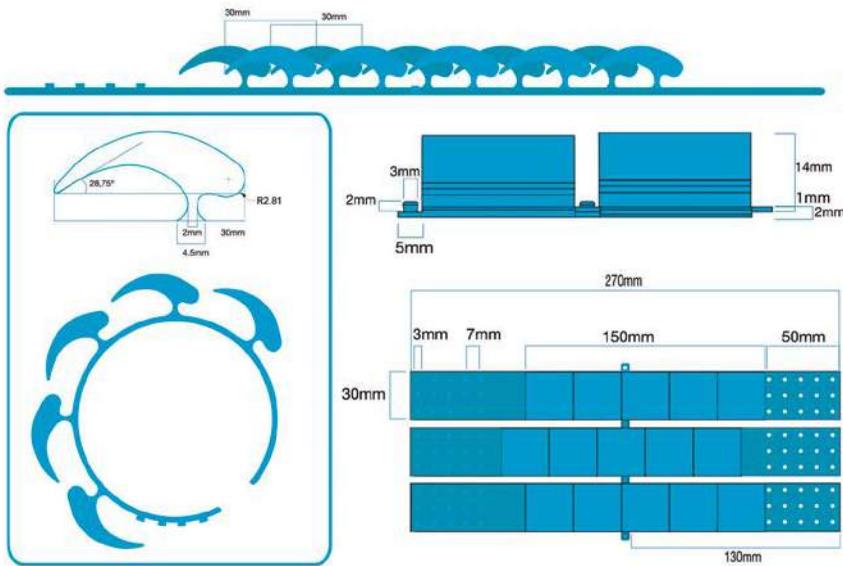
Phase 6: Benchmark new organism

The last phase of the model proposes the performance of comparative evaluations of the generated result. Although there are multiple methodological approaches and validation instruments and usability studies (Dumas & Redish, 1999), for this methodology the study is simplified to a comparative analysis according to the parameters exposed in phase 3. In this way the product of the fusion with the best qualified antecedents in the search of the state of the art.

The final design of the swim device was evaluated in hydrodynamic channels to determine the level of thrust and the ability to reduce the resistance to flow. With the generation of the elastic band, all the existing antecedents were overcome, and although there is no study that supports the difference in the push versus the existing antecedents in the market, the tests of use with amputees allowed us to show the capacity of the new product to improve the efficiency of the swim with an adaptable adjustment and a proposal that does not generate injuries by an incorrect angle of insertion in the water (see figure 13).
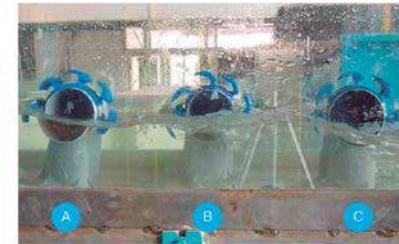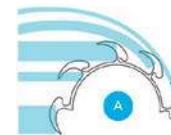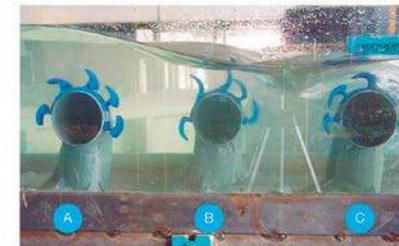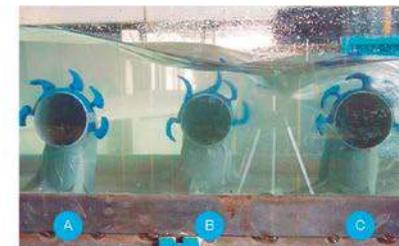
Figure 13. Benchmark and hydraulic analysis of the device.

RESULTS AND OTHER CASES OF IMPLEMENTATION

The final result of this process was called STOUK, wearable swim assisted device, and patented in 2015. Composed of one silicone tape that surround the limb of people with amputations in their upper extremities and that allows by means of folding "flakes" to generate resistance to water before braising the swimmer. The merging of the characteristics of the referents benefits each other. The concavity of the cups stiffens the hydrodynamic surface and the curvature of the belt allows the entry of water to allow hydrostatic thrust (see figure 14).

During the following years other cases were developed that use this methodology as a means of ideation: Shelley, aquatic soft robot, energetically sustainable; oxygenator by movement and purifier by plants, developed by Daniela Rojas (figure 15); BOYLE, hypobaric fruit and vegetable dehydrator without the use of external sources of energy, designed by María Paz Rojas. They are some examples in which the incorporation of methodologies of ideation based on the cooperation between independent sources of inspiration allowed to obtain novel approaches to the initial problem.

Figure 14. STOUK, wearable swim assisted device.
Figure 15. Shelley, aquatic soft robot designed by Daniel Rojas, 2017.

CONCLUSION

The development of this methodology required a series of iterations to ensure a free approach to the limits imposed by the type of problem to be solved.

In this way, this methodology was established as a model of work on degree projects with Design students, collecting new findings and promoting a recursive model that is perfected with new iterations.

We are symbionts in a symbiotic ecosystem and by looking in detail, we can recognize that symbiosis is a ubiquitous phenomenon. How long we should wait for this co-operative integration between species to permeate the creative processes remains a question.

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TRANSFORMING AGRICULTURE THROUGH URBAN PRODUCTION METHODOLOGIES WITH THE SUPER POTATO

It is estimated that by 2050 two-thirds of the world's population will be urbanized, changing the framework in which food is produced and consumed by the majority of people. The scarcity and high cost of fossil fuels will reduce the feasibility of transporting crops from rural zones to cities, and rapidly increasing climate changes will force dramatic transformations in agriculture. The potato is the third most important crop globally after wheat and rice, currently represented in the diet of over 1.3 billion people. Changes in climate and lifestyle in the future will threaten the present standards for potato and other staple crop production, risking hunger and malnutrition particularly in developing countries and low-income populations. In this work, the proposed solution is a super potato, developed through the isolation of desirable genetic traits from native andean potato varieties. This will be achieved through an accelerated plant-breeding process using the Agrobacterium tumefaciens-CRISPR-Cas9 system to create cisgenesis. The resulting super potato will be adapted for new growing methods in urban farming, reduced reliance on resources, increased resistance to pests and adverse environmental conditions, and modified to meet the nutritional demands of the middle/low income population. The proposed modified crop will be produced and commercialized in a single urban environment, eliminating transportation and intermediary costs. The results of this investigation propose a new configuration for the development of other super crops under the same production conditions to achieve a variety of super staple crops in the future.

Keywords: Superfoods, urban agriculture, cisgenic modification, cultivation transformation, crop system design

INTRODUCTION

Without immediate and sustained efforts to promote food security in the future, we risk the health and wellness of millions, if not billions of people.

It is estimated that by 2050 two-thirds of the world's population will be urbanized. In Colombia's capital city of Bogotá, the population will grow to 14 million inhabitants and 5.7 million homes, almost double the current numbers. This drastic urbanization of the population will inevitably change the paradigm in which food is produced and consumed by the majority of people. The scarcity and high cost of fossil fuels will reduce the feasibility of transporting crops from rural zones to cities, and rapidly increasing climate changes will force dramatic transformations in agriculture. Furthermore, as outlined in the recent EAT-Lancet Report, a global shift to a more plant-based diet is necessary to meet the goals of the Paris Agreement and Sustainable Development Goals by 2050.

The potato is the third most important crop globally after wheat and rice, currently represented in the diet of over 1.3 billion people and it is a staple food source in Colombia, where over 362 lbs of potatoes are consumed per household annually. Changes in climate and lifestyle in the future will threaten the present standards for potato and other staple crop production, potentially risking hunger and malnutrition particularly in low-income populations.

This project proposes a solution to future agriculture by the creation of a new "super potato," which is achieved through the selection of desirable traits from common and wild andean potato varieties. The gene coding for these characteristics will be included in a single variety through an accelerated plant-breeding process. This technique uses the *Agrobacterium tumefasciens*-CRISPR-Cas9 system to create cisgenesis, which enables the specific insertion of genes and therefore rapidly increases the generation of new varieties compared to traditional hybridization methods. The resulting potato will be adapted for new growing methods in urban farming, reduced reliance on resources, increased resistance to pests and adverse environmental conditions, and modified to meet the nutritional demands of the middle/low income population.

The proposed modified potato crop will be produced and commercialized in a single urban environment, eliminating transportation and intermediary costs. This system is designed according to the concept of a circular economy as defined by the Ellen MacArthur Foundation (EMF), which is based on the principle of 'take-make-waste.' In our proposed circular economy for the production of the super potato, the cultivation tower

eliminates waste and optimizes resources through a system of renewable energy creation, circular water management, and waste management and recycling, all of which are reused in the cultivation system.

This project takes into consideration the problems with current methods and other proposed solutions to future food security such as the limitations of conventional agriculture and of urban agriculture projects, and presents a new framework for considering how to address nutritional needs of our future population. The aim of this study is to propose a circular urban agriculture system where newly developed superfoods, starting with the potato, resolve the problems of food security on future urban middle/low class populations.

WHY THE POTATO?

The potato originated in the Andean mountains in South America. Native Andean communities began to domesticate wild potato plants through selection until arriving at what we know today as common potatoes (*Solanum tuberosum*). The cultivation of the potato began to expand along with corn due to its ability to meet the nutritional needs of early Andean populations. In fact, the potato stood out as a reserve crop for when the harvests of other foods were lost (FAO, 2008). After the Spanish conquered South America, the consumption of the potato expanded throughout Europe, Asia, and North America.

Finally, in the 20th century the potato became a global food source, both in production and consumption, particularly for developing populations. For example, currently in China, potatoes are considered the main food crop, accounting for 60% of the country's agricultural area (FAO, 2008). Given the current importance of the potato at a global level, its historic and future relevance in food security, and its natural nutritional qualities, we propose to use this popular food source as the basis of a new variety, which will meet the nutritional demands of future populations.

The domesticated potato can be prepared in versatile ways and is a good source of energy, containing 60% solids, of which 80% is starch. The protein content of the common potato is comparable to that of other cereals such as wheat and rice. It contains very little fat and is a source of vitamin C, B1, B3, and B6. It is also rich in minerals including iron, potassium, phosphorus, and magnesium. Additionally, it contains important antioxidants and other essential nutrients such as folate, pantothenic acid, and riboflavin, which are all key components to general health and balanced nutrition.

It is important to recognize that the potato contains a wide range of nutrients and that each potato variety has a unique distribution of nutritional content. The extensive diversity of potatoes and their individual nutritional advantages gives us the opportunity to select the most desirable nutritional characteristics to develop a new potato with superior nutritional qualities, designed to meet the specific needs of a population.

Scientific Methodology of The Super Potato

The potato has the most genetic diversity of any other modernly cultivated crop. The genetic resources of Andean potatoes include wild varieties, native species and hybrids of wild and cultivated plants. The Andean potatoes contain important characteristics such as: resistance to pests and diseases, high nutritional value, taste, and adaptation to extreme climatic conditions.

Traditional hybridization is complex and slow, so the use of molecular techniques has been of great importance in recent years to speed up the process of developing new plant varieties. The application of molecular markers to the characteristics of interest allows us to determine the suitable features and simplify the selection of improved varieties. The genetically modified varieties can produce more stable crops with greater nutritional value and productivity (FAO, 2008).

To obtain a general view of the quality traits in the native potato varieties, an association mapping could be used as performed in Björn *et al* 2008, which takes advantage of previous genetic information, amplified fragment length polymorphism (AFLP) markers, and statistical analysis to identify associations in the different varieties (Björn *et al*, 2008). These markers allow the identification of genomic regions (genes) where the quality traits and the pathogen resistant genes are encoded. For example, some studies involving the most significant potato pathogen, *Phytophthora infestans* have used QTL (quantitative trait loci) to identify genes associated with resistance (Leonards-Schippers *et al*, 1994). QTL will be analyzed to verify other resistance alleles and quantitative genes.

Once these genetic regions have been identified, molecular engineering technologies will be used to join these genes in one potato variety. The techniques that will be employed are cisgenesis and CRISPR-cas9. Cisgenesis is the genetic modification of a recipient plant with a natural gene from a cossable-sexually compatible plant. Cisgenesis products are similar to the products of traditional breeding, which encompasses all plant breeding methods where gene transfer is carried out among sexually compatible species. On the issue of safety regulations, cisgenic plants could be treated the same as conventionally bred
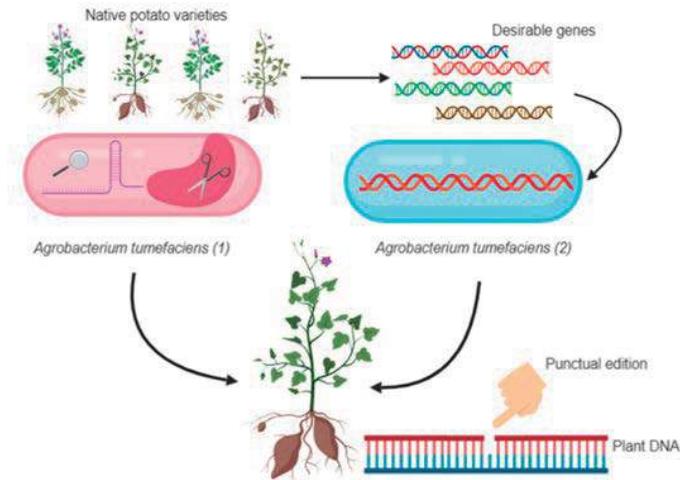
plants (Jogdand *et al*, 2017). Furthermore, cisgenesis represents a formidable advantage in terms of time in comparison to traditional hybridization methods as well as the ability to avoid undesirable genes such as susceptibility, bad flavor, toxic compounds, etc.

In complement, the system Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)- associated protein 9 nuclease (Cas9), will be used to introduce the desirable DNA into the plant (Wang *et al*, 2015). The bacteria *Agrobacterium tumefaciens*, which naturally has the capacity to transfer genetic material to plants, will be used in two ways as shown in the diagram below. First, to introduce the DNA of interest and second, to include the genetic material that encode the protein Cas9 (molecular scissors) and the RNA (which serves as a guide to make the scission on a specific point).

This methodology could be applied to different crops with some specific modifications. These proposed modified superfoods are selected taking into account staple crops, nutrition content, and traditionally consumed foods in different regions. In this project, the biotechnology behind the development of the superfoods is paired with the design of the adapted crop system to reach this aim.

The Adapted Crop Methodology

The Super Potato has been designed to grow in specific indoor conditions which include regulated temperatures, growing in a substrate created from a circular waste management system, and the design of a unique cultivation system. The cultivation system utilizes a rain water recollection tray, which drains into a series of internal conduits. These internal conduits are adapted into water drip irrigation. As diagrammed below in Figure 2, this

conduit system is located inside a central axis, in the shape of a half DNA helix configuration. The central axis has three containers anchored by a 180° hinge that allows the rotation of the containers in order to position the crop to receive the optimum amount of sunlight for the potatoes' growth.

Each container, as shown in Figure 3, is divided into three sections. The water drip irrigation system is passed through the central axis and into an internal compartment within the container where the system diverges into three individual tubing systems that are distributed into each of the three divisions in the container, ensuring that each crop is adequately irrigated. Each section of the container is designed to accommodate two potato plants, which are introduced into a molded and compressed substrate in the shape of the cavity. The divisions of the container each have a side hatch, allowing the grower to retrieve the potatoes without needing to remove the entire plant in order to access the tuber.

This system, as visualized below in Figure 4, has been designed to utilize the following materials:

- The internal water drip irrigation system: recycled flexible PVC (polyvinyl chloride)
- The central axis: an internal aluminum alloy structure for each of the four corners of the axis's shape, which is covered in recycled, translucent, green PET (polyethylene terephthalate)
- The hinges and containers: sheets of aluminum alloy
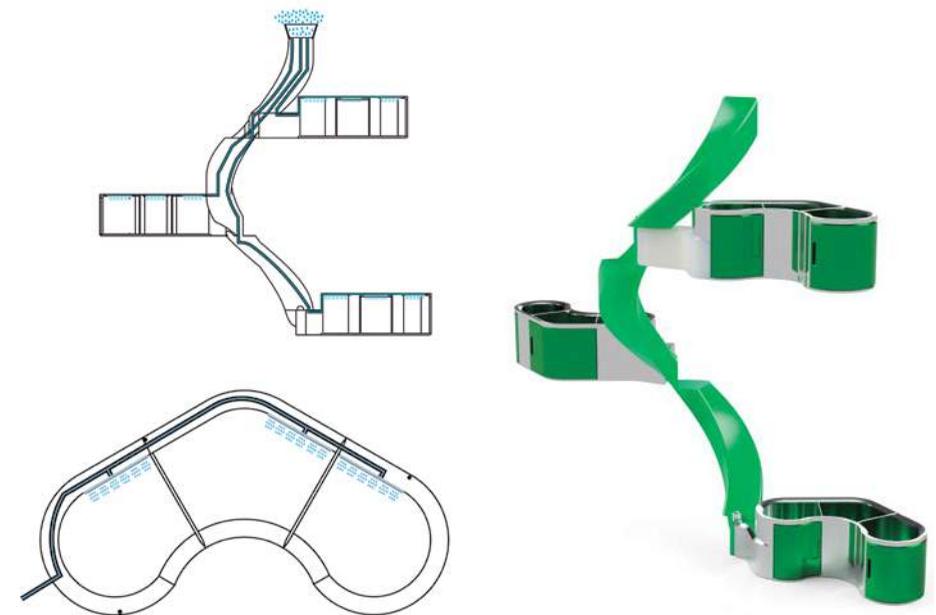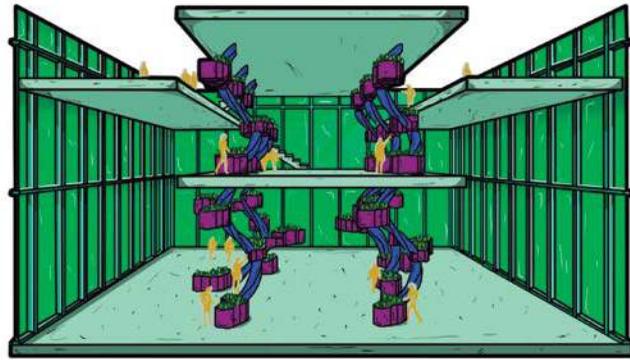
RESULTS

The crop system will be positioned in a single agriculture building, referred to as the "cultivation tower." This building will include the areas of crop production, storage, commercialization, and subterranean levels of circular resource management. The crop production floors will be constructed using materials that allow the entrance of natural light as the primary source of energy to the plants. As the cultivation modules can rotate, this design allows the exploitation of natural light as much as possible.

The commercialization floor, located on the ground level, will promote the concept of a circular economy, where transportation and intermediary costs are completely eliminated. The concept is designed to be consumer friendly, and give shoppers the ability to see the production floors above.

In the basement, resources are processed and distributed to the building in three levels. One level is designated for water collection and treatment; a second subterranean level contains a biodigester, which recycles organic residuals from the building and community and transforms them into biogas, producing energy for the cultivation tower; the third level is designed to process the organic materials left over from the biogas plant, and through a dehydration and molding process the waste is transformed into the substrates for the next crop cycle.

Discussion

The impact of this project depends on an intense genetic research investigation in order to find the quality traits and join them together in a single plant variety. To achieve this, accurate procedures and rigorous methodologies must be followed. Cisgenesis is a technique that enables us to use the same plant

family and share DNA between them. This biotechnology may not be able to be exploited to its full potential however, because of several reasons, the major one being its acceptance by consumers due to perceived biosafety issues (Jogdand, 2017).

Nevertheless, this technique represents many advantages in plant hybridization, specifically in reducing development time, which is crucial to find an adequate solution as well as enabling us to specifically select desirable traits and omit undesirable ones. Much of the public's preoccupation around Genetically Modified Organisms (GMOs) is based on the perceived "artificial" selection and manipulation of natural genetic material, but the domestication and selection of different crops that has been used throughout history is in fact also a form of genetic manipulation. Also, is complicated to define the concept of natural, and depending on perceptions of naturalness, some people would agree that cisgenic crops are more acceptable (less "unnatural" or "artificially" modified) than their transgenic counterparts (Mielby *et al*, 2013). Lastly, it is important to note that most perceived fear of genetically modified food crops have no scientific basis, or are concerned with the use of highly toxic pesticides on GMO crops, but not specifically with the genetic modification of the crop itself. Our proposed solution considers the importance of eliminating the use of toxic pesticides, and aims to achieve this goal both on a genetic level as well as through cultivating in an indoor, controlled environment, and in containers to reduce susceptibility to pests. However, considering current public perception, we believe that it in order for a project like this to succeed with consumers, a significant effort would need to be aimed toward disseminating trustworthy and truthful information to educate the public on any potential health risks and rewards of this type of crop.

Selection or genetically modified crops present many distinct advantages. For example, in many developing countries, small-scale farmers especially suffer bug pest-related yield losses because of technical and economic constraints. Pest-resistant genetically modified crops can contribute to increased yields and agricultural growth in those situations, as the case of cotton in India demonstrates (Qaim *et al*, 2003). In this way, the genetic selection, modification, and cisgenesis represent the opportunity to develop improved plant varieties in less time, creating a viable solution that can be achieved if is planned with ethics, responsibility, and controlled environments.

The proposed superfoods in this project are designed to always be produced as indoor crops. They will be controlled and the newly created plants will not be able to interact with other common and wild varieties outside these buildings. This means that these modified crops will in no way threaten biodiversity or any existing plant species. Instead, this project will change the way low and

middle income urban populations produce, acquire, and consume basic, staple food, providing more nutrient dense options that are accessibly priced.

CONCLUSION

The urban agriculture of modified superfoods is a solution to real problems. We are already experiencing the impacts of increasing population, urbanization, and the loss of farmers and farmland. Every day the demand for food, and more importantly nutrition, is rising. This, paired with increasing costs of transportation, storage, and the overuse of pesticides is limiting the accessibility to nutritious, healthy, whole foods to a wealthy elite. It is therefore no longer feasible to conceive of traditional agriculture as the sole viable solution to our future food security. We believe that newly designed urban crops are a plausible alternative to cover the food necessities in the future, providing a positive impact on the cities and the people who they will feed. This differs from other proposed solutions in that these will be modified superfood crops, with higher nutritional content, environmental resistance, and adaptability while still maintaining local food traditions.
Furthermore, the focus on crop design and a circular economy considers the impacts that this type of solution can have beyond meeting nutritional needs; this project promotes jobs, sustainability, and recycling while reducing waste, reliance on fossil fuels, and the use of toxic chemicals. This project seeks optimization through the entire process, from the development of the desired super crops to their commercialization and distribution.

Limitations

Currently this project is entirely speculative. Although the biotechnologies we propose to create the super potato currently are used in genetic modification, the super potato itself remains theoretical and will require funding and extensive research in order to be realized. This also applies to our modified crop design; extensive research and testing will need to be performed to validate the viability of this cultivation system.

Lastly, it is highly probable that this type of project will need partial if not complete governmental support in order to be realized, from conception through to potential subsidization of the crops.

Next steps

The next steps for this project not only include advancing the limitations mentioned above but also a phase of extensive research on the impacts of this proposed solution to both the cities as well as the consumers of these products themselves. Impacts on the city include how the building design and use of this cultivation methodology influence levels of water usage, pollution, and energy, as well as job opportunities and entrepreneurship. Impacts on consumers to be evaluated include measuring how the introduction of modified super crops influence quality of life, overall health and wellness, and obesity.

Contributions: Building illustrations by Juan Sebastián Ramos Farfán

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BIOMINING: AN APPROACH FROM BIODESIGN IN SEARCH FOR AN ECOLOGICAL EQUILIBRIUM

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Currently, alternative approaches to gold extraction are being developed, such as programs that promote sustainable practices for gold mining in regions like Chocó and Huila, Colombia. The contribution of this study to those programs combines science and design in order to improve the processes of concentration and recovery of gold.

This proposed solution involves the communities that are immersed in this sustainable mining program due to their explicit interest on the implementation of environmental systems of biomining in their regions.

The initial phase for the design process considered desk research and data analysis to characterize the target populations y las condiciones propias del Sistema. The second phase involved the identification of biotechnologies like bacteria and plants, useful for gold capture and experimentation with them.

The final phase corresponded to the design de una propuesta que hace aportes significativos a la consolidación del sistema productivo y cultural existente en la región y, particularmente, a la mejora de la eficiencia en el proceso concentración y recuperación del oro. Una biomáquina como alternativa de biominería que impulsa un sistema completo en el que las comunidades y organizaciones certificadas reciben mayor remuneración por el oro que producen a la vez que contribuyen a la sostenibilidad ambiental y promueven la economía colaborativa y el comercio justo.

This proposal invites to reflect about the intangible and intrinsic value of water, which is often undervalued. This correlates with the importance of ecosystems equilibrium, which is fundamental to preserve the services they offer to sustain humanity and all living organisms.

Keywords: biomining, biodesign, mercury, gold, equilibrium of ecosystems.

INTRODUCTION

Gold has been fundamental in the history of Colombia. From pre-Columbian cultures with the development of aesthetic and spiritual practices on gold, passing through the period of the conquistadors that brought an economic view on it, to present day, the gold mining is one of the most important drivers of the economy at the national level.

According to the data provided by (UN Environment, UNEP, 2008) small-scale and small-scale mining (MAPE for its Spanish acronym) constitutes between 20 and 30% of the annual global gold production. This occupation involves an estimated number of between 10 and 15 million miners, including 4.5 million women and one million children. Moreover, it is by itself the world's largest source of intentional release of mercury (UN Environment, UNEP, 2008) and a widely extended alternative in the national territory, especially in those rural regions where the possibilities of economic sustainability are limited due to social, cultural and armed conflict factors.

The use and release of mercury during the process of concentration and recovery of gold not only implies serious damages to the biodiversity of mining regions, but also puts at risk the lives of workers who are exposed directly to the element and it also causes risks for the inhabitants of the surrounding areas, who after the consumption of contaminated fish, suffer deterioration in their health. Not to mention that the storage, transport and handling of mercury create opportunities for spillages and for people to be exposed to mercury vapor (UN Environment, UNEP, 2008).

This academic paper aims to analyze, from the design perspective, the necessary variables to propose an alternative to the use of mercury in mining based on the concepts of responsible design and bio-design, as well as the existing biotechnology for that purpose.

BIO-DESIGN AND RESPONSIBLE DESIGN FOR BALANCE

After highlighting the role of mining in Colombia and its involvement in the pollution of water sources in Colombia, progress has been made from the academic literature and the perspective of responsible design, to analyze the variables of context that allow to establish the necessary characteristics to promote a system that allows communities to address alternative methods of concentration and recovery, thus reducing their contributions to the release of mercury to the environment and the risks of contamination because of it.

The analysis categories were established based on the proposal of (Thackara, 2006) about the factors that should be considered during the design processes favoring the consolidation of systems and suppressing the creations of objects without real value for the communities. Thus, the first category refers to the natural, industrial and cultural systems in the practices of small-scale mining in Colombia. The second category refers to human factors and their agency capacity to address the problem (at this point, the endogenous initiatives are especially considered). Finally, we address the technological elements, which for this section contemplate the existing biotechnology and their potential use in the territory.

Natural, industrial and cultural systems

Taking up the theoretical basis, we understand that responsible design seeks to debate the current tendency that calls the human being to adapt to the new technologies, because this has brought serious consequences on native populations and has led to the disappearance of traditional cultures (Thackara, 2006), in addition, it brought the "dehumanization of work". Therefore, it is proposed to establish new paradigms in which people have more value than technological advances and innovation is guided by the strengthening of social relationships and the understanding of the consequences that may bring about the contexts where it is implemented. In this sense, the analysis of the first category proposes to highlight the industrial, cultural and natural systems involved in the context in which we worked to ensure a responsible design (Thackara, 2006).

In the case of gold mining in Colombia, the industrial system with mining title represents only 13% of the total production of the metal, which demonstrates a high margin of illegality and small-scale mining in the country (Ministry of Mines and Energy, 2012). The industrial form to extract gold starts with the extraction by mining or excavation of the mineral that contains gold, then it is transferred to a heap of leaching where cyanide is used to recover the gold. This process can have a high environmental impact if the appropriate measures are not applied and if a thorough water treatment is not done. Finally, chemical processes are carried out to obtain solid gold, which is refined and can be marketed (Ministry of Mines and Energy, 2017).

However, these processes are difficult to appropriate by artisanal and small-scale miners, who do not have sufficient funding and therefore use tools such as motor pumps, dredges and backhoes along with mercury for the gold separation (Mosquera, 2013). These activities totally affect ecosystems and the lack of regulation by the government, leads to damages persist and the biodiversity losses become definitive (Mosquera, 2013).

Important efforts have been made to reduce the use of these practices, however, their use is still widely distributed in the different mining areas of Colombia (United Nations Environment Program, 2008). This is because artisanal methodologies, of low impact for the environment that could be used, have less productive capacity and therefore are not attractive. In addition, initiatives to encourage miners to abandon the use of mercury do not take into account the dynamics of mining communities, the needs of workers and the conditions of the regions, which means that they are not appropriate for the community (Gavin Hilson, 2007).

Therefore, it is also essential to understand the natural and cultural system of artisanal and small-scale mining in Colombia, in order to implement to mercury that are efficient and highly welcome by the community.

In relation to the cultural system, regions such as Chocó in Colombia, are characterized by communities dedicated to alluvial gold mining since before the colonial times (Mosquera, 2013). This activity provides a livelihood for a large number of families in the region, however, the socio-economic conditions of these people tend to be precarious, with basic levels of education and limited access to social security (Ministry of Mines and Energy, 2012). Moreover, the widespread use of mercury for extracting gold in this region leads to the exposure of miners to high concentrations of such toxic metal. Due to its low efficiency, large amounts of mercury are also released into the environment, which affects the ecosystems of the region and the health of the communities (Barrios, 2016).

However, also within the cultural and natural system of the region highlights an alternative form to mercury for the extraction of gold. This consists of the use of knowledge inherited from the African tradition, which take advantage of the biodiversity in fauna of the region to obtain extracts of plants that allow the cleaning and subsequent extraction of gold. Specifically, plants such as the Balsa Tree (Ochroma pyramidale), Malva (Hibiscus furcellatus), White Guácimo (Goethalsia meiantha) and Yarumo (Cecropia virgusa) (Brooks, 2015).

For example, the Balsa is a species found abundantly in the Pacific coast and other regions of Colombia that are characterized by their tropical vegetation. Due to its rapid growth and high quantity of organic matter (Douterlungne, 2013), it is sustainable to collect its large leaves to be used together with low amounts of water to obtain a viscous and frothy extract that allows an efficient washing of gold. This technique uses the principle of flotation and separation by densities. Gold has a very high density, ten times greater than the density of other minerals found in the mixture to be washed. Therefore, the gold falls, while the sand and other less dense minerals are trapped in the bubbles of the vegetal extract and float, thus extracting gold of greater purity (Brooks, 2015).

Plants such as the Balsa are also recognized by the properties of their wood, which could be used as a secondary benefit to the extraction of gold. In addition, due to its rapid growth, it can provide favorable conditions for slow-growing plants and could contribute to reforestation programs in impacted areas (Branciforti, 2009).

Human agents and endogenous initiatives

The analysis of this category gives priority to human agents, as proposed by (Thackara, 2006) without considering them mere "factors" in a larger scene, on the contrary, it works to give value to people, not give people to systems, considering the differences in space, time and culture as positive values, and not as obstacles in the design process.

One of the most important collective agents on the stage is promoted by the "Green Gold" program, founded in 2001 in Chocó, Colombia. This program seeks to encourage responsible small-scale mining with objectives of sustainability and that does not use mercury or cyanide in its gold extraction processes (United Nations Environment Program, 2008). This initiative seeks to motivate the use of traditional knowledge of indigenous and African origin communities, such as those previously mentioned. In addition, after mining is carried out, the impacted areas are rehabilitated to minimize the environmental impact.

The miners who are certified by the Green Gold program also have benefits during the marketing of gold, which has a 15% higher price in international markets, which is increasingly attracted by these initiatives, as is the case of Germany, the United States, the Netherlands and the United Kingdom (United Nations Environment Program, 2008).

These alternatives are in accordance to the responsible design model proposed by Thackara (2006) because they give value to the well-being of people over the economic system of production. They also exalt both cultural and environmental diversity and seek conservation.

This is why the design process developed in this study focused on providing improvements to the production system currently used by Green Gold miners, maintaining their traditional knowledge and mixing them with technological advances that allow greater efficiency of production processes.

Material and technological resources

While there are currently several alternatives to the use of mercury during the process of concentration and recovery, especially biological alternatives, most of these do not

contemplate the application in territories with social, cultural and economic conditions as those in which MAPE is implemented.

The following table addresses some of the existing biotechnology in contrast to its possibilities and restrictions of use in the territory.

The chemical alternatives to mercury are cyanide, thiourea and borax, elements that are polluting the environment, but not in the same measure as mercury, but represent serious risks to the health of workers.

Some organic solvents, such as ammonia and halogenated compounds, require strict control of the variables for their use, that is to say that in an environment highly restricted and controlled by experienced professionals could result in the removal of mercury in the mining process, but the fact is that such a level of control is not possible in the territories and the communities do not have the knowledge required to carry out such procedures.

ALTERNATIVES	RESTRICTIONS FOR THE APPLICATION
Chemical: Cyanide, thiourea, borax.	Pollute to a greater or lesser extent the environment and/or represent risks to human health.
Organic solvents: organic ligands, ammonia, halogenated compounds.	The success of the techniques depends on the strict control of the variables that are obtained in the laboratory which makes them costly.
Bacteria for bioleaching and biooxidation.	The use of cyanogenic organisms has been successfully used in mining industries for gold leaching.

RESULTS

After the analysis of the categories of research (systems, agents and resources) the results were focused on identifying meeting points among the existing elements in the context, biotechnologies available and the community. This section focuses on highlighting the importance of collaborating in the construction of complex systems that drive the creation of design solutions focused on the broad understanding of them and the problem.

Then the first design of 'Probila' is established, a bio-machine that gathers the understanding of the findings, that is still in the iteration stage, but that tries to be located at the center of the technological, community and contextual factors to impel the economic and social system pre-established in the territory across endogenous initiatives like Green Gold.

One of the main obstacles posed by the use of balsa as an alternative to mercury is that its use during the process of

concentration and separation, at least with the manual techniques that are used today, is not competitive in terms of production. In other words, communities that use balsa as an alternative do not have the capacity to produce the same amount of gold as those who still use mercury or cyanide during the process.

How does Probila work?

The Balsa biomass used currently by small-scale miners is not going to be enough to achieve the objective of enhanced competitiveness. For this reason, we designed Probila, a bio-machine that aims to improve the efficiency of the separation methods currently used in the green small-scale mining and focus on promoting competitiveness of the organizations that support alternative gold mining.

The biomachine is composed of four modules with different functions. The first is a biofilter in which the water used in the separation of gold in rivers is pre-treated with bacteria of the species *Lysinibacillus sphaericus* (Lozano, 2013), which have a very high metabolic potential and are known to resist high concentrations of toxic metals for other living organisms, like men. Therefore, they were used in the bio-machine as a bio-filter to capture metals such as mercury, lead and chromium, among others, which are present in the water. These bacteria are immobilized in an alginate matrix, a biodegradable polymer extracted from algae that protects the bacteria (Covarrubias, 2012)

In addition, the analysis of several categories of responsible design led to the design of a bio-machine and it showed how the traditional knowledge of the communities is disregarded by the scientific community.

On the other hand, a disarticulation was identified between the technology advances and the necessities of the communities. This is mainly caused by institutions and organizations at local, regional and national levels, which may be public or private. Thus, biotechnological solutions usually do not contemplate the social context when proposing improvements to the systems under study, in this case, the process of gold extraction by artisanal al small-scale miners.

Finally, the design process conceived during this study achieved a wider perspective of the problem related with the artisanal and small-scale gold mining and it led to the understanding of the systems as the point of convergence of several political, economic and social forces. It also showed the importance of finding an equilibrium between conservation of the ecosystems and the human species.

and allows them to carry out the cleaning of the water in a more efficient way. The pretreated water continues to the second unit, a miller where it is going to be used to obtain a liquid extract of the leaves of the Balsa tree that works by difference of densities which allows to separate the gold from the sediments. These leaves enter the module through a hopper and are softly macerated.

The extract flows simultaneously to the main unit. In parallel, the sediment of the river is sluiced through a gutter that is composed of a metal mesh in the bottom. The cavities allow the smaller material, which usually contains the gold, to be trapped and separated from the bigger rocks and minerals of the sediment, while the water flows. Then the smaller material is deposited in the main module of the biomachine. Here the extract is mixed with the minerals that contain gold to separate them and wash the precious metal to obtain a pure extract.

CONCLUSIONS

These research and design processes improved the understanding of how to employ scientific knowledge to the solution of local problems taking place in complex systems and that require a change in perspective in terms of the relation between humanity, technology and biodiversity.

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SENSING NATURE: EXPERIENCE DESIGN FOR LEARNING THE INTERPLAY BETWEEN MATERIALS AND EMOTIONS

While the importance to human and planetary well-being of meaningful contact with nature has been well documented, less attention has been paid to creating educational activities that correlate emotional well-being with nature. This study is transdisciplinary research-in-practice, focusing on three main matters: human-nature connection, materials (from nature), and emotions (from humans). This project i) co-designs digital-physical learning experiences – from enquiry into sources to construction of 3D prototypes – to explore relationships between emotions and materials, ii) explores tangible and intangible tools such as meditation and natural inks, iii) investigates the effects of sensorial experiences with nature on children's behaviour from a social and environmentally-sustainable perspective. The aim is to create meaningful learning experiences to enhance children's understanding of themselves and of the natural world. The approach is mixed-method; the primary methods are Participatory Action Research and co-design, including workshops with educators (n=35) and children (n=80; aged 12-13), and co-creation sessions with field experts (n=11) in Psychology, Design, Education, Cognition, and Materials in Finland. The outcomes are the design and evaluation of a toolkit including i) the 4h-step process and ii) guidelines for educators to implement "Emotional Nature" learning experience to explore the origins of emotions and materials. This study contributes to Finnish and global discussions in environmental education related to emotions and nature, and UNESCO's Sustainable Development Goal 4: 'Quality education'. It is the first stage of a broader ongoing research project called Sensing Nature.

Keywords: human-nature connection, education, well-being, sustainability, biomaterials.

INTRODUCTION

Meaningful connection with nature provides several benefits for humans' physical and mental well-being, as well as for planetary health (Mayer, Frantz, Bruehlman-Senecal & Dolliver, 2009; Moss, 2012; Yuen & Jenkins, 2019). Nevertheless, in recent decades, opportunities for children to engage with nature during school have diminished (Moss, 2012).

Lack of engagement with natural processes has negative effects on children's inner (emotional and mental) and outer (physical) states (Mayer, Frantz, Bruehlman-Senecal & Dolliver, 2009; Moss, 2012). This study addresses both states through the topics of emotions and materials (see Figure 1). The overall aim is to contribute to education for sustainability (UNESCO, n.d.) through cultivating a more balanced relationship between humans and nature.

The Sensing Nature project comprises four stages, including this first, "Emotional Nature", using the framework of experience design for learning (Leinonen, 2010). Experience design is a field that acknowledges connections between various disciplines, considering different tangible and intangible aspects of the desired experience and giving meaning to the created links within a systematic approach to a solution (Leinonen, 2010; Mclellan, 2000; Shedroff, 2001).

The key fields within Sensing Nature research are: sustainability, human-nature connection, education, design, materials (nature), emotions (humans), senses, cognition, and psychology (see Figure 2). The experience design for learning presented here is centred around the opportunity in Environmental Education for activities that interrelate emotions and nature (Jeronen & Jeronen 2012, emphasising the importance suchlike learning experiences for individuals' emotional growth and connection with nature). It also builds off Dweck's Growth Mindset learning principle (2012), which states that anyone at any age can learn and develop
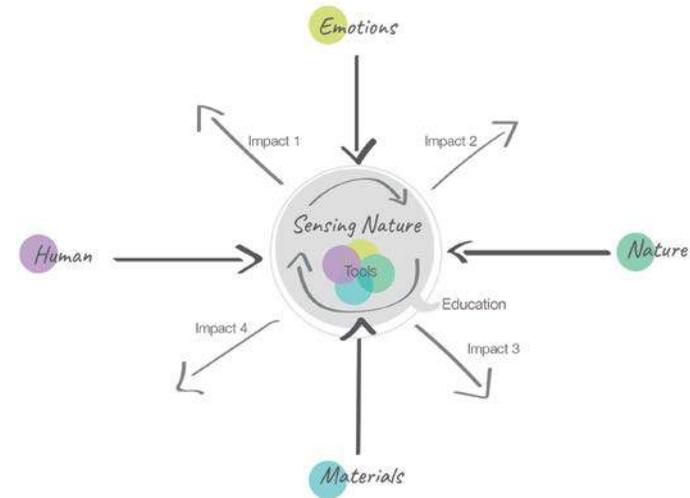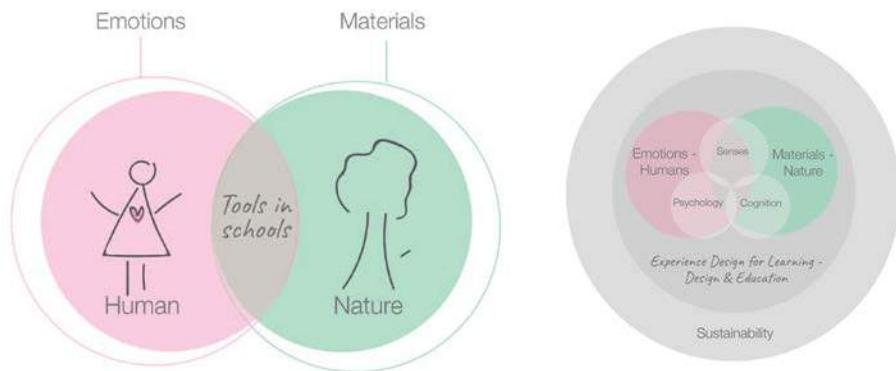
their capacities further. Therefore, the focus is on how to design learning experiences and facilitate those experiences for all. This paper presents the Sensing Nature's first stage, Emotional Nature, which focuses on creating educational activities that interrelate emotions and nature for children ages 12 and 13 in urban areas of Finland.

This research explores in practice the original sources of materials and emotions. It formulates possible outcomes by bringing together various digital and physical tools that allow children to build tangible and intangible relationships between emotions and materials and to be more in touch with nature. In the first stage, I explore physical tools like metaphors, meditation, and materials, including natural inks from berries (Rueda Mejía, 2019).

Grounded in transdisciplinary research, this study includes several theory-based links among the topics of humanity, nature, emotions, and materials to convey the complexity of the design opportunity (see Figure 3). For instance, it considers the relevance of emotions in taking sustainable actions, as well as how emotions are regulated when we have the chance to sense nature through materials in the classroom (Rueda Mejía, 2019). Other such links are the process of nature becoming material (both natural and man-made), and the key use of materials for making sense of emotions and within cognitive processes (Malafouris, 2013; Rueda Mejía, 2019). Here, I present nature as the common-sense perception constructed to differentiate human from the other beings. While the project research examined other emerging concepts such as new materialism as well, these do not apply in the Sensing Nature context.

Relevance of Emotions

Nature has notable impact on emotions. Meaningful time in green spaces increases capacity for calm and resiliency (Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; Moss 2012, Yuen, H. & Jenkins, G., 2019). Further, emotions are a critical causal factor in the sustainability challenges we face today; studies describe how most sustainability issues are rooted in human action, mainly driven by our emotions and mental models (Goodman, 2002; Senge, 2006). For instance, when feeling sad, people shop and accumulate things to make themselves feel better. In the education context, Boler's study discusses the challenges of dealing with emotions in school settings (Boler, 1999).
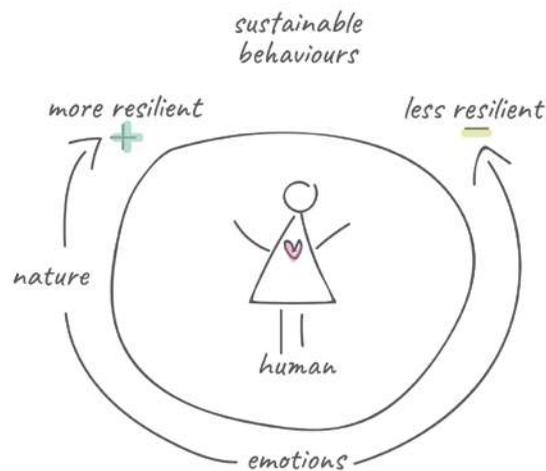
The strength of children's meaningful contact with nature is central to the relationship between their outer and inner dimensions – their "hidden, affective world" – as noted by Moss (2012). Connecting with the hidden world – emotions through nature, can also curb and redirect children's tendency to consume and acquire new goods. Incorporating these theories, my hypothesis is that connection with nature as the original source of natural and man-made materials may increase the incidence of humans taking emotionally resilient and environmentally sustainable actions (see Figure 4)

Relevance of Materials

Malafouris's study (2013) focuses on the relevance of material things to our learning process and proposes how materials and things become extensions of the human mind, at the same time playing a significant role in our understanding of emotions in individual and social dimensions. In practice-based projects

prior to Sensing Nature, I had the opportunity to engage in self-exploration with biomaterials, especially wood-based materials, at CHEMARTS Summer School, Aalto University (Kääriäinen, Niinimäki & Lindberg, 2017). There, I was captivated when I made the connection through my hands between different bio-based materials and nature (Rueda Mejía, 2019). For instance, while working with berries to extract their colours, I grasped the connection between inks and nature. Furthermore, I was able to observe, how experimenting with biomaterials also engendered positive emotions like joy in my classmates and me.

The Emotional Nature stage of the Sensing Nature project is organized into four cycles of mixed methods like co-design practices (Jégou & Manzini, 2008), and the Participatory Action Research approach (Kelly, 2005). The result of the research is a designed, evaluated toolkit for educators and children, composed of the 4h-step process and a learning experience for exploring the origin of emotions and materials. Each element helps participants explore the interplay between emotions and materials, as well as enhances children's personal connection with nature for their individual well-being and engagement in sustainable behaviours.

DEVELOPMENT & FINDINGS

To provide a wider picture of the phenomenon of human-nature connections through emotions and materials, the research combines qualitative and quantitative approaches. The main methods are Participatory Action Research (PAR), questionnaires, self-explorations, intuition, and co-design methods such as workshops and co-creation sessions with experts.

The PAR method provides the general framework in engaging stakeholders during the different stages of this study, to take action and create knowledge (Kelly, 2005). It is an iterative process developed in cycles. For this stage, I organised four cycles based on the same general objective and co-design methods, each cycle with its own specific objective: i) define key stakeholders and tools, ii) validate the relevance of the experience in the Finnish educational context, iii) improve the experience with field experts, iv) test the final prototype of the learning experience and toolkit with educators, children, and field experts.

The first cycle involved designing an initial prototype of the learning experience based on an intuitive process originated in previous self-explorations, theoretical knowledge, associations, and feelings (Raami, 2015). In particular, I applied intuition for selecting the tangible and intangible tools, and organised them into four main steps to provide coherence and a sensible order for participants.

Afterwards, I implemented various co-design practices. I conducted 11 interviews with field experts, built on three open-ended questions resulting in co-creation dialogues (Rueda Mejía, 2019). Some of the areas of expertise discussed were pedagogy, psychology, cognitive neuroscience, design, craft, and material sciences. These interviews were crucial for understanding the practice context and giving the research a viable trajectory.

Alongside these interviews, I employed workshops to co-design and prototype the learning experience. I undertook six workshops (5-7 participants each) with children (n=5), educators (n=22), and design experts (n=7). Participants answered questionnaires at the workshops' start and finish, using a 5-point Likert scale to track the progress of the designed experience.

After the workshops, participants were invited to dialogue openly about their perspectives on the selected content, tools, and steps of the learning experience in order to create meaning, uncover feelings, obtain insights and recognise patterns (Phillips, 2011; Mattelmäki, 2006). The data from the workshops, questionnaires, and dialogues were carefully analysed and discussed to draw conclusions. The key findings of the first stage of Sensing Nature are divided into the project's two main practice objectives: i) co-design for enhancing human-nature connection; and ii) making sense of the interconnections between materials and emotions.

Co-designing Bridges for Human-Nature Connection

For this study, the co-design practice is crucial to contemplating multiple perspectives, providing viability to the research project, and joining the various theoretical and practical elements of the research in a coherent manner. Specifically, co-design acts as a bridge to connect people, research fields, and knowledge, as well as enhance the links between humans' inner and outer natural worlds. One co-design example is the 4h-step process constructed through intuitive exercises and dialogues with co-creators, allowing the scientific and artistic strains of the research to merge. The 4h-step become a link between human and nature throughout: The Head step - understanding the theory; Heart step - moving to heartfelt conversation; Hands step - exploring biomaterials and possible nature sensations; and Hum step - reflecting on what participants felt and thought.

Another example is the evolution of the initial perception of the human-nature relationship as linear (see Figure 5). From the dialogues with educators and experts, another conceptualisation of the human-nature relationship arose: an enclosing sphere (see Figure 6).

In the Finnish educational context, co-design also serves to bring existing governmental guidelines and the latest academic knowledge into everyday learning activities in schools.


Specifically, it can support educators in designing learning materials and activities that incorporate others' knowledge, as well as students' insights and learning desires. Thus, co-design makes lessons more engaging and inclusive to the needs of each generation and to all character types in a classroom.

Experiencing Materials Through Emotions

Sensing and feeling materials with our hands eases the process of our understanding and connecting with their natural sources. At the beginning of the Emotional Nature Learning Experience, participants are invited to sense a bottle of plastic and a piece of wood. While touching the materials, they are also guided to remember and trace the origins of plastic and wood (see Figure 7). Plastic typically comes from fossils of prehistoric plants and animals, and wood comes from trees. While participants are touching the materials, they also feel emotionally touched (Rueda Mejía, 2019). In this way, emotions become the link between the touched material and information provided about the original sources of the materials (Malafouris, 2013; Rueda Mejía, 2019). This experience thus nurtures participants' cognitive processes relating nature and materials.


Figure 5 and 6. Linear (left) and enclosing (right) relationships with Nature. Emotional Nature: A learning experience to explore how materials relate to emotions from Rueda Mejía (2019).
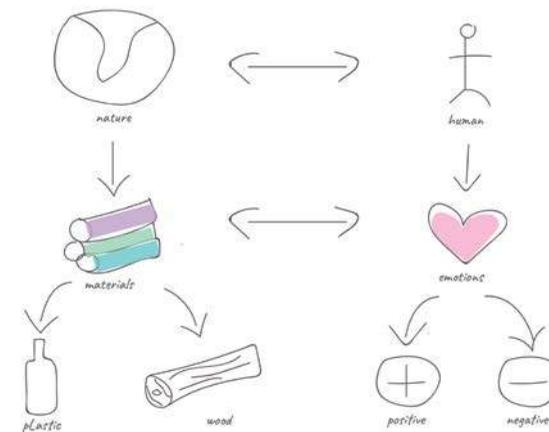
Figure 7. Metaphor: Origins of materials and emotions from Rueda Mejía (2019).

Experiencing Emotions Through Materials

During the workshops, participants reveal how the materials, and in particular biomaterials, become a bridge between the body and mind. This created bridge supports their own process of recalling, sharing, and materialising emotional memories (Rueda Mejía, 2019). Through the activity, participants sense different materials with their hands, while sharing a previous emotional experiences (See Figures 8 and 9). Afterward, with a short guided meditation, they imagine a creature. Subsequently, they build a physical model of their emotional creature with organic materials such as paper pulp and berry inks. In this case, materials become the element that makes emotions palpable. In addition, this exercise allows participants to notice how the same emotion can be perceived in different ways, through the opportunity to visualise and listen to how other people experience it.

In implementing these workshops, I was able to observe some of the difficulties and misconceptions that exist in educational settings and that were highlighted in Boler's study Emotions in Education (1999). For instance, the majority of educators who participated in the dialogues suggested that children are not open to sharing their emotions with others. However, during the workshops, the child participants were eager to share their emotions and listen to others' emotional experiences.

Figures 8 and 9. Children (left) and educators (right) giving shape to their emotional creatures with biomaterials and sharing their emotional story during the workshop from Rueda Mejía (2019).

RESULTS

The first stage of the Sensing Nature research the main results were: the Toolkit with its various materials, the 4h-step process, and the validated "Emotional Nature" Learning Experience.

Toolkit: Designed mainly for educators, the toolkit is the concrete starting point for stimulating the curiosity of educators and children alike, inviting them to take the first step into the interconnections between emotions and materials and its impact in sustainability. Some of the elements of the toolkit includes are recipe cards for using organic materials, "values cards" to create the desired atmosphere, an educators' folder with materials and

Figure 10. The Emotional Nature toolkit from Rueda Mejía (2019).
**Figure 11.** Recipe cards, natural inks and glues from Rueda Mejía (2019).
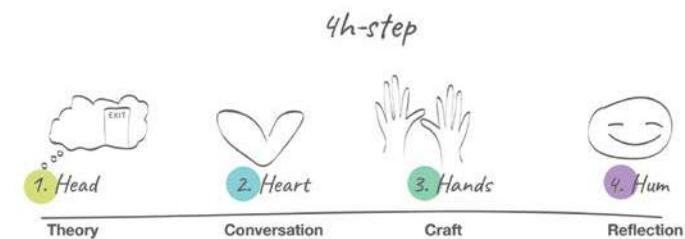
Figure 12. The 4h-step process for educators from Rueda Mejía (2019).

guidelines, a spoon, a fork, and a box with small containers to prepare natural inks from berries (See Figures 10 and 11).

The 4h-step process: This system is a crucial tool for educators that emerged from combining the theoretical and practical parts of the research. The steps are: i) Head — a short introduction to the learning experiences and theories of emotions and materials. ii) Heart — participants hold heartfelt conversations around the topic of emotional memories in nature, evoked by touching a plastic bottle and a piece of wood. iii) Hands — Craft activities begin with a short meditation for imagining an emotional creature based on the shared emotional memories. Participants give shape to their emotional creature with plants and wood-based materials. iv)

Hum – A final individual and group reflection on each participants' emotional and material experiences is held for closure and to enhance their relationship with nature and their learnings around the topics of materials and emotions (See Figure 12).

The "Emotional Nature" Learning Experience: (See Figure 13). This experience was designed with the aim of creating a safe, temporary space in schools to meet and raise educators and children's interest in in exploring the topics of emotions and materials, through the combination of various tools. During the last prototype and before the validation of the learning experience, seven participants evaluated the experience from 0 (not relevant) to 10 (highly relevant). The average rating was more than 9. Thereafter, the finished prototype of the "Emotional Nature" Learning Experience design was validated in the Aalto University Junior Lab with 75 children and 6 educators from multiple fields of the Espoo International School in Finland. Some of the collaborators in the various stages of the research project commented:

> "I see myself more deeply and have connected my biological body with nature."
> "I could also use this experience with my kids to understand their feelings and thoughts."
> "When I was touching wood and paper pulp I got many memories of nature."
> "This project opens a Pandora's box; my colleague in the Department of Chemistry has been implementing more practice-based courses for teenagers at Aalto."
> "I find it gratifying that environmental education and education for sustainable development are studied and developed from this new perspective."

Though the learning experience is designed to encourage exploration of both the topics – emotions and materials, some educators still expressed difficulties in bringing the topic of emotions to classrooms. Nevertheless, this first stage of research has not only stimulated curiosity in schoolteachers and children around both topics and their interplay, it has also inspired field experts to design their own courses for different audiences, mainly around the phenomenon of materials.

CONCLUSION

This research is the first prototype of more to come in Finland and in other locations around the globe. It has posed a unique challenge to my way of thinking and approaching design, triggering a move from certain frameworks and specific methodologies towards a multidimensional perspective that links knowledge from several fields and research methods. These new methods are based on careful and critical reading of the environment and on existing theories, as well as deep listening to co-creators, and connection to intuition.

I am particularly interested in further exploring the many tangible and intangible relationships between emotions and materials in order to connect us with nature and ourselves. My overarching aim is to achieve high-quality education (UNESCO, n.d.) and more balanced human-nature relationships. My main methods are co-design of learning environments and exploration of digital and physical tools as means to this end. The first stage was focused on exploring physical tools. The next stages will explore digital tools such as 3D printing.

As I mentioned in the introduction, a key feature of this research is its transdisciplinary perspective, which also makes it is difficult to place within a specific field. Rather, the research yields various findings and results as it develops. It is like being and learning in nature: the learnings and outcomes are many, and vary with each one of us.

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PROTOTYPE OF A SELF-SUFFICIENT BIOFABRICATION PROTOCOL FOR REMOTE TERRITORIES

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The exploration of materiality is of fundamental importance for the processes of architecture and design. Due to the rapid development of digital manufacturing, prototyping processes today allow the manufacture of customized systems accessible to all audiences. However, not all parts of the planet have access to these technologies and standardized materials to which today's industrial machinery and standards require them. Therefore, creating bio-manufacturing practices, where locally self-sufficiency using local materials is essential to create circular models. This fact underlines the importance of experimental materials research that connects the exploration of territories of all kinds of environments, with self-understanding and responsible use of technologies in sensitive territories, thus allowing the development of self-sufficient emerging manufacturers in extreme territories.

This work highlights the essential points in the approach to bio & eco-manufacturing by investigating the use of materials in one of the areas with the last cardinal points of the planet, Puerto Willams, Chile. The planning procedure is developed for a correct approach to the territory, as also the development of first samples of biocomposites and potential materials to work in this area. As a result of experience, this paper discusses both the technological aspects of bio-manufacturing and the social and ecological considerations involved. It also integrates cooperation within an interdisciplinary group of networked Laboratories interested in disseminating and contribute to the bio-fabrication design movement in Chile.

Keywords: Biofabrication, biomaterials, self-sufficiency, remote territories, open source

DESIGN AND COUNTERCULTURE

The term counterculture historically refers to different moments when mainstream cultural values and institutions were challenged, usually by alternative emergent subcultures. Over the past years, counterculture design ventures have proven a strong adaptive capacity to the oftentimes, hostile productive mainstream venues. Non-mainstream design has been especially good at finding cracks around the system and exploit those gaps for the benefit of small communities or finding alternative ways to think and understand social processes. What is the role design could play in creating new production models or economic systems? What role could design play in challenging or presenting alternatives in the way people relate to the territory and the managing of their resources? What strategies could design help to develop, to tackle issues of inequality, social justice, and marginalization? What other possible scenarios could be set for the development of a society and a renewed idea of human progress?

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WALKING BACKWARDS INTO THE FUTURE: USING INDIGENOUS WISDOM WITHIN DESIGN

Everyday life is a negotiated territory of space, time and resources. Encouraged by the recent renaissance of Buckminster Fuller's Spaceship Earth and Victor Papenek's critiques, renewed rhetoric of design's capacity and capability to contribute to the development of more positive futures has emerged. This paper references the responsibilities imbued in Fuller and Papenek's views and presents the emergent provocation Transition Design. Utilising the tangible and intangible interconnectedness of social, economic, political and natural systems, Transition Design seeks pathways to more positive futures for humankind's health, well-being, territories and resources. Transition Design proposes that the tenor of relationships cultivated within Indigenous Wisdom has much to offer the design of sustaining and sustainable futures. Borrowing Highmore's understanding of The Everyday as place-based lifestyles in which solutions to global problems can be designed, Transition Design further asserts the connections to people, place and space offered from within Indigenous worldviews are key to the development of environmental, social, and economic health and well- being. This paper specifically focuses on the worldview of New Zealand Māori (te ao Māori) alongside models from the Pacific region to illustrate cultural approaches to environmental and social health and well-being that use reciprocity, guardianship and self-determination to guide their relationships with people and place.

Guided by Transition Design this paper offers *ka mua, ka muri - walking backwards into the future*, as an approach that enables Indigenous knowledge and practices to inform design's capability to facilitate equitable and inclusive negotiations of space, time, resources and responsibilities.

Keywords: Transition Design, Indigenous Knowledge

DESIGN IN TRANSITION

Continuing on from the efforts of Richard Buckminster Fuller (1895 – 1983) and Victor Papenek (1923 – 1998) and further rallied by the emergent design provocation Transition Design, calls to rethink, rescale, reskill and refocus design towards de-colonization and the development of networked systems and strategies that impact social change and sustainable practices continue to gain bandwidth. Transition Design neither claims to be, nor is the first to challenge design's universal approaches or the manifestos that embed Western practices and beliefs as mainstream. Instead, transition designers acknowledge the variety of contemporary discourses and initiatives concerning change and aspire to act as integrative agents among the interdisciplinary teams that promote and enable positive societal change as their ethos (Terry Irwin, 2015, p.3).

Fuller and Papenek are considered two of the more provocative voices for social and environmental change within the twentieth century. Both criticized design praxis and pedagogy as being short-sighted, profit- orientated and contributing to the establishment of homogenous, un-sustaining and un-sustainable practices, behaviours and economies (Fuller, 1969) (Papenek, 1995). Seemingly reluctant to change, and well over half a century after their critiques, any shifts undertaken to address these issues by design are yet to be considered as wholesale. Prudently, the advent of Transition Design brings with it new collaborations, disciplinary definitions and pathways for design to consider how it may contribute to a shift in paradigm. This shift includes the future health and well-being of not only the planet, our place, but Earth's inhabitants, our people. This paper contributes evidence to Transition Design's argument that knowledge and wisdom from the past can enable discussions and solutions that better consider the future impact of today's actions (Terry Irwin, 2015a). Building on Transition Design's underpinning of place-based knowledge this research elucidates traditional understandings of interconnectivity as expressed within Indigenous worldviews and offers examples of how this knowledge can enable a recalibration of design's practices and, as Fuller and Papenek had hoped, its tenets.

ENGAGING WITH DIVERGENT WORLDVIEWS

"The leading role of the modern man entails that we live in a planet with only one storyline: the heroic story of the modern man" (Leitao, 2018, p. 7).

"This one storyline is conceived from the perspective of the Euro-American experience and exported to many world regions over the past few hundred years" (Escobar, 2015, p. 14). This

paper acknowledges this fundamental flaw and seeks change. But before any engagement with Indigenous knowledge can take place it is critical that an appreciation for the significance of this knowledge be offered. Indigenous knowledge is not old knowledge or knowledge relevant to distant, now outmoded times. Quite distinctly from Western knowledge, Indigenous knowledge has continued to evolve through rebellious, resistant and resilient practices of its own. In 1980 the World Commission on Environment and Development, defined 'Sustainable Development' as "meeting the needs of the present without compromising the ability of future generations to meet their own needs"(Jules Pretty, 2007, p. 1). While this approach is positive, the acclamation fails to acknowledge the pre-existence of Indigenous ideologies that proffer beliefs and practices of circularity, sustainability and forecasting within economies, ecologies, intergenerational relationships and responsibilities to both people and place, as central to their worldviews. For many peoples of the Pacific region inter-connectivity between humans, things and nature is a central tenet to their culture and translated over time and space by many who have and still co-exist with nature, practice collective and collaborative lifestyles, and who have lived sustainably for generations. Fundamental to these beliefs is the reciprocity and respect embedded in both tangible and intangible relationships and what those values contribute to the maintenance, adaption or co-creation of sustainable and sustaining relationships between people and place.

Hoki whakamuri kia anga whakamua, walk backwards into the future, is a traditional Māori saying (*whakatauki*) that acknowledges past, present and future relationships within *te ao* Māori, the Māori worldview. Similarly Tongan academic, Hūfanga 'Okusitino Māhina elucidates reciprocity as fundamental to relationships between humans and humans, humans and nature, and humans and things within the Pasifika ideology of Ta-Vā by explaining that, "All things, in nature, mind and society, stand in eternal relations of exchange" (Māhina, 2010, p. 174). In his formative work, Tā, Vā and Moana: Temporality, Spatiality, and Indigeneity, Māhina states, "People are thought to walk forward into the past and walk backwards into the future, both taking place in the present, where the past and the future are constantly mediated in the ever-transforming present" (Māhina, 2010, p. 170) and explains how time and space move fluidly; forwards and backwards between generations offering and sharing moments of negotiation, reflection, learning and exchange. Inspired by ideologies and beliefs like these and other acumen held in pre-industrial societies, Transition Design acknowledges Indigenous Wisdom and positions it as key to enabling current generations, "to draw from the past to conceive solutions in the present with future generations in mind" (Terry Irwin, 2015a, p. 1).

Using te ao Māori and *Ta-Vā*, in synergy with Transition Design this paper illustrates examples of how we might, by 'walking backwards into the future' recognize and integrate *tikanga* Māori, the traditional Māori values of *whanaungatanga*, connectivity, *kaitiakitanga*, guardianship, and *rangatiratanga*, self-determination, as fundamental values when considering design's approach to problems of individual and collective wellbeing and the development of more equitable and inclusive negotiations of resources and responsibilities. Professor Dennis Doordan of the University of Notre Dame further supported this assertion when he wrote, "I believe that Transition Design will ultimately force us to examine what it means to act locally and to learn about place in order to contribute to the stewardship of space, place and community" (Doordan, 2015, p. 66).

UNDERSTANDINGS OF SPACE

"We can only become aware of the features and flaws of our worldview in contrast with other storylines" (Leitao, 2018, p. 8).

Western understandings often express space as mode of separation. "Once it is assumed (after Newton and Kant) that space is absolute and infinite as well as empty and a priori in status, places become the mere apportioning of space" (Gone, 2008, p. 371). Henri Lefebvre's *"The Production of Space"* offered the discipline an alternative. Lefebvre's work gave both architecture and design the concept of space as non-existent 'in itself' (Lefebvre, 1991), adding that "everyday life is a negotiated territory of space, time and resources" (Schmid, 2008, p. 28). Fuller also considered space as more than defined by boundaries stating that, "Space is irrelevant. There is no space there are only relationships" (Fuller, 1969, p. 46). Papanek spoke of Indigenous expressions of space as wholly more expansive from those of the West (Pepanek, 1985, p. 136). Fuller's understanding of space as undefined until enlivened by relationships parallels the worldviews of New Zealand Māori and Pasifika peoples. Both *Te ao* Māori and *Ta-Vā* speak of space as tangible and intangible connections between humans, nature and things. Central to this connection is an everyday undertaking of responsibility and guardianship (*kaitiakitanga*) of people and place (*tangata whenua*). These relationships are held together by what Māori and Pasifika consider an eternal relationship of exchange that connects people and place. Respect and reciprocity are imbued into these connections as is the understanding that to remain healthy relationships need to be continuously nurtured. This study posits that *te ao* Māori and *Ta-Vā* offer design enriched understandings and opportunities to reframe relationships. Both also contribute to the care and guardianship (*kaitiakitanga*) of people and place

and establish co-design values that better enable connectivity (*whanaungatanga*) and self-determination (*rangitiratanga*) of solutions for health and well-being with those people and place.

GUARDIANSHIP OF SPACE

The use of *tikanga* Māori to enable collaboration. Within Service Design and Design for Social Innovation a shift is required within the developmental and participatory ways of working to include models that better recognise local expertise. The aim is to enable engagement with the complexity offered in this knowledge rather than reduce or simplify it to enable more universal understandings of it. To support this a, "process that involves bringing together evidence and wisdom from non-traditional sources" (Jamie Gamble, 2019) is required. In 1982 a holistic model of health and well-being was designed, by Māori for Māori. *Whare Tapa Wha* (the four cornerstones) is a holistic strength based model that considers wellbeing in terms of social, physical, mental and spiritual capacities. (Durie 1982). Figure 1 illustrates the cornerstones of this multipronged approach which depicts the four wall of one's home (*whare*) working in unison to create a whole.

The walls represent; mental well-being (*taha hinengaro*), physical well-being (*taha tinana*) and social well-being, (*taha whanau*) and spiritual well-being (*te taha wairua*).

Critically this model evokes tikanga Māori; engaging values of connection (whanaungatanga), guardianship (kaitiakitanga) and autonomy (rangatiratanga) as key determinants. Whare Tapa Wha moves away from Western health models in which services are delivered by 'outsider' experts and addresses "a pivotal question in regard to culture and mental health in Indigenous communities. It asks, under what conditions might mental health professionals, whose clinical approaches and techniques emerge from and depend upon a variety of 'Western' notions and norms, therapeutically benefit their vulnerable Native 'patients' or 'clients'
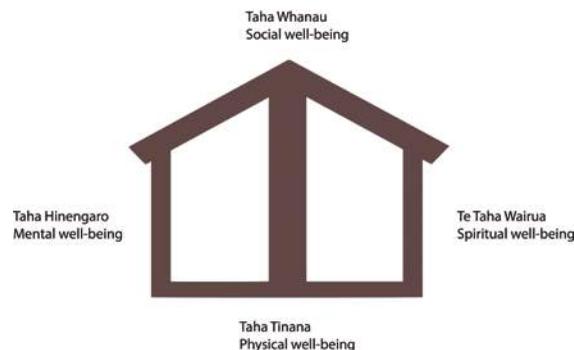
Figure 1. Maori health model Whare Tapa Wha, designed by Sir Mason Durie, 1982

Taha Whanau
Social well-being

Taha Hinengaro
Mental well-being

Te Taha Wairua
Spiritual well-being

Taha Tinana
Physical well-being

without reinforcing (or re-enforcing) the colonial project (Gone, 2008, p. 136). Whare Tapa Wha places the agency for health and well-being into the hands of the individual or community seeking it and ensures that decisions around stakeholder participation, methodology, evidence, intervention, communication, facilitation of outcomes and distribution of funding are in the hands of those whose lives, whose every day, lands, children and grandchildren are to be impacted (McNeil, 2009). This research asserts that the approaches demonstrated in Whare Tapa Wha and tikanga Māori hold much for the development of co-creative methodologies and practices in which currently the voices of others, skills of others and the pathways to the future are still determined by those who exist outside the problem.

Whare Tapa Wha encourages, as Māhina does within Ta-Vā, a space in which meaningful relationships can be nurtured and maintained. These relationships acknowledge local, traditional, every day and place-based practices, beliefs, assumptions and wisdom. In addition they demonstrate respect and reciprocity between participants and negotiate roles and responsibilities in order to enable both collectives and individuals to determine their own lives and those of 'their' next generations. Within tikanga Māori self –determination is considered as fundamental to enabling autonomy (rangitiratanga). These beliefs challenge current practices to confront and question assumptions and norms, question who validates what knowledge is, and what systems of knowledge are privileged (Jamie Gamble, 2019). Importantly Whare Tapa Wha asks for the reassessment of who makes the decisions. This paper asserts current Eurocentric ways of seeing or being in design need to shift towards more culturally calibrated mindsets. "While there is increasing recognition in mainstream or Western science settings of Indigenous knowledge systems as legitimate in their own right, references to evidence-based practices and programmes in policy and service settings still rarely include this type of knowledge" (Jamie Gamble, 2019).

CONNECTION WITH 'OTHERS'

The use of whanaungatanga (connections) to impact systems. "He reo e rangona, engari he kanohi kitea, a voice may be heard but a face needs to be seen" (Davis, 2017).

Transition Design acknowledges the importance of the everyday in understanding that social, cultural, economic and political spaces are connected through complex systems. It also recognises this specific time and space as a forgotten context not yet fully utilized for its potential to enable change (Kossoff, 2015, p. 31). Like Transition Design, this study references Highmore's The Everyday Life Reader and places this work alongside Indigenous Wisdom

to illustrate ways that can enable "place-based lifestyles in which solutions to global problems are designed"(Gideon Kossoff, 2015, p. 3). As an example, on the 24th September 2018, the Right Honorable Jacinda Ardern, the Prime Minister of New Zealand became the first female head of government to speak at the United Nations General Assembly with her infant present. This was not the only significant statement Prime Minister Ardern made on rather ironically named, 'maiden' speech to the General Assembly. Ardern stated, "We must redouble our efforts to work as a global community. We must rediscover our shared belief in the value, rather than the harm, of connectedness, whanaungatanga" ("Jacinda Ardern's full speech to the UN General Assembly," 2018). The connectedness Ardern referred to at the Assembly is embedded in te ao Māori and asserts as its essence, relationships between humans and both the natural and spiritual worlds. Māori explain everything through intergenerational layers (whakapapa) with both tangible and intangible relationships holding equal relevance and importance (Royal, 2007). These relationships and the respect and reciprocity demonstrated in them function at many scales and include everyday familial (whanau) connections and more complex relationships between disparate stakeholders in the negotiation of large scale, complex and highly contested territories and resources. In her speech, Ardern spoke of a need to prioritize the development of frameworks that enable relationships (whanaungatanga) at many scales and across large expanses of both time and space. Specifically, the Prime Minister highlighted guardianship (kaitiakitanga), not ownership and self-determination (rangatiratanga), as values that support healthy relationships at multiple scales and contexts and from which to design and build more inclusive, equitable, sustainable and sustaining futures ("Jacinda Ardern's full speech to the UN General Assembly," 2018).

Ardern's inclusion of her infant at the General Assembly, where she spoke of humanity's need to develop interconnectivity, respect, care and collective well-being was a very public, if not global demonstration of her efforts to recognize, respect and retain family (whanau) as an everyday relationship at the personal scale of motherhood, while attempting to illuminate and provoke discussion (whanaungatanga) about this very 'gendered' relationship and the historical interpretations, restrictions and bias toward it within a much larger and more complex scale and context. This paper suggests that the introduction of Ardern's everyday, that of a working mother in a leadership role, with a nursing baby, to the General Assembly session demonstrated that the everyday is a primary context from which the "design of sustainable futures, changed perceptions, and an improved quality of life can take place" (Terry Irwin, 2015b, p. 6).

Inspired by the Transition Design programme at Carnegie Mellon Design and the connections my research shares with it, I have summarized the endeavours of this research by referencing theirs, "In a world where the vast global systems of designed technologies mediate and modify human existence it becomes increasingly important for designers to develop better and more nuanced understandings of what human difference is and how we might as a collective benefit from this knowledge (Ahmed Ansari, 2018). And in response to their considerations this paper offers manaakitanga, respect for all that connects us, nga manakura, empathy towards all that connects us, and kaitiakitanga, guardianship of all that connects us, as the a new way of being and designing more positive, inclusive, sustainable relationships within 'our' space.

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A CONTEMPORARY URBAN HUMANISM: THE URBAN SPACE AS CULTURAL FRAMEWORK FOR PARTICIPATIVE ARCHITECTURE, GRAFFITI IMAGE AND URBAN GENRES

This paper analyses the relation between urban cultures and formal knowledge, reflected in three different scenarios: participative architecture, graffiti image and urban genres. Despite their differences, they have similar approaches to key factors as the urban space, citizenship construction and production methods. In architecture it is represented in the practices of the thus called 'participative architecture' that are produced mainly by collectives and try not to relate to the traditional ways of architectural production, rather focusing on participative processes, scarcity and mindfulness of the informal urban condition. In street art it is represented by the graffiti image work also produced by collectives that interpret a socio-cultural condition having the urban space as canvas with refined techniques of display. In music is possible to perceive an ongoing transformation of the urban genres through compositional approach, that minds their tradition merged with more traditional genres such as jazz and soul, and a broader social perspective of the city. All these share the fact that a strong inspiration and application framework is the city and its problems such as spatial segregation, social justice, gender and inequality among others, derived from the way it is produced. Thus their cultural production is susceptible to be perceived as a movement that through its work creates not only artistic pieces but rather a social manifesto, a new urban humanism.

Keywords: Urban cultures, participative architecture, informal city, interdisciplinary methods, Bogota.

INTRODUCTION

The contemporary city is a breeding ground to multiple sociocultural situations, although many are not always recognised as integral part of the cultural production being rather treated as outsiders. This is the case of the participative architecture, graffiti image and urban genres which are cultural expressions based in the city context and configure a way to understand its identity. In spite of their close relations to the disciplines architecture, painting and music, which common aspects have commonly merged with politics, culture and aesthetics in the definition of humanism as movement (Davies, 1997), the urban cultural expressions mentioned above and their practices are treated as a rare disconnected phenomenon despite they are a way to provide identity to a generically produced city (Sassen, 2006). These phenomena may be considered what Lefebvre (1996) foreseen as the replacement of humanism for the city in the context an urban expansion that lacks identity. To assert this is fundamental to evaluate if the procedures of these expressions can be characterized by common factors.

The key common factors to describe these expressions as a movement are: the relation with the construction of the city and its urban space, the politic stand in the construction of citizenship and the disciplinary tension derived from methods that are simultaneously formal and informal. These factors are relevant because they address their working framework, their position towards society construction and the methodologies the expressions use as cultural production. Through these is possible to answer whether these expressions configure a contemporary urban humanism.

METHODOLOGY

The three cultural expressions are reviewed parallel in terms of how the common factors, that originate and characterize them, transform into cultural production. The factors that define these expressions are addressed in general terms, as they apply to many cities that have underwent aggressive urbanization processes. Nevertheless, as the practices linked to the referred expressions respond to specific contexts, in this occasion, the examples are taken from Bogotá; where its growth dynamics have been studied and the found practices are mature enough to support an analysis.

The reviewed sources are specialized books and papers but as the research addresses practices with informal roots, press, interviews and compilations are also used.

THE COMMON FRAMEWORK: THE CITY AND ITS URBAN SPACE

The urban factor is the strongest and clearer link among the expressions studied. They are responses to the way the city has been produced, mainly by urbanization processes that overlook fundamental characteristics of the city like its complexity, diversity and heterogeneity, because they are led by elites that prioritize economic gain (Low, 2009); creating a segregated city that lacks identities and ignore alternative ways of cultural production (Koolhaas, 2006). This situation forces the emergence of new actors which tend to come from segregated areas with many social problems; consequence of a finance driven urbanisation model that they discern and are eager to transform.

One of the alternatives to change this context is the cultural production, that finds in the residual public space, the *terrain vague*[1] (Solà-Morales, 2009), a scenario and an inspiration to make visible the segregation, poverty, violence, inequality and even oppression they face by this production of the city.

There are different reasons to explain why the residual public space becomes so attractive to these new actors. One is the fact it is one of the few truly democratic scenarios within the city, which means the new actors are able to have access and simultaneously their message reaches more people. Another, is the intrinsic significance and symbolism of the public space, essential aspects for the cultural production. In addition, it provides a practical facility, hardly fully controlled by authorities as its extension and poor quality has been expanded by the urbanization process. For obvious reasons the public space of the thus called 'informal city' makes easier the appearance of these cultural expressions. This complexity of the city implies multiple approaches that are explored by the referred cultural expressions, providing the urban space with significance, activity and constructing an idea of place identity and through it, achieving a constructing of city and citizenship.

In architecture most of the participative practices with communities try to fill a void of structural collective spaces for segregated and poor areas overlooked by the city planning (García, 2012). This kind of infrastructure is fundamental to the consolidation of the city as they bring life to urban areas and help to structure social fabric in cities like Bogotá as stated by Arteaga-Arredondo (2018). In these areas the responsibility is assumed by the community with help of architectural practices that act as an intermediary, providing a participative project, its management

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1   Solà-Morales refers to the residual urban spaces, product of the city transformation. They conserve their memory as ruins and by the feeling of forgotten, charge them with potential

and technical support. This explains why the programmes of most of the work done by this kind of practices are fundamentally multifunctional public urban equipments. As it is an investment of the community it cannot afford to be monofunctional, also because its performance as city builder is directly related to the programme.

In Bogotá many local equipments have been developed under the model of a community association of a low income peripheral neighbourhood with support of architectural collectives (Navas, 2018). They develop the project needed through self-management, self-construction in empty areas of the neighbourhoods; very often in plots not recognised by the municipality as they are located in informal settlements.

In graffiti image, the interaction with the city is a fundamental part of its process as the work is necessarily done on the walls in the public space, regardless of their private or public condition. This makes leftover spaces of the urbanization process visible, mainly back walls and residual areas. A significant case is the El Dorado Avenue, where an urbanistic operation to enlarge the highway section and include BRT, caused many back walls to turn into the avenue's façade as many properties had to be demolished, thus the new avenue's façade was closed with almost no openings creating an insecure area. The bare walls called the

attention of urban artists to transform the highway into an open and continuous assorted art gallery (Fig. 1); initially by their own initiative, and later, with support from the city hall. It configured a landscape intervention that enhanced the quality of the urban space in terms of occupation, identity and perception (Fundación Rogelio Salmona, 2015; Sáenz, 2016).

In music the relation with the urban space is mainly narrative. The language used in the lyrics or in its stories depict situations product of the way the city is produced, such as poverty and violence. The residual public space is their natural habitat and they intend to demonstrate their identification with it by describing the actions that take place in it and using it as scenario for their music videos. The view of the public space they present has the intention of being as authentic as possible which means showing openly its problems. An example is the work of the crew 'Crack Family' where they tell stories about situations generated by the lack of opportunities for their community (Suárez, 2016). Particularly the music video 'Las tetas d' (2015) uses as background Plaza España, one of the more problematic areas for the city in terms of security and access, and showing a strong sense of belonging.

POLITICAL EXPRESSIONS

The contemporary city, as stated by Borja & Castells (1998), is a political artefact as in its production process, dynamics of power are involved through the decision making and its affectation. Nevertheless, this process is not as democratic as it should and leaves the majority of the citizens out of it (Low, 2009), thus the development of citizenship construction moves to scenarios like the cultural expression as has been exposed.

The political actions taken, in this case by the cultural expressions reviewed, have as aim the development of an active citizenship in different scenarios like denunciation, activism, community construction, political satire and complaint. Those become an essential and differentiated part of their work as most of the disciplinary practitioners prefer political neutrality. This translates in insurgent practices, directly or indirectly, because their political stand is a response to the procedures of the establishment, fundamental in the city's dynamics of power, where the people represented by these practices are excluded.

An interesting case in which is possible to understand the political role of these practices, even when they are not directly politically involved, is the project Casa del Viento. Developed by Arquitectura Expandida with the community in a poor and depressed area of Bogota (San Cristobal), it had as a goal to create a new cultural

Figure 1. Back walls transformed in murals in Avenue El Dorado. Photo: Alcaldía de Bogotá, (2016)

centre on top of the local library (created by the community in a self-built abandoned house) where the young people of the neighbourhood could access to art and music classes, among other cultural activities (Fig.2), and through it avoid entering the violent drug chain. The project, financed by governments, private companies and collectives (graffiti and hip-hop included), was developed successfully and built. As soon as it started to operate it became a target of far right violent groups that claimed it was a place to 'create social scum'. After many threats, one morning the project was set on fire. Despite the cause of the fire remained unknown, its leader received threats before the fire, and after it, he received a fire extinguisher (Redacción Semana, 2017). This aim to show that is not only about a participation with community development, the project itself is a strong political action and is perceived as such.

The political role of these practices is more explicit among the graffiti collectives. On them is possible to find a more direct activism against the establishment in addition to other political scenarios of citizenship construction (Rodriguez, 2017). This activism spreads an alternative message using the public space as medium, much inspired in the role of the Atelier Populier in the May of 1968 in France (Maréchal, Maréchal, Liévano, & Toxicómano Callejero, 2018). One of the practices in Bogotá working with political themes is the anonymous collective 'Puro Veneno' (Pure Poisson) which work is relevant because the only theme they use is the political one against right wing parties, portraying them as evil through montages of images of politicians from such parties with symbols of dead and evil (like bones, skulls, devils); also including information about victims (as shown in Figure3), remembering the failed campaign promises and explaining the meaning of some government decisions. All these is done through a diversity of graphic means ranging from muralism, graffiti, stencil, posters. Their goal seems to be a more

informed society through communicating topics not addressed by the media (which is part of the establishment) thus becoming an actor not only in the cultural scene but in the political one too.

The political role of hip-hop is a middle ground between graffiti image and participative architecture, as it uses most of the political tools mentioned but without referring to specific subjects and making an effort to transform the cultural production into an educational tool, making it a micropolitical approach (Ravelo, 2017). Two works that bring together the urban pedagogy of hip-hop and political issues are Midras Queen (*Poder Femenino*, 2019) and Diana Avella's (*Nací Mujer*, 2019) that addressed more explicit themes as human rights and gender equality, which is rather elusive. In this case the practitioners take a stand to call attention to a violent sexist society through lyrics that describe the role of women in the Colombian society in addition to an effort to raise awareness against drug and crime scenarios both in their lyrics and as organizations (Freixas, 2017).

INFORMAL + FORMAL

A significant factor that characterize these expressions is the blend of formal and informal work methods. The practices take distance from traditional disciplinary methods as they are insufficient to address their cultural production by diverse reasons. One is the inability to recognise effectively all parts of society because the city provides a framework far more complex and richer. Another, is the intentional blurring of disciplinary boundaries to include themes like society, cultural and social change and virtual communication among others (Pires do Rio Caldeira, 2012), that clash with disciplinary dogmas. However, despite the expressions claim of distance to the formal disciplines, they incorporate elements from the disciplines creating a work that merge the best of two worlds and configure a transgression in multiple aspects.

This implies the necessity to either use disciplinary tools differently or create new ones leading towards interdisciplinary practices. The change in the production has led to cultural expressions that are mature and complex addressing not only an approach of insurgency and rebellion but also of theoretical input for the disciplines.

In architecture, despite these practices efforts to distance themselves from ideas concerning form and aesthetic, is evident they have created a recognizable aesthetic identity much informed by their community process and scarcity (Añon-Abajas & Ramos-Carranza, 2018). Their influence on contemporary conceptualisation of the discipline is undeniable

Figure 2. Process of Casa del Viento. Photos (Arquitectura Expandida, 2015)
Figure 3. Poster of Colombia's former president in Bogotá during the 2018 elections. Photo: Puro Veneno (2018)

giving the amount of works developed, the impact of their project management and the interdisciplinary design methods as stated by Zaera-Polo (2016). An example of these contributions is the developments of project methodologies made by Simón Hosie where the community work is combined with the interdisciplinary approach, creating an innovative and sensible method for architecture (García, 2012).

The recovery of the park La Concordia is an example of how architecture and graffiti image are closely related in the construction of the city and integrate disciplinary knowledge with informal practices. The park had security and abandonment problems that led to an infrastructure upgrade by the municipality, that included a grant to paint a mural won by the artist 'Ródez' and his collective. They decided to make a larger transformation involving the community, co-creating with them through painting a collective identity enhancing the work done by the local government. The decision of painting the architectural elements of the park was crucial to achieve a sociospatial transformation recalling and reinterpreting ideas presented in the theoretical work *A pattern language* (Alexander, Ishikawa, & Silverstein, 1977) where city problems are presented with a simple spatial solution that range from activities to architectural elements modification (Fig.4).

The tense relation with disciplines is also present with graffiti image, in spite of having clear affinities identified by art theorists (Pires do Rio Caldeira, 2012). One of the common themes is their interest in the human body, which graffiti image has been approached with many nuances. Nudity, gender, politics, portraits, including some reinterpretations of historical art references of the body are some of the approaches to the body as idea used in graffiti (Rodriguez, 2017). Narrative and composition are some of

Figure 4. Parque La Concordia during a break dance festival. Photo: Mike Ceaser (2018)

Figure 5 Skore999's character. Photo Omar Campos (2019)

the other topics from art history commonly addressed on graffiti image (Silva, 2013). The pieces developed by Skore999 constantly depict a colourful hermaphrodite face (Figure 5) and through it, raising questions about the acceptance of gender difference in a conservative society and simultaneously showing an artistic concern about the evolution of a single idea.

In music, the recent production of hip-hop and rap combined with genres like jazz/soul has also created a clash between worlds, in this case from both sides claiming that they should not be consider either urban genres or jazz/soul leading to be excluded from both. It raises questions whether constant classification matter and what is negative on blending concepts from the urban genres, like politics and the city, with elements from jazz, instruments like saxophone, piano and composition techniques. The work developed by artists like Aerophon Crew, LosPetitFellas, Rap Band Club is an example of how the mix of concepts enrich cultural production as their compositions blend sounds of hip-hop with jazz (Aerophon, 2017). Particularly the work of Aerophon as a crew, both in graffiti and music (*Nada está escrito*, 2018), brings great input from the city situation, opens the conversation about how the cultural scene can evolve within the blending of cultural expressions and whether a purist approach is valid in the construction of the heterogeneous and diverse city.

CONCLUSION

A contemporary urban humanism can then be defined as the joint of cultural expressions forming a cultural production movement; derived from a socio-spatial relation with the city and its complexity, which leads to political practices and innovative interdisciplinary processes. As such it, has direct effect on the production of the city, citizenship and methodologies of traditional disciplines.

However, the intention that seems to guide this movement is beyond the cultural production, is to be a mean to address collectively social problems, created by the generic rapid urbanisation and an establishment. This deeper goal is achieved through the strengthen of the social fabric and citizenship processes, fundamental to unstable societies with low political engagement. A strongly social centred approach, a humanist view.

This view can be taken into account by more formal practices in different ways. One can be the inclusion of participatory process of creation which is important in order to have a more inclusive city and so expand the urban society's representation in the city production through cultural means. This implies stronger political stand from private practices and through it achieve changes in urban public policy and which leads to reduce the stigmas around the work of the informal practices. Finally, these expressions leave a message about the importance of methodology variation and experimentation in order to achieve more innovative design products in different scales.

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THE CREATION OF A DIGITAL PUBLICATION ABOUT GENDER AND DIVERSITY FOR EARLY CHILDHOOD

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This article explores, through an interactive publication in digital media, the uses of the concepts intertextuality and performativity as tools to redesign and reshape gender stereotypes transmitted during early childhood. In early childhood, the construction of gender is assumed as a gradual process that, through education and other cultural mechanisms, is the result of social construction. This process is questioned through the work of philosophers such as Butler and Stockett and from examples taken from pre-Hispanic cultures—specifically Mesoamerican cultures that raised, at the time, the understanding of nonbinary gender. A childhood game is a starting point, an everyday activity, that defines gender roles. Performativity and intertextuality are proposed as tools translated to illustrations that critical theory offers to redesign the stereotypical construction of gender. This involves questioning the role of design as an agent of capitalism and its effectiveness in silently, but effectively, prolonging stereotypical conceptions of gender through performativity, mass media, publications, and toys for children. Intertextuality is proposed as a tool to break gender stereotypes—which is exemplified through the publication First Day of Class that, through concrete poetry, seeks to modify the construction of gender in early childhood toward a more egalitarian and wider dimension.

Keywords: aesthetics, intertextuality, gender, performativity, design, publication, early childhood

INTRODUCTION

One of the pillars of the United Nations' sustainable development goals is gender equality and the empowerment of women and girls. A UNICEF report (2018) indicates that half of the adolescents between the ages of 13 and 15 years suffer some form of bullying and aggression in school. The Colombian government promotes policies of diversity and equality of race and gender to denounce and end the practice of bullying in schools (Instituto Colombiano de Bien Estar Familiar, 2018). However, there are many advances to be made and issues to discuss on the subject.

In 2015, during the administration of former President Juan Manuel Santos and after the suicide of Sergio Urrego, a gay male student who committed suicide as a result of school discrimination and bullying, the Minister of Education, Gina Parody, recommended a revision of the manuals of coexistence of schools in Colombia, in accordance with the UN. The intention behind the new manuals was to promote the free development of personality and respect for the sexual orientation of students. In opposition, the deputy of the Santander department, Angela Hernandez, affirmed that the newly revised manuals were really meant to support the behaviors and customs of the LGBTI community and, therefore, promote homosexuality (El Tiempo, 2016). The newly revised manuals caused marches and intense discussions on social networks—initiated by ultraconservative parties, the Catholic Church, and evangelical churches (El Tiempo, 2016).

The internet is an essential part of people's lives, even without their realization. According to Schleifer (2019), children and adolescents' average daily screen time ranges from four hours, thirty-six minutes to six hours, forty minutes. Not only the time spent with these devices but also their ubiquity is remarkable, a phenomenon that has been recently posited by Leeker (2017). Among several topics currently discussed and shaped through social media, gender is one of the most debated and discussed. According to Cook and Hasmath (2014), social networking plays an important role in discussions regarding gender harassment–oriented situations.

In this article, we will discuss how the notions of intertextuality and performativity can be used as a tool to conceptualize a design that could help break gender stereotypes transmitted during early childhood by means of an interactive digital-media publication. Through the poststructuralist philosophy and examples of nonbinary gender conception taken from Mesoamerican cultures, how gender stereotypes are perpetuated through popular culture and everyday design objects, visuals, and performances is explored in this study. Conversely, intertextuality presents words as living organisms that relate with each other through different

devices to help change the way children think and feel about gender identities. The objective of this reflection is to design an interactive publication, *First Day of Class*, that poetically deals with gender issues and diversity through digital media.

THE CONSTRUCTION OF GENDER IN EARLY CHILDHOOD

"Femininity" and "masculinity" are not stable notions. Poststructuralist philosophers (Butler, 2010; Stockett, 2005) affirmed that the body, the basis on which gender is established, is comprised of political and social forces. These authors unmasked the operating binary concept that restricts gender meanings by stating that nothing is natural: neither sex nor anatomy. These concepts respond to gender definitions according to society's expectations of sex, desire, and heterosexuality. Even the connections between anatomy, desire, and sexual activity are interchangeable and differ in other cultures. Sex and gender, as proposed by the authors, are thought to be shaped through performative repetitive actions and vocabulary—that is, several discourses converging on the meaning of men and women and boys and girls until a dominant discourse is formed.

Despite the search for a normative and homogeneous heterosexual identity among most people, dominant discourses are not totally efficient (Butler, 2010). In the arts, for example, borders are crossed between what constitutes "natural" and "artificial" sex and gender. The author is interested in subversive performances that cross the barriers between masculine and feminine and the "normal" and the "abnormal," such as drag queens (Butler, 2010, p. 2549). The presence of a drag queen in a show contradicts the stereotypes. In performance, the appearance is feminine, but the essence is masculine. In pop culture, there are examples of the subversion of the feminine and masculine sorts to obtain a dramatic or humoristic effect. This can be seen in the image of Bugs Bunny dressed as a woman, for example, who reinterprets and appropriates the body to resignify gender and thus creates sociocultural fiction (Figure 1).

Figure 1. The character Bugs Bunny dressed as a woman (Cracked, 2014).

According to Stockett (2005), the binary gender model—that is, feminine and masculine—is not proper for understanding gender construction in Mesoamerican pre-Columbian cultures. In fact, the Spanish male-centered colonization throughout the 16th century was represented through chronicles about people with idealized gender roles performing their day-to-day activities (p. 568). The gender representations found in these chronicles depict a life structure built around the masculine gender as the dominant gender. However, in pre-Columbian civilizations, men and women did similar tasks. Women were warriors, wives, and mothers, but men were also warriors, "wives," and "mothers." Task divisions were dynamic and not exclusively based on biological sex (p. 568).

Accordingly, the sexual body and gender were malleable issues in Mesoamerica. Stockett (2005) proposed that the theories of complementarity and gender hierarchy could provide insights for archaeologists to study pre-Columbian civilizations. However, these elements are limited by a prejudiced view of the European male-gaze colonizer. The construction of gender in Mesoamerica is not as simple as the binary construction of Western gender. Some authors have judged that certain representations of human civilizations in Mesoamerica are masculine; however, many of these images do not have genitals to prove it. This type of image substantiates the existence of a third gender in the civilizations of Mesoamerica, which means that the analyses of archaeologists and authors need to give rise to differences and exceptions (p. 572; Figure 2).

Figure 2. Image classified as male; however, it does not have genitals that prove this hypothesis (Miller, 2010).

In the Zapotec culture, women dominated local businesses and markets, where they were practically in the company of other women constantly. During parties, rumors were heard that some women had sexual and loving relationships with other women. These women were called *marimachas*. Simultaneously, Juchiteca men also enjoyed their sexuality and various ways of relating. Most of the men were married or seeking a partner; however, other men were *muxes*. Some *muxes* could be married to women; however, others had long-lasting relationships with men and performed feminine tasks such as embroidery and creating religious altars. There is no relationship between *muxes* or *marimachas* and homosexuality in these cultures (Stephen, 2002, p. 43).

The construction of the notion of gender and its discussion, at present, suggests that binary constructions are part of a system whose validity dependes on social precepts that abolished ancestral cultural practices. The perception of homosexuality and its contemporary problematization by some groups on social networks obey a cultural construction that aims to reduce the complexity of sexuality to the current binary system.

Children at an early age do not perceive gender in a binary way on their own. However, this understanding is created so early in life that it is difficult for anyone to imagine a life without gender.

Since birth, children receive information about the roles they must play in society: through their clothes, music, toys, or even lullabies and their parents' tone of voice. The social environment teaches them to be men or women, and the enthusiasm and ingenuity of babies mean that this learning experience happens rapidly. Boys and girls learn to act as befits a certain gender in their everyday activities—which teach what constitutes masculine and feminine and create distinctions between boys and girls that are not natural, essential, or biological. Early childhood is a very important period because children are beginning to develop their intellectuality at this time. This process must be stimulated in several ways, for example, by coexisting with people, toys, and entertainment that promote diversity free of stereotypes (Garner & Grazian, 2016).

THE ROLE OF DAILY AESTHETICS AND PERFORMANCE IN THE CONSTRUCTION OF GENDER STEREOTYPES

Duncum (2007) referred to *aesthetics* as visual appearance when it concerns everyday aesthetics—a kind of aesthetics outside the realms of art, literature, and the teaching of art. This everyday aesthetic can be seen in all places and social situations—such as sports, consumer goods, plastic surgery, and television—and is essential for understanding design capitalism since it always involves ideas and beliefs such as being sexy or sensual, which create a perception maintained through performativity and the natural privileges of gender and promotes certain ideologies. This concept also refers to the aestheticization of everyday life and exposure to mass media and consumer products (Duncum, 2007, p. 287).

Figure 3. Bratz doll Yasmin (Bratz, 2018).

Duncum (2007) exemplified this concept through an analysis of Bratz dolls—a toy that appropriated a part of the market for Barbie dolls, obtaining first place in sales among girls from 7 to 10 years old in the early 2000s. The Bratz dolls offered a sensual adolescent aesthetic while being exotic. The company's marketing strategy was based on stimulating empowerment through consumption. While doing the latter, the dolls provoked a sense of confusion between feminism and femininity, with the aim that girls would be permanently renewing their identity within the dynamics of the market (Duncum, 2007, p. 286). Conversely, parents thought that children were too innocent to have contact with a doll with

an erotic appearance. However, they tended to yield to the market and the company's rationales, arguing that the doll is not erotic but has an attitude (Figure 3).

Besides toys, vocabulary also helps to perpetuate gender stereotypes. Motschenbacher (2009) analyzed advertising in both female and male magazines—*Cosmopolitan* and *Men's Health*, respectively—and stated that the vocabulary of the body functions as a synecdoche for the whole body. Nouns that name parts of the body express lexical gender and convey feminine or masculine semantics. For example, the words *beard, vagina, penis,* and *breasts* have the same impact on speech as the words *man* and *woman*. Other words, such as *muscle,* for example, are more associated with the male gender. However, the word *eyelash* is more associated with the female gender. For the masculine gender, the body is related to muscles and athletics, while for the female gender, the body connotes a delicate and beautiful figure. The language used in advertising should be understood as a reflection of dominant ideologies and discourses (p. 6). Gender can also be constructed through the language in mass media and can be changed by how it is performed (Motschenbacher, 2009, p. 18).

INTERTEXTUALITY AS A TOOL TO BREAK GENDER STEREOTYPES IN EARLY CHILDHOOD BOOKS

Brazilian concrete poetry is intertextual; it creates its own objects and new forms parallel to the world of things, removes the content load of a word, and uses it as a material to make new forms and words (Campos, Pignatari, & Campos, 2014). It is the transposition of a system in which there are dialogues and relationships between texts since every text is connected to another by citations, loans, allusions, and appropriations. Indeed, Brazilian concrete poetry recycles, readapts, reappropriates, and recontextualizes old forms and styles to generate new functions (Figure 4). The rhetoric implied in the concept of intertextuality turns it into a device that can talk to and affect thoughts, actions, and emotions (D'Angelo, 2010).

Figure 4. Beba coca cola (Décio Pignatari, 1957). A poem created with uses of the expression "Drink Coke."
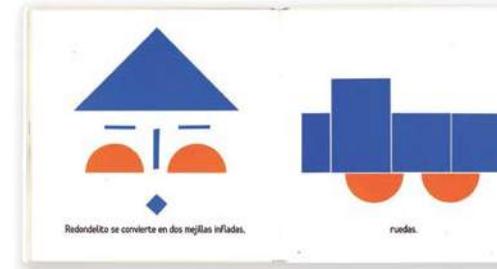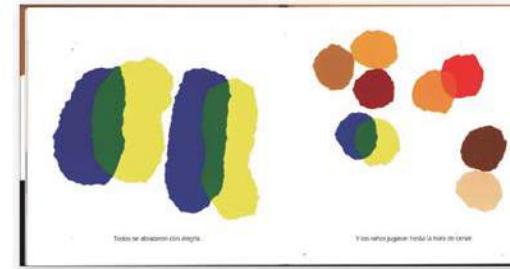
Figure 5. Wednesday (Bertier, 2012).
Figure 6. Little Blue Little Yellow (Lionni, 2016).

A children's book is an example of a device that can possibly create new imagery about gender, play, and transformations. In the children's books *Wednesday* (Bertier, 2012) (Figure 5), *Little Blue and Little Yellow* (Lionni, 2016) (Figure 6), *Flicts* (Ziraldo, 2012) (Figure 7), and *Les aventures d'une petite bulle rouge* (Mari, 2007) (Figure 8), the artists used geometric shapes and colors to create genderless characters that interact, play, and transform. Without the use of the human body, the authors managed to create daily situations of harassment, control, and prejudice— avoiding gender stereotypes with a narrative formed by a network of meanings and proposing a meaningful game practice based on confrontations of verbal narratives with images of various levels of content, context, and style (Schwarcz, Schwarcz, & Hearne, 1991).

In the book *Wednesday* (Figure 5), the big square is a large blue square, and the small circle is a small orange circle. The square and the circle have no gender. For the little circle and the big square, Wednesday is a very special day when they play and perform their favorite game, the game of transforming. The two play on the blank sheets of the book. When a word is said, they begin to transform themselves into that object. Everything goes well when it is something simple like a butterfly, a flower, or a mushroom; however, things get complicated when the big square wants to transform into big things and the small circle does not manage to accomplish it.
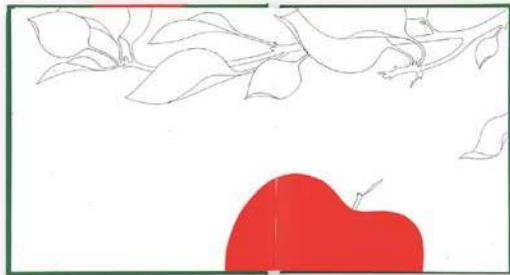
Figure 7. Flicts (Ziraldo, 2012).
Figure 8. Les aventures d'une petite bulle rouge (Mari, 2011).

The book *Little Blue Little Yellow* (Figure 6) tells the story of two friends Little Blue and Little Yellow who also have many friends of other colors. The play together games and go to school, a place of control. One day, Little Blue went to look for Little Yellow at his house, and Little Yellow was not there. He searched for him quite a bit, and when he found him, he hugged him so hard that they became a green stain. When they returned to the house, the families did not recognize them because of the color and did not accept them in the house. They cried a lot, and each one returned to his original color. When they arrived at the house and Little Blue's parents hugged Little Yellow, they realized that, when they were together, they turned green. Everyone then began to hug one other.

The book *Flicts* (Figure 7) tells the story of a color that does not find its place in the world. Flicts does not have any of the characteristics of the other colors. In the world, everything has a color, but nothing is colored like Flicts. He neither finds his place in objects, nature, a box of colored pencils, the rainbow, a garden, or Newton's disk nor in the flags of countries, traffic lights, the sky, and the sea. The book is written in a very poetic language, and each page offers small performances and performativity with popular sayings. It also brings identity changes and transformations of objects, flags, and elements of nature.

Les aventures d'une petite bulle rouge (Figure 8) is the story of a red balloon that is carried by the wind to several places. During a walk, we accompany its metamorphosis. The balloon is transformed into objects, fruits, and animals. The book has a lot of movement, and the balloon performs and interacts with its surroundings very subtly.

FIRST DAY OF CLASS

First Day of Class (Figure 9) is a digital publication that aims to possibly help reshape and redesign gender stereotypes through the concepts of performativity and intertextuality. Starting from the statement "One is not born a woman, one becomes a woman" by Simone de Beauvoir (Beauvoir, 1973, p. 301), I created characters that were born as neither men nor women but as geometric forms. The geometric forms are a step away from the human body—a possibility to make the body less controlled by dominant political and social discourses that converge in the meanings of *man* and *woman*. Illustration exercises interpreting the concepts and differences representations of the human body were made until the final forms were derived (Figures 10 and 11). This poetic type of writing and playful exercise creates new meanings and interpretations using simple forms.

The children on the first day of class are already familiar with their roles in society since they have learned these roles very early in their family life. However, each child is constantly searching for an identity and transformation. The classroom is a controlled situation in which they need to be very focused and attentive to

Figure 9. First Day of Class (Débora Gonzales, 2018).
Figure 10. Drawing exercise that aims to interpret gender, performativity, and intertextuality (Débora Gonzales, 2018).
Figure 11. Drawing exercise that aims to interpret gender, performativity, and intertextuality (Débora Gonzales, 2018).

¡Toque el salón para que entre la profesora!

¡Cuando llega la profesora al salón todos se ponen muy concentrados!

¡Soy una casa!

El triangulo les enseña su juego preferido, el juego de transformar.

the teacher (Figure 12). The soccer field is a game-related territory where they are free to transform and change roles (Figure 13).

Using concrete poetry (having a temporal, spatial, and visual structure with optical and acoustic stimuli), *First Day of Class* seeks to break stereotypes. The geometric shapes themselves are materials for new compositions of geometric shapes. The characters of *First Day of Class* seek to generate empowerment and knowledge in a playful way. It proposes several levels of experiences for children through colors, movements, sounds, and interactions between father and son and through movements and clicks with the mouse.

CONCLUSION

Performativity is related to discourses and citations that are repeated and generate reactions and changes in reality. These performances are composed of symbols that are part of a social context and experiences that provoke feelings and sensations in a malefic or beneficent game. These microperformances act silently to reinforce gender stereotypes in children or question gender stereotypes.

The designer at the service of capitalism also facilitates the potentiation of stereotypes and myths related to the notion of masculinity and femininity, as the aesthetics of everyday life involve feelings, ideas, and desires reflected in objects' external appearances. This makes it easier for parents to reflect on their ideas and thoughts of what is feminine and masculine in their children and their environment, surrounding children with objects and creating an environment that is feminine and masculine according to their ideas and expectations. In addition, children are stimulated by their surroundings and are exposed to images of the media and the television that drive them to consume as a form of empowerment and identity creation.

First Day of Class is an application that promotes interactions with early childhood. It is an application designed to critically assess gender stereotypes in society with the intention of possibly redesigning and reshaping gender. Technological devices are part of people's daily lives; they are omnipresent even in a way that people do not perceive. That is why *First Day of Class* also targets the importance of including digital technologies in performativity studies, proposing the process of generating identities in the digital world from interactions.

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COLLABORATION AS A FORM OF COUNTERCULTURE

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Every institution has a set of pedagogical approaches which influence the way design is taught and the results expected from students. The collaboration between the University of Johannesburg and Ardhi University looks at open public spaces in three selected sites in the city of Dar es salaam, Tanzania. The paper investigates the recent collaboration between the two schools and uses it as a lens to question pedagogies in African education. The paper explores how the clash of cultures, social and economic beliefs begins to form a new understanding of public open space in developing cities and suggests alternative perspectives of knowledge construction, organization and delivery in architecture and planning studios.

Even though the project speaks of spatial exploration, the collaboration tackles issues of inequality, social justice, gender exclusion and questions policies that guide the formation of open public spaces in developing cities like Dar es Salaam. The tension between the two schools: the diverse cultural and social differences between the students; and their location, frames a counterculture that challenges mainstream methods of teaching architecture and planning and suggests new ways in which people relate to physical or psychological territories in the urban space. The student projects on public spaces explored using critical visual representation methods.

Keywords: Open public-space, territories, collaboration, perspectives, policies

INTRODUCTION

This paper discusses collaboration as a counterculture teaching and learning strategy in a Unit System studio named Unit 15X in the Graduate School of Architecture at the University of Johannesburg. The discussion focuses on Unit 15X's Master of Architecture Students' collaboration with fourth-year planning students from ARDHI University on projects that investigate the design of emerging public open spaces in the city of Dar es Salaam, Tanzania. What makes this collaboration of critical importance to the goals of Unit15X is that, it begins to define or refine emergent professional relationships between architects and planners in developing cities. In the real world, planning and architecture are two distinct professions that occupy the opposite ends of built environment industry, with architects engaged in the production of designs in the public space, while planners are entrusted with evaluation and approval of such designs using legal frameworks and criteria. In this collaboration, architecture students will interpret contemporary city-challenges into imaginative designs in public open space, while the planning students will imagine new criteria and processes of evaluation such of designs in relation to their main professional, task of development control. This counterculture studio goes against the mainstream way in which architects and planners learn, train and reproduced. The idea is not to replace mainstream methods of teaching architecture or planning, but to provide diversity in learning strategies in a search for sustainable solutions to unique challenges of developing cities.

Counterculture is defined as a culture with lifestyles and values opposed to those of established cultures (Oxford Dictionary; 2018). The need for counterculture in public space in African cities arises from the fact that African cities have unique problems that must be tackled differently from their Western counterparts. This paper argues that collaboration teaching and learning strategy has the capacity to develop students to become more aware of critical societal issues which then can be used as agents of transformation in their profession, by developing values that resonate with their contemporary social and cultural context (Myers: 2014). This position will be advanced through two strategies: an analysis of the Unit 15X Studio teaching strategy in the context of architectural studio practice; and secondly, analysis of collaborative projects between Units 15X and ARDHI University students.

Unit 15X which is entitled 'Larval Landscapes' in 2019 derives its eclectic teaching theory from the recent calls by student activists through the call for #DecoloniseTheUniversity and its related #CurriuculumMustFall movement. These calls are about providing learning opportunities for students that are responsive to their social, political and cultural contexts (Booysen 2016).

Unit15X teaching and learning strategy is underpinned by values of co-operative and collaborative, student-centered learning experience than one that is teacher–driven. By encouraging co-operative and collaborative learning Unit 15X provides the counterculture from mainstream approach to teaching in architecture schools that normally promote competition among students as a strategy to further design creativity. Secondly, Unit15X draws on social problems as defined by United Nations (UN) in designing the projects for the year. The New Urban Agenda set by UN's Habitat III was instructive in developing the projects for Unit 15X in 2019. The projects addressed three themes: sustainability, inclusivity/ access and social justice in public open spaces (Habitat III: 2016). These themes explore counterculture in architecture, as they are not mainstream themes that underpin studio projects in architecture education. Unit15X students are encouraged to select their own topics of interest in the studio and are allowed to explore through design thinking, image and model making as legitimate and creative ways of bringing to architectural education the themes of sustainability, inclusivity and access, and social justice. These explorations bring to the fore, design ideas and research in architecture that does not only address aesthetics, but also provides visual commentary on wider societal issues that are relevant (Dee 2004). This kind of learning is what we term as transformative learning in Unit 15X, which will develop the next generation of architectural practitioners in a rapidly changing world.

Unit 15X's teaching strategy is a post-modernist approach that suggests an organic, fluid, flexible and interactive process of learning and one that integrates new knowledge and blurs the traditional disciplinary boundaries of knowledge (Van Loggerenberg 2000,8). This teaching strategy utilizes the integrated and interrelated challenges of public open spaces in Dar es Salaam, to develop design responses that are sensitive to multiples cultures, economic disparities, children and gender discrimination in the city- a social problems approach. This approach emphasizes counterculture in Unit15X because the Unit's knowledge content is formulated in relation to the environmental and urban challenges observed and discovered by students in the process of understanding the city. Unit15X utilizes collaboration as a teaching strategy, in order to teach students how to conduct themselves and exert their influence among their fellow professionals in an ethical manner. Unit 15X hopes to develop integrated design proposals that may bring new understanding, new ways of interrogating city challenges and perhaps more importantly, suggesting alternative methods of teaching and learning for architecture, landscape architecture and urban design planning disciplines. The need for counterculture in public space in African cities comes from the fact that African

cities have unique problems that must be tackled differently from their counterparts in the West by testing the undisputed habits of practice in architecture and planning. This collaboration offers counterculture, as an opportunity for architecture and planning students to define new understanding of each other's roles and ground-rules in the design of public open space in developing cities. For the architecture students this collaboration is an opportunity to test their design imagination in the face of contemporary developmental cities challenges; and for planners to imagine new criteria for evaluation of development control in the public space. The aim is to prepare students in the two professions, architecture and planning, for practice in the African context by providing them with the wherewithal to nurture their own theoretical constructs through reflective practice. This collaboration aims to shift our attitudes from master plans and artifacts with singular objectives to modes of learning and practice in architecture and planning that invite transformations and spontaneity, in response to change in developing cities (Hamdi:1996).

The next session discusses the strategies that were employed during the collaboration.

THE COLLABORATION

Like any other collaboration, it was appealing in concept but very challenging in setting out guidelines and strategies for its application. In the GSA, each Unit has its own set of methodology of practice. We (Unit 15X) consider collaboration as one of our methodologies of practice, which makes our output different every year as we collaborate with different institutions every year. As a Unit we believe in the power of collaboration and the possible outcomes we may achieve rather than the traditional way of teaching, which has a set of curriculums inputs and outputs.

The collaboration between the GSA and Planning School at Ardhi University, Tanzania brought to the fore some of the cultural differences between both parties. Snow (1998) identified cultural differences between science and the humanities which made communication across the divide difficult. One would think that because both disciplines are of the built industry, we should be speaking the same language. In most universities, architecture falls under the built and engineering faculty but in the case of the GSA, this is not the case. Architecture is part of the faculty of Arts and Design, so for most of our students this would be the first time engaging with planning students. For us, it is a counterculture moment, it was a moment where we stepped into an unknow territory. As much as the cultural differences looked like barriers, we also hoped that it could bring about a lot

of conversations that will lead to creative ideas in addressing the open public spaces in Dar es Saleem.

Ehrlichman, Sawyer and Spence (2018) setup five Cs of a roadmap to effective collaboration; Clarifying purpose, Convening the right people, cultivating trust, coordinating existing activities and Collaborating for systems impact. Three of the Cs have been useful in our approach to collaboration. Firstly, we made sure that the purpose for the collaboration was clear on the onset. The purpose of the collaboration was to bring rigorous academic and practical research on issues facing open public spaces in the rapidly urbanizing African Cities and also to propose possible interventions. Setting out the purpose of the collaboration allows each of the schools to constantly use the purpose as a lens through their approach.

Ehrlichman, Sawyer and Spence (2018) also mentioned the need to convening the right people as a strategy to an effective collaboration. For us, convening the right people was about the convening of the right facilitator (Actors) that the students could use as a lens into the context. The actors are made up of community members (artist, traders, children, men and women) and local government bodies. Once the facilitators were identified and right protocols are observed, group discussions are held with them and the students to get a better insight of the context prior to engaging with the site.

Our convening of the right people also led us into conversations with a fashion designer, Farouque Abdala who introduced the city to the students through the lens of fashion, weaving it with culture and historic dynamics of the city of Zanzibar.

Fig (1) Discussions with Farouque Abdala, Fashion Designer (2019)

One of the cultural discoveries through fashion is the use of the veil "buyi buyi" as termed in Swahili. The veil is worn by Islamic women but in the context of Tanzania, it is more cultural than religious and therefore you could find a Christian wearing it. In a traditional way of seeing the city through the eyes of urban planners and architects, fashion wouldn't have been a medium, however, we decided to explore different ways of seeing the city through the eyes of artist in the city. This approach brought to light several social, gender and cultural issues that students will later consider in their quest to understand the open public space.

Ehrlichman, Sawyer and Spence (2018) also mentioned the need to cultivate trust, "trust for impact". This is a type of trusting relationship that can hold tension through difficult conversations, engage in generative conflict, find a common ground and make collaboration a reality not just an aspiration. To solidify the trust between the two schools, students are grouped into six groups of five and led by two lecturers. Each day as we did our field work and site visits, lecturers rotated their groups to engage with different groups of students to allow exchange of knowledge between both students/lecturers and cultivate trust among collaborators.

Two groups where then assigned to a site with a local public officer also signed to the group to aid them in negotiating their way on the sites. The public officer then introduced the site to the students from the local/governmental perspective, as well as their own experience. Prior to students diving into the site to investigate and map, the students were introduced to community leaders to first get a general understanding of the context. This allowed students to engage with the site from the perspective of the user. Through that we encouraged students to identify and recognize the citizen expert. The citizen experts are the members of the community, as they are the experts of their environment (Liz Ogbu,2013). This engagement between the students and the community is held on site to enable students to raise relevant questions. As much as we aim to learn from the citizen experts (the community), the main aim of the collaboration with the community is to create a sense of ownership and build trust between all parties. Often teachers are the depositor of knowledge and students as depositories (Friere,1996), in our approach of collaboration as counterculture, not only does the student and teacher learn from each other but both learn from the community.

The next session discusses the initial projects that students from Unit15X and ARDHI University produced in their initial collaboration.

REPRESENTING THE URBAN PHENOMENA THROUGH CRITICAL VISUAL STUDIES

One can argue that this multidisciplinary collaborative approach to pedagogy is a radical one. It moves away from the traditional 'orthodox' practices of teaching and learning, where in the student is not merely the consumers of knowledge, but also the producers thereof. Moreover, this shift gives the students the opportunity to immerse themselves intellectually and practically in the process of learning, thus giving them the confidence to imagine alternatives to the status quo (Harriss, 2015, xiv). However, what kind of alternatives emerge from embracing an unorthodox counterpoint approach to the architectural discourse, especially as it relates to questions around our understanding of the meaning and design of public space?

The subject of public space is one that is extensively covered in literature, especially on urbanism. Amongst many definitions, public space is also understood by some scholars as an arena that reflects the socio-political landscape of cities (Amin, 2006 and Harvey, 2006). Barbosa and Pereira (2018) expand on this definition to include a sphere of "self-creation with others... counter-hegemonic movements against the city owners". From these perspectives we gain a deeper appreciation of the complex nature of the public sphere (Radović, 2016), which makes the process of collaboration even more challenging.

The 'south to south' collaboration between ARDHI and GSA sparked uncomfortable discussions around issues of identity, belonging and questioned governmental policies and regulations. Issues that were not at the fore front in the planning of the studio. As previously mentioned, the student and staff composition is one of interdisciplinary disciplines (architecture and urban planning), with students enrolled in different levels of study (undergraduate and postgraduate) and who come from different pedagogical backgrounds. These differences pose both challenges and opportunities. For this section, we would like to discuss some of the opportunities that these differences raised.

Three key opportunities come to mind, namely; the need to develop alternative means of representation (learning from critical visual studies), the need to explore/pose more questions than the traditional approach of problem solving (Friere, 1996) and the collaboration also gave us the opportunity to consider ourselves as both the researchers and the subjects thereof simultaneously. These were made more evident in the preliminary outcomes of the studio, some of which are discussed briefly below.

Dee (2004) identified five overlapping and blurred categories of critical visual studies in landscape architecture, namely; art as enquiry, dialogic drawings, mappings, hypothetical design and

PART III

SITE MEETING

The Masais, the council and locals came together to discuss the potential of the site and what it could be. This site carries an element of nostalgia and memory. Where everyone have their own experience projected onto what the site could be.

The consensus was to preserve the space and keep its memory. The discussion braughgt up the need for children play area, pool, seating area, proper toilets. The program that was discussed to be implement shows the urgency of inclusive public space.

The space is a transit space and it is a node where people from different spectrum of the region move through. Giving the site potential to be a link.

Visual narratives. These categories of critical visual analysis, though not explicitly at the time drawings for public spaces were made, were explored in the representation of both the field data and initial design propositions within the groups of students working in two of the sites of our enquiry in Dar es Salaam, namely; Mnazi Moja and Magomeni

The group working in Magomeni used a combination of dialogic drawings and visual narratives to raise questions around culture, religion and gender in public spaces. Parallel to these questions were also pragmatic ones around ecology, rehabilitation and restoration of the botanical garden. In their proposition, they sort to draw links between the phenomenology of the everyday experience and the material culture (urban form) of Magomeni.

The group held a community meeting with the various stakeholders (actors) of the park to draw issues from the community about their views on the park (Fig 2). The use of photography, emotive mappings and text/language became a medium the group could collaborate to gain a deeper understanding of the issues raised. Language was key in the investigation as the meeting was conducted largely in Swahili, limiting the engagement by GSA students; however, their ARDHI
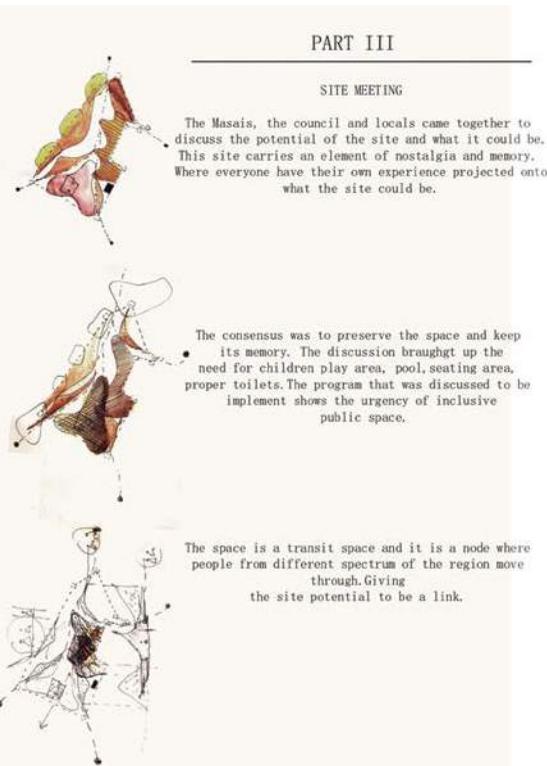
counterparts took on the role of interpreter and translator to overcome this obstacle. Thus, these drawings are more interpretive than representational.

The groups working in Mnazi Moja used mappings, visual narratives and hypothetical drawings to raise questions around policy, identity, belonging, history and memory. The park carries historical and cultural significance to Tanzania. Historically, it came to existence as a result of forced removal of earlier African inhabitants, argued to create a "cordon sanitaire" (Seifert & Moon, 2007), a green buffer between the local Africa population and the European population. However, this is not the dominant or recognized narrative of the park. People relate to the park as a public space to celebrate Tanzania's independence from colonization, a union of all its people, albeit in its restricted access.

The question that resonated with GSA students was of understanding whose public space is it? Who is included and who is excluded from its narrative and everyday use? Thus, created the above drawing (Fig 3), that speaks of a disruption, a scar on the landscape by burning the open space to reveal its painful history about belonging and exclusion.

Another group questioned the policies and regulations that perpetuate the restrictions on access to what an open public space is supposed to be. They employed subversion (inverting the color codes of the urban planning act) in their mapping drawings to highlight the limitations the current urban planning regulations act has in the everyday experience of the park (Fig 4).
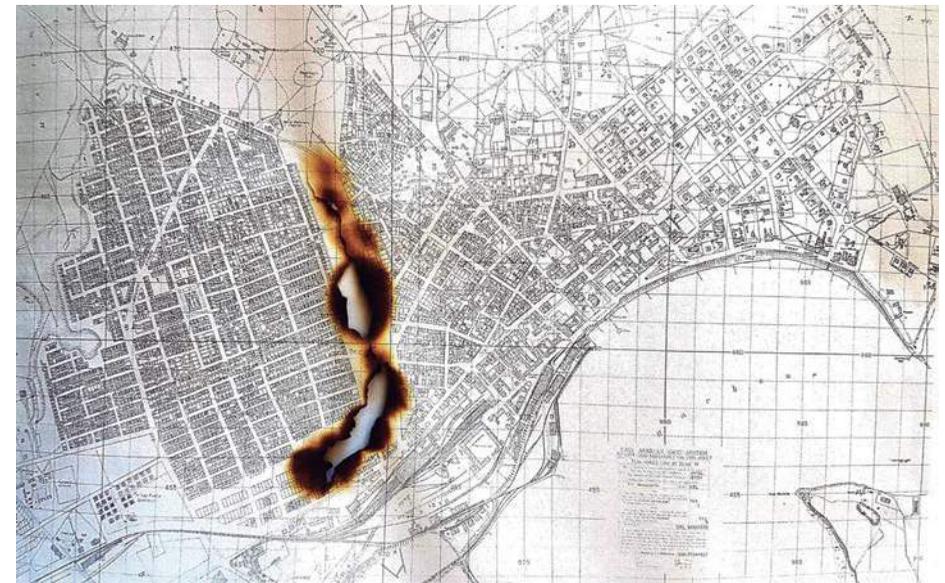
CONCLUSION

The experience of collaboration as a counterculture pedagogical strategy in Unit15X has begun to define new values: new strategies about how to teach in the architecture studio, new relationships between the teachers and students, new relationship with the public actors; responsive planning and architecture professions to *real* local needs. In terms of teaching approach, counterculture collaboration means that the students have a much higher say in what they are learning and can determine how they want to archive the outcomes. Students exercise freedom in selection of projects and are freer to experiment with the means of representation. This represents a shift from mainstream studio projects, which are normally strictly controlled in process and outcomes by way of given briefs and conventional productions of plans sections and elevation in order to demonstrate competences. In this counterculture Unit15X's approach, students are given the opportunity to explore what the problem is and to look for the appropriate methodologies by themselves. This freedom requires giving-up of many of the control found in mainstream studios by the academic definition projects and processes of execution and production. This allows the development of trust between students and staff thereby, challenging the master-student relationship that so much characterizes studio learning in architecture programmes.

In mainstream architecture studies, students learn through following the master-architect's designs as principle informants about what constitutes good architecture in modernist manner. Having noted the failures of modernism, counterculture's

collaborative approach to the studio learning provides the student architect and the academic with a broader criterion on which functioning architecture can be assessed and justified because of its reference to wider society.

The collaborative approach between architecture and planning to the Unit15X studio enabled students and staff to develop an appreciation of possible future evolution of the professions of architecture and planning based on real engagement with contemporary issues in the African context. The public space project emphasizes that people's experience in the public space is what is important for the design and planning profession and perhaps these should begin to make us realize the closeness of these two professions. Counterculture collaborative studio approach could become an approach to democratize the design and planning professions, a theme that mainstream studio struggles to achieve.

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SUSTAINABLE DESIGN AS ANTI-FASHION

This paper will begin by tracing the role of repurposing and the appropriation of the 'aesthetic of use' (Monasterios-Tan, 2015)—a term to refer to the look o\f worn-in garments— in fashion by different counter cultural groups throughout history. At the end of the 20th century, avant-garde fashion designers such as Martin Margiela introduced the aesthetic of use through repurposing of second hand garments as a type of anti-fashion. Since fashion relies on newness and change, the use of old garments or repurposing is inherently anti-fashion.

The author will then explore the rise of the sustainable movement and alternative economies in Singapore with specificity to clothes borrowing platforms. The paper will explore theories of sustainability and repurposing through a real live project pioneered in January 2019 between clothes borrowing platform Style Theory and graduating fashion design students from Lasalle College of the Arts. This case study will follow the design process and challenges faced by 9 students who chose to respond to this brief. The students had to make use of unwanted garments collected from Style Theory's customers and to repurpose them into new garments. The most successful designs also stood the chance to be market tested and available through Style Theory's subscription app.

Through class observations, interviews and reading of the students' process journals, the author will highlight challenges, possible frameworks and insights from this project.

Keywords: Sustainable design, anti fashion, disruptive design processes, share economy, waste

INTRODUCTION

The 'aesthetic of use' (Monasterios-Tan) implies the manufactured distressing or deconstruction of garments to mimic the look of natural wear and tear in textiles. Deconstruction, distressing and upcycling, techniques found in worn out textiles, reached its heyday in the eighties and nineties with avant-garde designers such as Rei Kawakubo and Martin Margiela. Margiela was the first designer to successfully transform second-hand clothing and remove its associations of poverty or thrift, elevating his label's recreations into desirable objects instead (Farrer, 2011). While these approaches were largely conceptual and not rooted in sustainability dialogues, upcycling and the 'aesthetic of use' has returned to the fore of fashion design. In this paper, upcycling is situated as a counter cultural way of working as it contradicts conventions of fashion design and fashion education, demanding that the design process begins with ready-made, second hand garments. The paper will delineate the move towards sustainable fashion in prominent fashion schools in Europe, America and Australia that have begun including upcycling or similar projects into their curriculum, followed by a design case study at Lasalle College of the Arts in Singapore.

CONTEXT

A study that attempted to understand how sustainability is perceived by practicing professionals in the United States by Palomo-Lovinski and Hahn (2014) found that the frameworks within design education are still largely uncritical and encourage unsustainable design practices resulting in fashion collections that are largely aesthetically driven. Fashion education is currently undergoing rapid change in efforts to address the climate crisis. The leading schools such as Central Saint Martin's (CSM), London College of Fashion (LCF) and Parsons are at the forefront of sustainable fashion education. In 2012, London College of Fashion founded the Centre for Sustainable Fashion (CSF), which has been developing academic and pedagogical research into sustainability in fashion. The CSF introduced a five-year masterplan in 2015 that has resulted into compulsory units for undergraduates to ensure sustainability is not a one-off component but embedded into every fashion practitioner's education. In a move towards a sustainability-centred agenda, Parsons School of Design (New York) hired Burak Cakmak as dean of fashion in 2015. Cakmak is an industry veteran who spearheaded sustainability initiatives in fashion and is driving the program towards social and environmental sustainability. In September 2019, CSM will launch a new multidisciplinary MA in

Biodesign, to drive sustainable innovation through material research. Australia's biggest fashion university, the Royal Melbourne Institute of Technology (RMIT) is launching a new curriculum for design, technology and enterprise in 2020 that will include sustainable goals established by the UN. All these efforts show a structural shift in curriculum building that places sustainability as an important criterion for what constitutes 'good' design.

Upcycling is often a hobbyist activity or used as a class exercise to generate ideas within fashion design education, yet the realm of upcycled fashion that gets directed at consumers is still the domain of niche brands. The increased spotlight on sustainability in recent years has resulted in upcycling making a resurgence within commercial fashion. In 2019, the prestigious Louis Vuitton Moet Hennessy (LVMH) Prize's top eight finalists saw a diverse group of designers presenting business concepts revolving around upcycling of vintage garments including Duran Lantik and Bode. The 2017 winner, Marine Serre, also presented upcycled clothing for both Autumn/Winter 2018 and 2019 collections. This could be a result of more fashion courses including upcycled projects into their curriculum.

Since at least 2012, LCF has been working with industry partners such as Speedo and H&M to get students to upcycle surplus or second-hand garments (Blanchard). In 2014 and 2016, high profile projects with luxury conglomerates LVMH and Kering saw students from CSM upcycle luxury waste fabrics, in a bid to encourage sustainable fashion within the luxury fashion sector. Similarly, RMIT announced in 2019 that it would be restricting all first-year fashion students from using new materials.

While upcycling does not address the root problem of the industrial model, it is an effective short-term solution that builds confidence to engage with sustainability, encouraging a shift in mind-set towards waste and materials. Instead of losing value over time, materials are able to increase in value through craft and 'thoughtful reclamation' (Fletcher, 2012).

In response to the changes in fashion education, Lasalle College of the Arts offered a graduating project brief on upcycling to a class of 36 Diploma in Fashion students, of which 11 eventually took up the brief. Upcycling is often used as a design approach at the beginning of fashion design studies to circumvent students' lack of technical knowledge, yet it had not been offered as a final year brief with an intentional sustainability angle before.

EXTENDED CASE STUDY

This case study was informed by individual readings of students' Creative Process Journal (CPJ), open ended interviews with

students and lecturers involved in guiding these projects and personal class observations over sixteen weeks. Throughout the project, the students were supported with a scheduled nine hours of contact time equally divided into three components. 'Studio' oversaw the design process, 'Pattern Drafting' and 'Production Methods' oversaw the cut, fit and sewing of the garments. In Table 1, a breakdown of each week's activities and specific interventions pertaining to the project are outlined.

RESULTS

The first challenge as a lecturer of this project was the lack of a methodology or framework that could be used in a project that defies conventions of fashion design. In an article about sustainable fashion education by Ifeagwu and Kent (2019), deans and heads of fashion programs in London, Melbourne and Amsterdam, highlight that fashion education has not changed in the last 30 years and re-educating staff is one of the focus points. The lack of methodology for teaching below postgraduate level means that sustainable fashion remains a niche endeavour. While there are plenty of instructional books on developing a fashion collection by academic publishers aimed at students and lecturers, design for sustainability is still the realm of specialist research studies and is not the industry standard.

Disrupting the Order of the Design Process

All students begun by picking garments from over 400 garments of collected post-consumer waste that was delivered to the college. At the beginning, most students continuously picked a large pool of garments to work from without a clear agenda. In the process, it was difficult to tell which bag they had already gone through, which was not an efficient process. It would have been useful to sort them out either by type, by fabric weight or by colour. These formal elements could have become starting points for conceptual development.

The conventional fashion design process taught in colleges and expounded in fashion design manuals consists of:
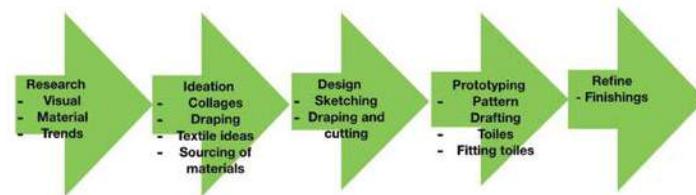
WEEK	ACTIVITY SCHEDULED	INTERVENTIONS
Week 1	Studio: Clarifying the brief Pattern Drafting and Production Methods: Techniques to sew a tailored jacket	Initial industry briefing was delayed to Week 2
Week 2	Studio: Ideation Pattern Drafting and Production Methods: Techniques to sew a tailored jacket	**Briefing from Industry Partner: Style Theory**
Week 3	Studio: Draping ideation using 'Creating with Shapes' methodology Pattern Drafting and Production Methods: Techniques to sew a tailored jacket	Students were given additional parameters to help their upcycling ideation
Week 4	Studio: Managing Production Workshop Pattern Drafting and Production Methods: Consultation for toiles	
Week 5	Studio: Consultations Pattern Drafting and Production Methods: Consultation for toiles	2 Students drop out of the project
Week 6	Studio: Consultations Pattern Drafting and Production Methods: Consultation for toiles	
Week 7	Studio: Consultations Pattern Drafting and Production Methods: Consultation for toiles	
Week 8	Project Week	
Week 9	Formative Feedback for all students Students were supposed to have 5 toiles ready for Feedback	Students were still not finished with their designs. Toiles were removed from the submission requirements
Week 10	Studio: Workshop on communicating design through portfolios, photoshoots and export kits Pattern Drafting and Production Methods: Production for final garments	
Week 11	Studio: Workshop on Technical Specification Sheets Pattern Drafting and Production Methods: Production for final garments	
Week 12	Studio: Consultations Pattern Drafting and Production Methods: Production for final garments	
Week 13	Studio: Consultations Pattern Drafting and Production Methods: Production for final garments	
Week 14	Studio: Consultations Pattern Drafting and Production Methods: Production for final garments	
Week 15	Project Week	
Week 16	Project Week	
Week 17	Submission and critique from Industry Partners	**The Head of Buying at Style Theory and her Buyer gave the students critiques pertaining to their finishing and market suitability.**

However, working with ready-made garments, the students interviewed explained that the design process often was a variation of these steps or they found that they could omit some actions within each step altogether, such as toiles.

"The design(s) are really up to what kind of clothes we get and then work from there onward(sic). For example, usually we have to show lecturer our sketch first before we make or experiment but this time we had to know what clothes we are using and then experiment. The design(s) are really up to what kind of clothes we get." (Teo)

"The hardest part is designing the garments and coming out with silhouettes because we are working on second hand garments so what I initially planned in my head often are(sic) different than what I can realize with my garments. (S)o I later found out it is easier to design while playing with the actual garments and create out of them" (Zhou)

From Teo's experience of the disruptive design process, it would have been more helpful to allow the students to have more time working with the actual garments' materiality instead of working from 2-Dimensional methods like sketching. Students like Zhou, began with the conventional design process and later scrapped every design in favour for working with the actual garments on the mannequin.

The Need to Understand Materials

Students chose garments based on conventional formal qualities that were guided by the concept they chose for their collection. From interviews, they were concerned most with colour, weight and what they perceived as 'good quality'. There was a tendency for students to equate good quality with natural fabrics and not just based on the hand feel of the garments. However, as highlighted in several other studies, a large percentage of post-consumer waste often consists of fast fashion garments created with synthetic materials, not natural fibres (Wicker).

On the third week of the project, students were struggling to begin designing even though they had a mood board and conceptual narrative. A quick workshop on re-thinking textiles was presented that included four techniques chosen for their suitability for natural and synthetic fibres. The techniques were: 1. Quilting and patchwork 2. Embroidery, 3. Digital Printing and 4. Silk Screen Printing. A digital mood board created on Pinterest was shared with students as a shared resource to visually link references that, while not necessarily upcycled, had a deconstructed feel. Students were strongly encouraged to pick one of these techniques to focus their projects. This method was meant to minimize options and to enforce the idea of treating the garments merely as fabrics; thereby finding ways to repurpose them into larger pieces of textiles that students could still impose designs onto. When questioned on whether the upcycling project made it harder for students to fulfil their requirements, Tan shared that:

"This project made it harder to meet requirements because it is(sic) our first time doing upcycling... Plus I do not think our lecturers really teach us how to do upcycling, they just show us a few possibilities like patchwork. The rest we have to figure it out ourselves." (Tan)

The quote highlights the difficulty of facing a challenge like upcycling without preparation. As Tan elaborates, although techniques like patchwork were shared, the upcycling process is daunting in its first encounter.

While the project begun with eleven students taking up the brief, two students ended up dropping the brief in the 5th week of the design process, which is meant to coincide with the development of design ideas. One of these students expressed difficulties in trying to fit the aesthetic aspirations of her theme and the type of garments that were available to use. This points towards a need to prepare the students from the beginning to work with the material given to them instead of forcing the materials to tell the story they want to narrate. This is reiterated by Zhou, who answered the question on what would she do differently if she was to do this project again by stating that; "I would play with the garments to create my design from the start instead of just sketching based on my ideas".

After the workshop on rethinking textiles, three students took the approach during the design process. The students cut up fabrics to create patchwork, keeping the overall silhouette of the garment quite conventional and recognisable, as can be seen in Figure 2 and 3. Another two students utilised machine embroidery as seen in Figure 4 and 5, also keeping the silhouette of the garments conventional. None of the students took up silk screen nor digital printing as a way to intervene the garments. The rest of the five students chose the route of draping with second hand garments to create new silhouettes.

Several students chose to amplify the aesthetic of use of garments instead of hiding it through distressing, raw edging or dyeing of fabrics. Dye techniques such as rust dyeing was employed by Zhou (Figure 7), inspired by research into worn out and rusted surfaces (Figure 6). Teo dyed her garments 'pebble beige', which gave a faded effect. Upon questioning, Teo mentioned a desire to give the different shades of white a more standardised effect by lightly dyeing them pebble beige.

The limitations on heat transfer printing both within the college and in Singapore meant that students who were considering doing prints digitally would have to find light coloured polyester fabrics. On hindsight, there could have been a more structured way to get students to think about fabrics and the possibilities for upcycling textiles to include a variety of factors including; technical limitations, fabric limitations and ecological cost of new solutions.

"It is kind of hard since this is my first time doing up cycle(sic). The process is not what I expect, it is kind of like doing backward

Scanned with CamScanner

design. And most of the clothes are stain(ed) with sweat, so the challenge is to find a perfect weight and colour of fabric that look(s) new. The limited farbic(sic) causes the design to be very challenging." (Teo)

Several students, in recollecting their difficulties, pointed out the fault towards the fabric, citing that there were often not enough fabrics pieces, that unpicking garments to get fabric pieces took too long, that they had to remove stains and be left with limited fabric. This can be read as a thought process that comes from the conventional way of working in fashion, where fabric use is unlimited and garments can be built from scratch. It also points to a need to change design thinking and to see waste as raw material, of abundance and not deficit as theorized by McDonough and Braungart (2013).

Prototyping

In the regular curriculum, students are required to test out their paper patterns in a cheap fabric, usually cotton muslin or calico. This pre-production garment is referred to as a toile. This was a Unit of Assessment for students to be graded on their cutting and drafting skills and as a way to evidence construction and fit knowledge. However, we realised that toiles, although in theory made sense, were limiting the students and instead it was decided that they work on their final garments straight away and document the process as evidence. This meant that they had to improvise if they were to make a mistake during the prototype.

Although challenging, Teo did manage to create toiles, one of them seen in Figure 8. Teo also figured out how to reproduce her toiles with second hand garments by panelling different materials together as seen in Figure 9. The toile design and pattern drafting did allow for panels to be built up from disparate fabrics.

FIT AND FINISHING

In preparing students for the fashion industry, an understanding of fabric and construction finish is emphasized. For example, sewing lightweight fabrics requires a thinner needle and heavier fabrics such as denim often require a different sewing machine more suited for thick fabrics. With the upcycled project, it was more challenging to get the students to find the most suited finishing for their garments, however, working with pre-made garments meant that most of the garments came 'finished'. One of the technical lecturers expressed concern over this fact, as she felt a graduating student needed to evidence construction and finishing skill and the upcycling project allowed them to bypass some of these constraints.

CONCLUSION

What would the design after look like if fashion design education included sustainability as part of the criteria; as important as textile, silhouette, form and fit? As outlined by Palomo-Lovinski and Hahn (2014), educators should make sustainable considerations part of every brief, and not an 'extra' consideration. The recent inclusion of sustainability modules for all students in London College of Fashion as well as development

of multidisciplinary materials-based courses in leading design schools align with the following notes.

1. Flexibility. There is a need to be more flexible with project briefs and learning outcomes. Although students are expected to show certain technical skills or have submission requirements, design for the future will need to allow for a wider range of responses that might not always meet the submission requirements. Technical lecturers in particular, found it difficult to assess these projects conventionally.
2. Sign posting. There needs to be an intentional framework when working with complex problems such as upcycling.
3. Material knowledge. A higher emphasis on materials—their physical attributes, limitations and ecological repercussions needs to be negotiated within the project. An understanding of material and not just aesthetic considerations will allow students to view waste as a resource.
4. Making as design. A higher emphasis has to be placed on playing with materials and not just following 2-D to 3-D conventions of design.

Upcycling and utilising waste as a resource challenges the creative process and critical thinking in fashion design. As sustainability experts and educators Fletcher (2014), Gwilt and Risassen (2011), Palomo-Lovinski and Hanh (2014) have highlighted elsewhere, the elevated rigour and complexities of all areas of sustainable design paves the way for superior and ingenious design for the future. However, upcycling also falls under critique for not addressing consumption. As stated by Fletcher (2014), "...recycling on its own will never bring big change. It is ultimately a transition strategy, useful while society is transformed into something more socially aware and less energy intensive." (p.89). In the meantime, while fashion design transitions into a more sustainable model, upcycling can only benefit from a more intentional pedagogy that equips students with a stronger understanding of materials and as a way to disrupt their design process.

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DESIGN AGAINST WAR. HOW CAN DESIGN SUPPORT THE EFFORT TO PREVENT CONFLICT, MITIGATE WAR DAMAGES AND PROMOTE A CULTURE OF CARE?

The imaginary linked to the design culture brings to mind well-crafted technological creations intended to please the functional and esthetical user needs. In peace life conditions designers have expanded the limits of the discipline from product to services, systems, communication and storytelling.

In contrast, in affected areas, devastated and conditioned by war, in the realm of the culture of conflict, combat, human suffering, crisis and trauma, seemingly there isn't an urgent need for design support. Moreover, the harsh reality of needs and desires of life, in war conditioned areas, essentially contradicts any form of creativity. Looking at the contradictory cultures of War and Design, (VIS DELENS versus VIS EXSTRUENS), the main issue addressed in the paper is how to create an extended design culture that takes into account all the phases in which conflict and War evolve.

Firstly we introduce the war as a social phenomena in a historical context and argue that designers have to take into account the contextualization of their design actions; secondly we present a framework that helps organizing design against war interventions on three levels: technical, ethical, esthetical; thirdly we discuss the examples and present the development of a program focusing on design against war as part of a culture of care. In conclusion we suggest that "Design against War" has not only to provide solutions to alleviate the war damages, but also to envision the (re-)built of a "new normality" through the generation of places that host "Concordia".

Keywords: Design; Conflict; War; Concordia; Culture of Care

INTRODUCTION

How can design act against war in all its forms? What can designers do when confronted with such a seemingly impossible brief? To attempt answering these questions, in the next paper we will first present the conflict as a social phenomena that evolves in time and in different phases. In the following part we will first investigate the contrast between the destructive nature of conflicts and the creative potential of the design interventions; in this sense we argue that designers have to be consciously aware of the political meaning and end use of the artifacts they create. We will then explain how the results of the design process being products, services, systems or other, are never neutral and bear the imprint of their social context, for this reason we suggest that design may have a political role. To conclude we draw attention towards the dimension of time. To act against war designers have to understand how time accelerates before the outburst of war, shrinks during war and takes care of peace when conditions are restored.

Raising awareness about war as a social phenomena in historical context

The notorious Prusian general and military theorist, Carl von Clausewitz defines war as an utmost exertion of forces, which has its seeds initially into abstract contrasting ideas. While still in abstract form, ideas and convictions are easily pushed to extremes; instead when the potential intentions become actuated in a conflict, they distort the reality of the two opponent forces (Clausewitz, 1982).

As crude as it might be the dynamic of conflict is present not only in the declared "war zones", or the areas that are theater of a recognized armed conflict, but is also pervasively imbedded in all human, social interactions. More than a claim that suggests a non-active attitude, being "against" underlines a position that implies a constant observation of the societal fractures and asks for immediate action from the part of the designers. In this sense we point towards a politically engaged approach in design that moves away from the simple esthetical and functional beautification of the products. The first step towards acting against war using the design approach is therefore *to place* the incipient conflicts in a social context and *to understand* the roots of conflicts in a historical time scale. The importance of contextualizing the design activities in a historic context has been advocated before by Viktor Margolin, who argued that, "history has always played a role in shaping contemporary thought" (Margolin, 2009, p.94) through the years no matter the political and social changes.

In Margolin's opinion, learning from history is the only way to design in a conscious and meaningful way avoiding a limiting "solution based" approach. In this concern he draws from the British historian Eric Hobsbawn who "rejects a technocratic way of addressing social problems that lacks human experience for which history is the repository" (Hobsbawn, 2011) (Margolin, 2009, p.95).

Following this view, we argue that design has the potential not only to address social problems but also to raise awareness about the political aspects, anticipating the outburst of major conflicts.

Design as a political action linking past and future

Even when apparently detached from the socio-political context, design has never been a neutral activity. In the participatory design literature, Light underlines how participatory practices have an intrinsic political value and "never aspired to be neutral" (Light & Akama, 2014); in graphic design field the call for a re-consideration of the social and political meaning and scope of the design practice has been outcried in the "First things first manifesto" (Barnbrook, 1999). Perhaps the most comprehensive argument of the political potential of the design discipline has been discussed by Tony Fry in his book "Design as politics". There Fry explains the relation between design and politics from the environmental sustainability point of view, arguing that design has to propose solutions for a "viable, sustainable and culturally constructive industry" (Fry, 2010). This reflects the previously shown historical contextualization and shows how design actions should link past with future in socially coherent interventions. In Fry's vision, sustainment is understood as an act of care, that has to take into consideration the increasing number of masses, in need of being supported and cared for. He explains how design should play a role in the definition of a "politics of care" in which care is understood as the essential catalyst of human existence. Moreover he suggests a two folded dimension:

(1) an ontological quality of our being (we exist in and by virtue 'of care' as it intuitively keeps us out of dangers inherent in everyday actions – like crossing roads, cutting bread using power tools, etc) and (2) as the performative quality of ethical things (which is to say things that [generate] future). (Fry, 2010)

By bringing forward the notion of "care" as the central focus of design driven political actions, Fry's argument supports our own assertion, that of the relevance of design against war. Moreover it provides a new vision of war, that of a complex system of careless actions that de-posses all actors of war – both combatants and victims of a caring future.

It is this contrast between care and ignorance, creation and destruction that provides a space for design interventions, for as Margolin brilliantly explains:

As creators of models, prototypes, and propositions, designers occupy a dialectical space between the world that is and the world that could be. Informed by the past and the present, their activity is oriented towards the future. They operate in situations that call for interventions, and they have the unique ability to turn these interventions into material and immaterial forms. Granted that others usually define the conditions of their work, designers still create the artifacts that are put to use in the social world. (Margolin, 2007, p.4).

Design against war takes in consideration the political space in which designers can act. A space that interprets "politics" not as a theater for displaying demagogical dialectics but in its etymological sense, as the science of governing a community of citizens. Without attempting to offer definitive solutions, we suggest that in order to design effective interventions, designers have to study the temporal dimension of conflict. For this reason we indicate three moments in which the perceptions of time is altered: 1. how time accelerates before the outburst of war; 2. how time shrinks during war; 3. how time takes care of peace when conditions are restored.

Understanding the relation between time and war

"War does not spring up quite suddenly, it does not spread to the full in a moment; each of the two opponents can, therefore, form an opinion of the other, in a great measure, from what he is and what he does; instead of judging of him according to what he, strictly speaking, should be or should do" (Clausewitz, 1982)

Learning from Clausewitz, we can hint the anticipation of war in a series of conflict encounters in which two or more opponents confront, first in terms of abstract ideas and subsequently in a series of cascading actions. Taking this into account "war" can be seen as starting in the manifestation of actions and counteractions in the context of apparently normal day-to-day life. This starting point becomes the territory in which design can operate against war, in the initial phases of conflict, unpacking the differences or mitigating emerging conflicts through communication design, creating spaces for dialog by using and interior and urban design approach, but also providing product and service design solutions for disaster relief, during or in the end of war. In the same way, while "war" is the equivalent of destruction, design means making and creating with specific tools and methods that designers have at hand. In the next part we indicate three levels on which design can act against war:

technical, ethical and esthetical. Although the three levels do interfere with each other, we suggest that this categorization can support designers to envision solutions at a larger, systemic scale and think of the planned intervention in a historic context in a longer time scale.

DESIGN AGAINST WAR: A FRAMEWORK ON THREE LEVELS TO ORGANIZE THE DESIGN SOLUTIONS

Design for humanitarian causes has long been advocated in conferences, books and other written publication (Audefroy, 2010) (Dabaieh & Alwall, 2018) (Sinclair, 2006) and many international design organizations have already tackled the possibility of applying design methods and solutions to alleviate the war trauma and counterbalance the burden left by war. As mentioned before, we suggest that in all instances the interpretation and meaning of time is one of the main elements that can lead to successful design solutions. In order to support this argument we present a synthetic framework and show how the example of three projects can be organized according to the parameters indicated (fig.1).

	LEVEL	TYPE OF CONFLICT	EMERGENCY DIMENSION
Mine Kafon	Technical / Functional	Civil war: International conflict	Disaster relief in the end of war
Participatory Public Space	Ethical / Emotional	Civil war: Territorial conflict	Prevention of conflict emergence
Fuori di qui	Esthetical / Symbolical	Local conflict: Migration issues	Anticipation of potential tensions

Technical level – responding to a well defined function

The first level responds to concrete and easily identifiable problems that require innovative product and service design solutions. These solutions take into account the importance of recuperating time and re-composing fragmented territories and destroyed physical spaces.

Example 1: One of the best known projects that proposes an innovative technical solution is the "Mine Kafon" project and company developed by Massoud and Mahmud Hassani, who lived in the outskirts of Kabul during the civil war in Afganistan. Having experienced the trauma of living in the midst on land mined zones, they designed a simple and effective device (cheap, reusable and easy to repair) - MK, that uses the power of wind to move on the landmine fields and detonated the mines. Since it was first launched, the mine detector has received many worldwide awards, and the Hassani brothers developed it even further into a more complex mine detection systems -Vento, Destiny, Manta, MK Ball, Maps[1].

Ethical level – designing civic awareness (empathy, participation, education)

The second level deals with the intangible dimension of participation and community engagement. On this level the design interventions unfold on a longer time length and involve many actors sharing the same territory. The main objective of the design interventions is to create a shared dialog space, both intangible and physical, and establish a vocabulary of concepts and behaviors on which the conflicts can be mitigated. This type of design interventions use tools specific to service and strategic design and have an important educational component.

Example 2: An initiative of the UN-Habitat program, the "Participatory Public Space Design with host and refugee youth to promote peaceful coexistence in Turkana County"[2] is a community engagement project that brings together the local community of Kalobeyei, Kenya with a refugees community from South Sudan. The program implements a series of workshops in which the two communities collaborate in designing a network of public spaces for their joint communities (a sort of Arbre a Palabre evolutionary metaphor). The participants used the computer game Minecraft as a tool for 3D design and visualization of the public spaces.

Esthetic level - "scandalously beautiful", has to be the care!

The third level is taking into account the importance of beauty as symbolic and therapeutic act of care against trauma and psychological damage. The healing benefit of esthetical beauty has been stressed out by the Italian medical doctor, Gino Strada , the founder of Emergency NGO, who puts a great effort in making hospitals placed in war zones. As Strada mentions:

"Scandalously beautiful" have to be the hospitals that the organization builds around the world, because the beauty becomes the sign of respect towards the persons who are deeply scared by war and illness, and a beautiful place offers the necessary conditions for recovering one's dignity in the suffering[3].

1   http://minekafon.org/ accessed on 11/06/2019

2   https://www.unhcr.org/ke/kalobeyei-settlement / accessed on 11/06/2019

3   https://www.lifegate.it/persone/news/design-contro-la-guerra-emergency / accessed on 11/06/2019

The beauty and care for communicating trauma in a symbolic visible language is also present in the work of Enrico Battaglia who transforms the day to day struggle of the asylum seekers into a beautifully illustrated visual manifesto.

Example 3: "Fuori di qui"[4] is a visual diary of the Italian illustrator and graphic designer Enrico Battaglia who shared the same living space with a group of refugees and asylum seekers. The book tells the story of two months of field research in which the author employed participatory observation methods and indirect interviews with the participants. By using a visual language specific to artistic depiction, the author aims to give a different perspective to the struggle of asylum seekers in search of a new identity and place of belonging, contrasting their sufferance with the rigidity of the Italian immigration laws. In this case the esthetic and highly symbolic language of illustration and graphic design emphasizes the importance to anticipate the social tensions and growing frustration of the hosting and hosted communities.

A PROGRAM FOR ENGAGING A CONVERSATION ABOUT THE RELATION BETWEEN DESIGN AND WAR, PROMOTING A CULTURE OF CARE

While the previously presented framework proposes a possible way of organizing the design interventions when conflict related issues are already well identified, in the next part we will discuss the importance of an ongoing conversation about tackling war and conflict even in times of peace. More specifically, to illustrate the discussion we present a program established in the occasion
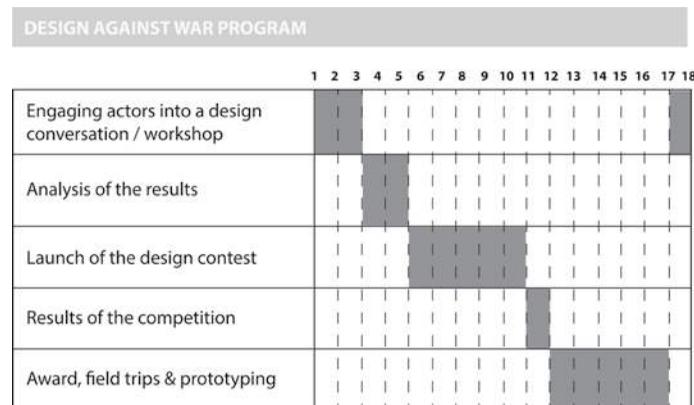
4   http://designformigration.com/portfolio/fuori-di-qui/ accessed on 11/06/2019

of the anniversary of 25th year of activity of the Emergency foundation, one of the most prominent humanitarian organizations in Italy. The program is structured in several steps (fig. 2) and was launched with a workshop that brought together citizens with design experts, journalists and representatives of the Milan city government, in a conversation on how design can provide solutions to support humanitarian organizations fighting against war.

Workshop at Casa Emergency

The investigation on how the design approach can be applied in a systemic, long-term program to issues related to war, started 26/05/2018 with a workshop and brainstorming session at Casa Emergency in Milan. In this occasion 60 participants shared thoughts on the meaning of design and war and what it means to be "against". The brainstorming session had a duration of 3 hours and the setting was intended to emphasize the contrast between the two concepts. For this reason the participants divided in two groups and worked on three different physical spaces (fig.3).
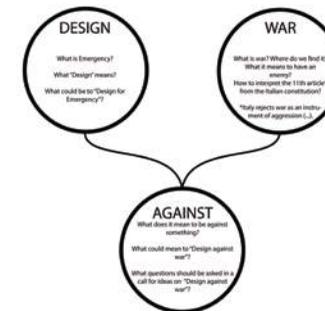
Engaging a conversation among design experts and policy makers

The brainstorm was a initial step to prepare a conversation among design experts, journalists and policymakers[5] about the meaning and manifestation of conflict and the different scales at which conflictual situations can provide opportunities for design interventions. Some of the most interesting insights focused on: a). ethical design and raised the question of the ethical issues of the design brief, and if a designer should refuse a brief if the solution requested is directly or indirectly made to serve in war; b). what does it mean to live and tackle small-scale neighbourhood wars translated into acts of racism, public vandalism or other acts of violence indicating an undercovered conflict.

5   The vice-dean of one of largest design faculties in Milan, Italy; the city counselor in charge with the development of the urban space; a design journalist; an expert designer.

Perhaps one of the most important outcomes of the brainstorm session and conversation with the policymakers was the first step in introducing a vocabulary and set of concepts related to the different manifestations of war and the extent to which small conflictual situations are an indicator of societal frictions and cannot be ignored and neglected.

Planning the future steps for an extended design journey against war

The previously mentioned activity was also intended to draft the guidelines of a design competition called "Design against war". The competition aims to promote the design ideas that evolve on the above mentioned levels: technical, ethical and esthetical. More important the competition is seeking to updated definitions of conflict and war and how to approach the conflicts in all their phases. For this reason the winners will be supported by the organizers in developing the prototype (prototype award) and will be offered the possibility to experience, in a field trip, one of the hospitals built by Emergency. The meaning of the competition goes beyond the promotion of successful design solutions and aims to promote long term interventions versatile enough to respond to the specific needs in the various phases of the conflict and war.

In fact the preliminary results of the competition reflect the multiplicity of responses that designers can provide in all the phases of the conflict especially as a way to support war victims in regaining the dignity of their day to day life. An analysis of 60 entries showed how 50 % can be to placed in the Technical / Functional level; 20% to the Ethical / Emotional level and 30% to Esthetical / Symbolical one. Moreover the entries that responded the best to the brief, combined the 3 levels into coherent solutions.

CONCLUSION AND FUTURE WORK

In conclusion, the paper introduced a different view on the significance of the design interventions, by arguing the relevance of the system design approach in the seemingly remote domain of social and political confrontation that leads to war. This approach introduces an important distinction between a culture of care which is usually taken in consideration only marginally in the design projects and contrasts it to the culture of production to which the design discipline is usually attached.

From this perspective we drafted a systemic framework that aims to organize the areas in which design can be applied in a long-term timespan. To support this assumption we presented an ongoing program that has the main objective to educate designers on how to think the projects in a social and historical context, and take into account the impact of their interventions as links between past and future. The limitations of the "design against war" program come precisely from the impossibility to act in the midst of the armed conflict in which mass destruction cancels any form of creativity.

Furthermore we suggest that future work could investigate the potential of applying the design approach in influencing and eventually changing the political rhetoric towards a more socially-concerned and conciliating discourse.

In this respect, future investigations can focus on the notion of *"Concordia"* (such as the roman goddess who brings harmony and mutual agreement to communities after war)[6] and the creation of spaces and places of tolerance, in which debate can be exercised by conflicting opponents, but also in which the torned social relations can be knitted back into a shared reality.

6   https://www.britannica.com/topic/Concordia-Roman-goddess

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HAND-MAKING AS THE INTERPLAY OF THE PERSONAL AND COLLECTIVE IN DESIGNING TRANSITIONS

From the last two centuries design's legacy has been one of promoting individualism via consumption. In contrast, in the last decades design has taken systemic approaches with a focus on social wellbeing. This dichotomy between social and individual ways of designing perpetuates the disconnect between the personal and the collective. Designing for transitions to preferable futures needs to address the interplay between personal introspection and building collective power to achieve resiliency.

Through in-depth interviews with craftivism practitioners —members of a movement that combines handmade crafting and activism— I obtained their accounts regarding the topics of objects, doings, and meanings and the relationship of those with engagement and motivation. Through synthesizing insights, I have identified aspects of craft practices relevant for co-creation approaches concerned with transitions to sustainable futures.

The outcome is four avenues —ways for approaching—for the integration of handmade craft practices as a means for personal self-transformation and collective future envisioning for transitioning to sustainable futures. Areas strengthened by these practices involve group cohesion, materialization of tensions within a collective, and reflective and critical thinking for the shaping of personal voices intertwining thinking and emotion. Additionally, the openness of the practice allows for inclusiveness both in terms of skill level and diversity of voices.

Keywords: hand-making, transition design, craft, co-creation, sustainable futures

INTRODUCTION

Since the 19th century, the idea of the good life has been centered on individual self-realization through the consumption of commodities (Borgmann, 1984). Historically, mainstream design has been preoccupied in promoting consumption by driving desire for new products and services. Consequently, the prioritization of individuality over the collective is still considered the preferred way of living. In contrast, ways of designing such as Design for Social Innovation (Ehn et al., 2014; Manzini, 2015) focus on the collective, highlighting that material possessions cannot be a substitute for a sense of belonging, affection, strong social networks and experiences. These practices focus on behavior change and social wellbeing with an emphasis on systemic approaches over tackling issues in isolation (Manzini, 2007). However, current complex, systemic problems call for design approaches —such as Transition Design— concerned with catalyzing societal change across all levels, from the micro (personal, household) to the macro (institutions, systems) over long-spans of time to transition toward sustainable futures (Irwin, 2018; Kossoff, Tonkinwise, & Irwin, 2015). In the interplay between the personal and the collective, designing for transitions requires self-critical assessment of current mindsets, ways-of-doing-and-being in the world, and how we encounter issues in order to achieve transformational change of the system from within.

As a stepping stone in the development of knowledge regarding *how* we design for transitions, this research investigates the potential for designers to harness handmade craft practices as a means of engaging the interplay between personal and the collective change. This article looks specifically at how *craftivism* —the intersection between craft and activism—promotes personal transformation over time as makers immerse in reflective self-critical assessment while creating artifacts that relate to collective social, political and environmental issues.

Craftivism is a practice in which people hand make artifacts with an explicit socio-political agenda (Greer, 2014). While craftivism was conceived as a concept in 2002 (Greer, 2014), craft's socio-political stand through-making has existed throughout history all over the world both explicit and implicitly (Helland, Lemire, Buis, & Yonan, 2014; Newmeyer, 2008). Examples go from Hawaii's last reigning queen trying to preserve the nation's history (Moebes, 2011; Ryan, 2003), to the Arpilleras in Chile broadcasting to the world the injustices lived during Augusto Pinochet's dictatorship in the 1990s (Bacic, 2013).

Although this study is based on a small sample of craftivist in the US, it is intentionally subjective and means to explore the emotion and perception involved in making together. The format of the study also carries advantages, such as how participants reflect in retrospect regarding experiences and how, thanks to their documentation, they can talk about the objects at different stages of their making.

METHODOLOGY

Taking craftivism as a focus of inquiry, I synthesized insights from four in-depth interviews with makers. Consequently, I identified five aspects of craftivism relevant for co-creation processes and four avenues for co-creative approaches to incorporate making as a means for self-transformation and collective future envisioning.

Two of the one-hour long interviews were in person and the rest via video chat. The interviews were structured in three main sections. Firstly, participants shared their general experiences as craftivists. Secondly, I asked participants to select a project and talk about it in terms of Paolo Magaudda's model of practice (2011), discussing objects, doings, and meanings; this also served as a framework for coding components of the interviews. Thirdly, participants engaged in a mapping exercise, drawing a timeline of emotional curves for engagement and excitement regarding the specific initiative they had previously chosen (Figure 1). The mapping helped guide conversations about perceptions of high and low moments of emotion and formed the basis for the analysis of different aspects of craftivism as a practice.

Participants were facilitators/organizers of current and past craftivist initiatives in four cities in the USA while also taking part as makers. The projects go from messages of affirmation to working toward achieving positive global impact through materializing a theory of change. An overview of each initiative is described below.

Pittsburgh, PA - Handmade Arcade (since 2004), an ongoing yearly event grouping women coming out from other creative scenes who take the skills their grandmothers used to practice to reclaim handicraft and make alternative use of them.

Figure 1. Examples of the "Engagement and Excitement Curve" mapping exercise conducted during interviews.
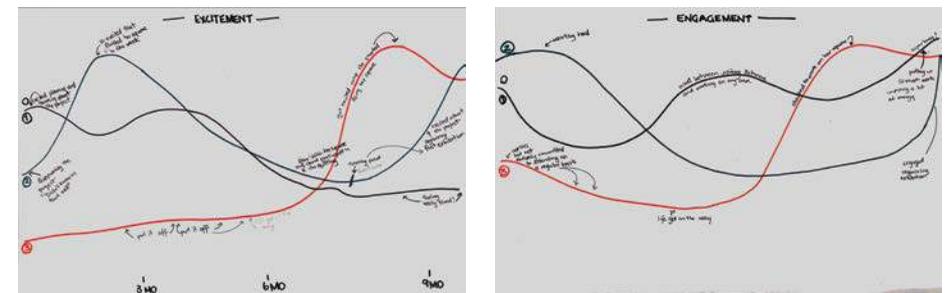
Baltimore, MD - Historic Coverings: Interrogating the Culture of Whiteness (2017), a project by Baltimore Racial Justice Action (BRJA) that incorporated Baltimore's quilting traditions from the mid 1800s to explore visual social culture in the US throughout history. The project culminated with an exhibition in 2018.

Durham, NC - Messages of Affirmation (2016). Started as a solo project stitching messages of affirmation, leaving them around the city and posting them online. Other makers around the world had followed the maker's lead in their own cities.

Chicago, IL - Badass HERstory (2018). An initiative to empower people through self-reflection, storytelling and building of hand-stitching skills. Participants represent personal stories on pieces of fabric that will be sewn together to form a public art installation. Additionally, photos of each piece are taken to form part of a digital collection online. An ongoing project with over 70 events hosted around the United States and Europe so far.

SYNTHESIS

I coded the interviews' transcriptions according Magaudda's model of practice including objects, doings and meanings (2011). Later, I used affinity diagramming as a method for inductive thinking (Figure 2), obtaining a collection of aspects particular to craftivist practices relevant for the development of self-critical reflective thinking and future-envisioning. Figure 3 shows examples of the notes under analysis. Subsequently, I identified four avenues for designers to take into account when involving craft hand-making practices in processes of co-designing as means for transitioning to desirable futures.

Craftivist Aspects Relevant in Co-creation for Transitions

The ways in which the artifact's life, multiple manifestations, and nature of its materials engage people.

The source of craftivist materials is very important, with participants describing their preference to repurposed or reclaimed fibers. Through reused materials, makers reinforce messages of hand-making being a political statement on its own, either by subscribing to a sustainability agenda and/or by the significance of reusing pieces made in originally so called "domestic settings." A participant mentioned how she repurposes antique embroideries —utilitarian in their original conception— and adds messages, hence altering the discourse of an already "finished piece."

An aspect of the artifacts' multiple manifestations relates to their documentation and dissemination, ranging from dissertations,
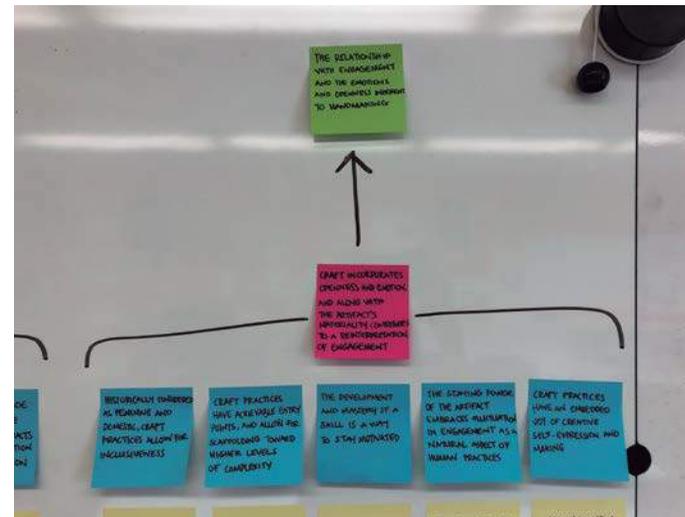
Figure 2 Affinity Diagram used to synthesize findings
Figure 3 Example of the notes that serve as a basis for insight analysis of craftivist aspects relevant for co-creation

academic and newspaper articles, to museum exhibitions, student curricula and social media posts. Interviewees acknowledged the power of dissemination to reach a wider audience, becoming however, tools for outreach and awareness rather than creating meaningful dialogues with makers. A participant highlighted that a picture or a description of an artifact is only a representation of it —and even though far reaching— turns it into a diluted experience.

Craft incorporates openness and emotion, and along with the artifact's materiality contributes to a reinterpretation of engagement.

Emotion and affect are embedded in craft in several ways. By continuously practicing, makers see their improvement over time; developing mastery of a skill becomes a way to stay motivated.

Interviewees highlighted how *the staying power* of the artifact leads to an embracing of fluctuation in engagement as natural in human practices. For every high point of engagement, a low point is expected, which participants described as moments of rejuvenation or pauses for celebration, emphasizing the importance of promoting them. An interviewee mentioned that even if seen as "low active engagement," the *object permanence* provokes makers to continue thinking about it when life gets in the way, and the desire to finish the artifact, or make a new one, motivates them to go back.

Craftivism involves critical thinking and reflection in and on practice.

Craftivist practices help makers engage in reflective processes about their lived-experiences to figure out their stance regarding different issues, being one of the main differentiators from other practices that promote social change. Some of the initiatives described by participants in this study explicitly invited makers to engage in a theory of change from within before engaging with collective change.

Additionally, participants engaged in critical thinking on how craftivism is being applied and its limitations. Almost all interviewees criticized humanitarian aid and aid work, and perceived craftivism often used to predicate how these organizations "know the best way to help people," instead of letting people determine their own way.

Craft move-making involves shaping voices through externalizing feelings, learning, and envisioning future actions.

Through making, people engage in self-reflection to form points of view as well as building up bravery to actively participate in dialogue and action. Respondents described how with the current rampage of political, ecological, and social issues, people that generally did not participate in these discussions, want to be part of them but often times do not know how. As a response, craftivist movements had arisen to provide a space for shaping individual voices, materialize collective ones, and give voice to the voiceless (e.g. plants, animals, a space, the environment). Craftivism expands makers sensitization of the present and understanding of the past. Makers question their preconceptions and feel compelled to further acquire knowledge about the issue. As an interviewee pointed out, "it helps me to get in depth into a history that is more honest than the history I was taught at school… I find it nurturing to do research for my pieces because I sometimes need external things to get me do it."

Artifacts as materialization of tensions allow for an alternating dialogue between people's shared connection with handmade objects and difference in opinions around complex issues while promoting group cohesion.

Interviewees highlighted that in a world surrounded by modern technology, the uniqueness of handmade artifacts distinguish them from mass-produced objects purchased at a retail store, capturing people's attention and providing an entry point for difficult conversations. Conversations might start by inquiring about the process, the type of work or the level of detail and then move into the message and the intent of the piece.

Another type of person-to-person connection among makers is when craft pieces become mediation artifacts. Making promotes slow reflective conversations around challenging topics, allowing people to alternate between personal and collective matters. When makers get together, they engage in conversations from the mundane to conversations that can be difficult to carry out in terms of the meaning of the piece. Participants described how in controversial conversations the artifact as a work in progress allowed makers to have "an acceptable excuse for pausing," continuing working on their piece, engaging in internal reflection, and coming back to the conversation. A participant asserted "I can just talk without having to look at the person, because looking at my needlework while having a conversation is socially acceptable. It [the artifact] lets me breath and move back and forth from being social to being alone."

Beyond allowing the discussion of particular beliefs from participants, hand-making allots time to get to know each other at a more personal level. Interviewees describe how making creates stronger bonds among members, providing value to a movement by building morale and promoting group cohesion.

Design Avenues for Integrating Hand-Making in Co-Creation for Transitions

Avenue A: Leveraging artifacts' materiality and lifecycle (related to craftivist aspect #1).

Incorporating hand-making in co-creation for transitions can allow the development of different relations among actors at different points in time. At the personal level, the materiality of handmade artifacts becomes a starting point for the maker's next move, similar to the studies by Goldschmidt (1991) and Schön (1992) with architecture students, in which they documented the process of sketching. Goldschmidt and Schön noticed how each decision put onto paper triggers the next *move* by opening up a range of possibilities for students to discern between.

In this regard, the artifacts become snapshots of the moves taken to shape people's voices. Before the making, the choice of materials is a strong contributor to the construction of a narrative, both in terms of their maneuverability and significance. During the making, the maker negotiates how the artifact is a materialization of their concern. Upon completion, the artifact lives on in a variety of ways, such as digital or conceptual representations of the physical object. Ultimately, the artifact not only represents a conceptual idea, but also conveys the self-transformation that the maker undergoes as s/he learns through engaging in material construction.

Correspondingly, at a collective level, the artifact functions as a boundary object for dialogue among makers and other actors both during and after the making. Conversation can happen both synchronous and asynchronously, since the artifact is the materialization of the maker's voice allowing for immediate and delayed reactions.

Avenue B: Engaging the emotions and openness inherent to hand-making (related to craftivist aspect #2).

Harnessing feminine and domestic traits, craftivism allows for inclusiveness by embracing the power for perspectives formed at the fringes. Most of the participants identify as women, thus these practices invite members of other groups whose voices are usually not heard. Additionally, as everyday practices, they possess achievable entry points and permit scaffolding toward higher levels of complexity and appreciation for the fluctuation of 'active' engagement. The *hand-making of things* is open and approachable to beginners but satisfying enough for makers that feel confident to add complexity.

Moreover, while Richard Sennett asserted that "making is thinking" (2008), making is also feeling. Integrating hand-making into transition-oriented co-creation means embracing emotions as vital and unavoidable for shaping moral decision and actions. If "even the decision to be rational is an emotional decision" (Escobar, 2018), by incorporating craft in co-creation, participants can shape moral decisions through emotionally engaged practices.

Lastly, as the members of craftivist group Craft Cartel asserted, "the connotations of comfort and kindness that the work carries are so powerful that it can open people up to viewing denigrated ideas in a positive light" (Greer, 2014, p. 200). The *historicity* of craft inspires openness, because people have been conditioned to interpret the practice as such (Heidegger in Verbeek, 2005). Thus, granting a space for co-creators of transitions to recognize and leverage commonalities and ameliorate tensions.

Avenue C: Hand-making for reflective and critical thinking (related to craftivist aspects #3 and #4).

From a phenomenological perspective, the act of hand-making is a way of world disclosure through the use of tools (Verbeek, 2005, pp. 77–83). Through craft, a practice that takes time, people can engage in reflection in and on action. While making, participants give themselves a reason to learn about an issue's past and present at different levels (household, infrastructure, institutions, systems, mindsets, culture). Therefore, embarking on an investigation and reflection that they might have not done otherwise. This process allots for the challenging of preconceptions and the shaping of personal voices involving thoughts and emotion. The purpose then being to gain consciousness of the past and present to recognize the wide landscape in which concerns manifest; to (re)evaluate and (re)frame current conceptions of systems and structures; for opening up for a holistic imagination of desirable futures; and engaging in dialogue regarding the moves needed for transitioning to those futures.

Avenue D: Building collective power, embracing diversity (related craftivist aspect #5)

As a construct, handmade pieces are imbued with intent and the experience of the maker. They become what Betsy Greer refers to as *vessels of change*, where pieces turn into an idea embedded with different thoughts, emotions, and feelings by different actors (2014, p. 12). Moreover, the process of making together can be an arena for dialogue and discovery of tensions. As opposed to a workshop or a meeting, in which certain voices might prevail, when making together, everyone is materializing their voices.

Through craft-making people do not only disclose the world, but also disclose themselves to the world. Exposing one's lifeworld, showing one's deepest thoughts, emotions, desires and fears, oftentimes requires *vulnerability*, an aspect of our humanity that people are usually taught not to show. However, if we take vulnerability as tearing off our own self-created shell to open up a door for others into our own lifeworld, then being vulnerable could be seen as a sign of bravery rather than weakness. Craft practices have the potential for exploring this type of courageousness, a type of vulnerability that people could strive for and see as heroic. Mutual disclosure of lifeworlds can become the basis for the development of group cohesion as well as embracing a diversity of voices, finding points of tensions, understanding where others are coming from, and find ways to relieve those tensions.

CONCLUSION

Beyond craft being a medium for the expression of design (Ford & Hanislan, 2011; Heiss, Beckett, & Carr-Bottomley, 2016), this research explores craft as a guiding path, hence the name avenues. Therefore, by incorporating craft as a form of reflective action and shaping of people's voices —especially those not usually heard— in everyday life, individuals can engage in collective transitions to sustainable futures. Additionally, as supported by previous research, adopting hand-making craft practices as part of co-creation processes has the potential to help in the development of cohesion in the group as a collective (Hackney, 2017; Nevay, 2017; Weida, 2014), as well as providing self-transformation and future-making, through the articulation of desirable futures (Ehn et al., 2014; Sas & Coman, 2016).

A key component of craft practices is the acceptance and embracement of the natural fluctuation of human engagement on an activity. Even though not consciously understood or reflected upon, the artifact becomes a sort of North Star that invites the maker to continue their journey. It becomes a reminder of where they were planning to go, however, the finishing of the artifact is not the destination itself. Through the continuous interplay between self and collective, hand-making offers a way to shape individual voices and build power together.

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BOGOTA DUST AND PAPER CITY: A CRITICAL DESIGN EXERCISE THAT EXPLORES CORRUPTION IN TOWN

One of the facts that condition the urban development of cities like Bogota is corruption; this phenomenon has limited growth, not only in physical terms but also in terms of the sustainability of this territory. This is why today, more than ever, various manifestations that question the mentality of people linked to this city in different scenarios are becoming necessary, inviting them to ask themselves and know more about this matter, the veracity of the information they receive and the role played by citizens as active participants in society.

This article explores the way in which critical design, through a speculative architectural object, can generate reflections and discussions about the effects of corruption, both in the development of the city and in the performance of professionals associated with the architectural field.

The text describes research through design exercise that contributes to the area of critical design knowledge - with special emphasis on speculative architecture and its role in the creation of cities- and a set of fictions, materialized in artifacts and narratives, which trigger conversations and reflections about corruption among architectural professionals and the community in general, not to dictate solutions to such a complex problem, but to make its impact visible in a context like Bogota.

Keywords: Critical design, Corruption, Bogotá, Speculative architecture, Research-through-design.

INTRODUCTION

Corruption costs Colombians an average of 18,400 million dollars annually (Maya, 2018), restricting economic development, as well as State and institutions confidence and therefore social growth. Just in Bogota, between 2000 and 2009, twenty-one judgments were issued for 28.5 million dollars in patrimonial detriment according to the General Audit of the Nation.

Taking this problem as a starting point and considering that design can be seen beyond its traditional role - understood as a material reality configuration exercise - like a tool to re-think how things could (or should) be, emphasizing in discussions that this idea can generate from these diverse visions of reality. In this document, we will call this exercise critical design.

This kind of design aims to question the problems we face in contemporary cities from the materialization of the design itself. Taking this perspective of critical design, we focus on this project, on thinking over corruption in Bogota through an object of visionary architecture. Supporting the objective, this introduction exposes three main themes this project moves around: critical design, visionary architecture, and corruption in Bogota.

Critical Design

In James Auger's (2012) words, the critical design is a space to dream, challenge and debate -critically-, through the use of artifacts that are used as a medium, not as an end. However, beyond creating objects, environments or architecture, critical design begins thinking about the laws, ethics, social and political systems, beliefs, values, fears and hopes to translate them into a material culture that works in an alternative reality to that we live. This form of design tries to propose a balanced vision not to overflow the imagination turning into fantasy; it consists of adding to what it can be, challenging what it is; and at the same time offer alternatives that are not tied to reality.

We understand critical design, as a way of implementing design that transmits through material critical thinking. According to Dunne & Raby (2013), critical design is objective, it is about make considerations of reality and generating spaces to debate what the audience consider good or bad in society. It is about thinking through design -more than through words- and using its language and structure to capture the spectators. Many of these projects or material expressions aim to question us about the different problems facing the contemporary city. In this project, we will focus on the city of Bogotá, from one of the manifestations of critical design: Visionary Architecture.

Visionary Architecture

During the sixties when the term "Visionary Architecture" began to be coined, many of the so-called visionary ideas became a challenge for construction. At present we can differentiate visionary architecture because it transcends the barrier of materialization. Not for its priority to be the manufacture of revolutionary buildings, but rather, like critical design, the creation of narratives and objects that allow us to generate discussions and dialogues through sensations that wander between the pleasant, the strange and the plausible.

According to Easterling (2005), Klanten & Feireiss (2009) and Spiller (2007), this way of doing architecture has contributed to the construction of fictitious worlds that seek to generate reflection, criticism, and inspiration to provoke dissertations about the possibilities of the future. Using its ability to propose ideas about the built environment, the designer can develop ideal projects; where he reconstructs the world to reflect on the present and the tendencies towards the future.

The interest of this project revolves around the way in which critical design can be used - and its aspect associated with the city (Visionary Architecture) - to address the problems of developing cities such as Bogota.

Corruption in Bogota

One of the questions that appears when we think about Bogota, is the manner in which corruption has affected the urban development of this city. Although this development has been subject to different factors such as the use of the land, the current leader, natural resources, the political position, densification, and among others, corruption is one of the great harms that afflict the sustainable growth of the city.

In line with the affirmations of Isaza, Restrepo, and Hincapie (2005), this work seeks to affirm the idea that corruption is one of the problems that limits the development of cities such as Bogota. This phenomenon has made indispensable projects for the city condemned to oblivion and failure by the malicious interests of a few. From the development of necessary megaprojects, such as the metro, citizen water pipelines, passing through parking lots for public transport like '*Transmilenio*', or the need of an advanced technology center for the police, corruption has flooded our city. Additionally, corruption scandals seem to occupy a predominant place in media coverage in Colombia, (Isaza Espinosa, 2018), which has ended up affecting the credibility of the country's institutions one way or another.

While combating corruption seems like a heroic task in Bogota, performed by colorful and brave characters occasionally like Antanas Mockus or Jaime Garzón, who have decided to challenge the precepts in defense of truth and reparation, there are two fundamental questions in this great vacuum left by corruption in the large infrastructure projects in the city. The first is related to the role played by professionals from areas involved in these projects, such as architects, urban planners and engineers; and the second, the role that we all play as citizens and the grade to which we are interested or not in applicating oversight and control of our own resources, since that is where these big budgets are born.

With this in mind, arises the project '*Bogota City of Dust and Paper*: a critical design exercise that explores corruption in town '. This project made use of Research Through Design method, which according to Stappers (2007) is proposed to investigate through the materialized design; that is, beyond the use of primary or secondary sources, approaching research through the design of objects.

In this particular project, two critical design experiments were developed that served as inspiration for the creation of a piece of speculative architecture.

EXPERIMENTS DEVELOPMENT

Starting from a previous phenomenon of corruption in Bogota's desktop research, two experiments were created in which stimulus materials were used to generate online and offline discussions, respectively. Both stimulation materials were developed from the concept '*Nacho Corrompe*', inspired by the children's booklets '*Nacho Lee*'; a series of books used in early childhood education that allowed in a practical, didactic and autonomous way to reinforce the knowledge acquired in school; which permit us to measure the importance given to corruption.

In a sarcastic way, we thought about the media proposal to lead a life surrounded by luxuries immediately and the need of making money quickly that society imposes on us, without the suffering of going through the costly expenses of multiple postgraduate courses, and without adding the enormous physical and mental strain that implies to be professional to pulse. With this in mind, we created a guide that quickly, easily and efficiently permits the understanding of the market, in order to create an opportunity that leads fast to economic success in a corrupt manner, with the hope of getting rid of legal responsibilities with the state and as a citizen, emphasizing the large infrastructure projects since, in addition to getting the greatest amount of economic resources, they affect the population in a general way.

Experiment 1. 'Nacho corrupts, the four steps to rob efficiently in Bogota' (*Nacho corrompe: Los cuatro pasos para robar eficientemente en Bogotá*)

The first experiment consisted of a flyer used as a stimulus material with the title: '*Nacho corrupts, the 4 steps to rob efficiently in Bogota*' ('*Nacho corrompe: Los cuatro pasos para robar eficientemente en Bogotá*'); where a sample was given of what seemed to be a promotion of a book which taught common citizens how to develop a corrupt infrastructure project successfully, linked to a Twitter account called @Nacho_corrompe where the author's role was to track and respond Tweets with labels related to corruption facts, in addition to generating and disseminating the book subjects associated with the campaign of expectation.

To learn more about the importance given to corruption, after the development of the flyer, we observed the impressions obtained about the topic through Twitter Analytics and a short quiz linked to a web page where 23 people responded. The questions were focused on knowing the feelings that corruption awakens, some of these were: What emotions did the flyer of the booklet 'Nacho corrupt' produce on you?, What emotions awaken corruption in you? , What do you think the role of citizens facing corruption should be? . It is important to clarify that the questions were answered anonymously. The obtained responses through experiment No. 1, served to make adjustments to the used language and develop Experiment No. 2.

Experiment 2. 'General parameters for structuring corrupt infrastructure projects in Bogota. Vol. 1 Pre-Investment Stage' ('Guía de lineamientos generales para estructurar proyectos corruptos en Bogotá. Vol 1. Etapa de Pre-inversión')

After the impressions of the first experiment, a booklet called: '*General parameters for structuring corrupt infrastructure projects in Bogota. Vol. 1 Pre-Investment Stage*' (*Guía de lineamientos generales*
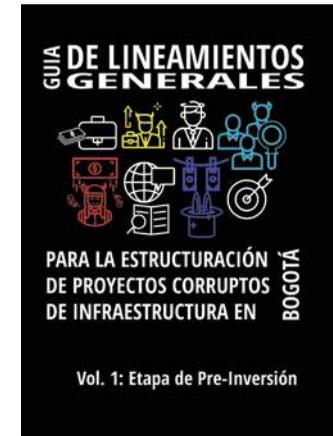
para estructurar proyectos corruptos en Bogotá. Vol 1. Etapa de Pre-Inversión), was developed as a stimulus material, which was taken to model the process of FONADE[1] projects and the research of Misas (2005) and Isaza Gomez (2005), aimed to give readers guidelines to avoid the law and generate the required documentation to build a -corrupt- project in Bogota. To do that, the researcher spread person to person the existence of the booklet to professionals related to the field of construction, such as architects, town planners, and civil engineers, having a non-formal conversation (making believe as real the existence and distribution of the document) around the issue of corruption with an ethical approach tied to profession; taking as results the impressions generated by the document in people. In this case, the sample was of a total of 5 people, with an estimated time of 30 minutes for each conversation.

Attending to the standardization that has been given to corruption in our society, this fact was clearly stated both in the flyer and in the booklet, arguing that the so-called 'malicia indígena[2]','in Spanish, is an interpretation of being a more sagacious person, advantaged and outstanding of the rest affirming the idea that the person that acts in a correct way and attending the norms is a 'silly'.

The first experiment had a quantitative approach, to the extent that it allowed collecting more data, and qualitative in terms of the answers obtained through the questionnaire. In the second it had a qualitative approach since it was a much smaller sample in a segmented population.

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1   Financial Fund for Development Projects. This institution stablish the guidelines to make infrastructure projects in Colombia, based on business investment international models, like project management.

2   Is a Colombian colloquial expression which means that is good to take advantage of circumstances.

RESULTS

Experiment 1: "Nacho corrupts, the four steps to rob efficiently in Bogota"

Thanks to the interaction that the Twitter account obtained, the first experiment showed as a result that corruption seems to be a cross-cutting issue, regardless of the color or political tendency with which we feel identified; likewise it is not only something that we consider as a problem that affects us all but also, in general, awakens strong negative emotions such as indignation, repudiation, impotence, hatred, and anger.

According to website survey, in general, corruption is a subject that arouses passions in people, and there is a widespread feeling of being a conflict that should interest all of us, so we do not know how to fight it.
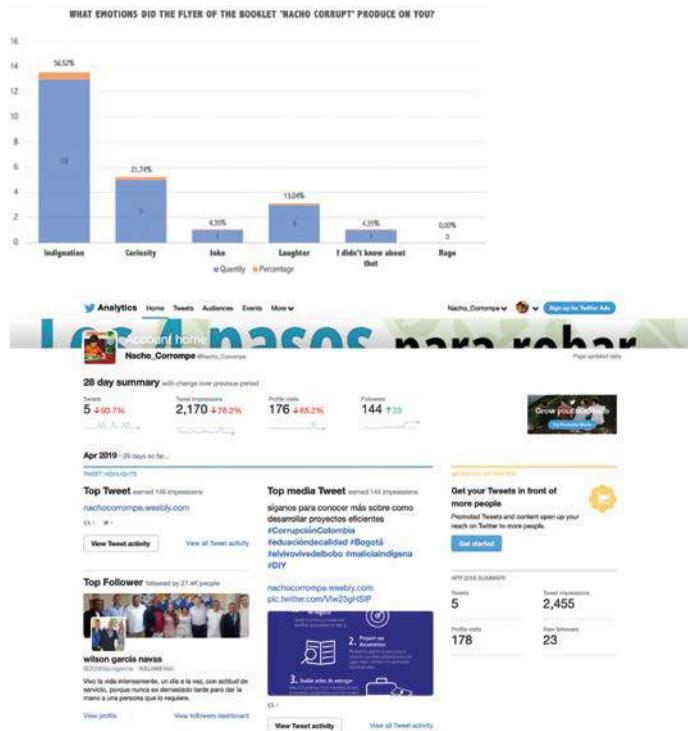
Experiment 2. "Guide to general guidelines for the structuring of corrupt infrastructure projects in Bogota. Vol. 1 Pre-Investment Stage "

On the other hand, the experiment of qualitative order, allowed us to appreciate that apparently corruption is something that has

normalized in the middle of construction, taking into account the experiences shared by the interviewees, likewise, the use satire or what they called 'technical sarcasm' as an education tool that could become a way to fight the corrupt, since one way to fight an enemy that cannot be defeated is to embarrass them.

Likewise, we understand that professionals have both Bogota future visions, one associated with hope and progress on the one hand and the vision that apparently real opportunities of change are few on the other hand.

Bogota Dust and Paper City

From the impressions obtained in experiments 1 and 2, the city visions presented by Turan (2009) and Doherty (2010); and the background of the vision of the permanence of the buildings that expose Cairns & Jacobs (2014), was born the idea of '*Bogota dust and paper city*', which is a reflection that interprets the paper as the material of which they are made, the money , the constructive plans and the newspapers that spread the news of the great fraud suffered by the nation daily, but with the same immediacy that are massified are forgotten and is also associated with the notion of the contractual and as it is colloquially said '*Paper holds everything*', corrupt projects are made on fragile paper that is easily undone and distorted.

On the other hand, the dust refers to pollution, not only the pollution that increases day by day in the city, but the pollution left by the abandoned works of the corrupt projects, it also represents the diffuse, the promises that politicians made to us as progress that will not be. In short, this Bogota translates into nostalgia for what could have been and will not.
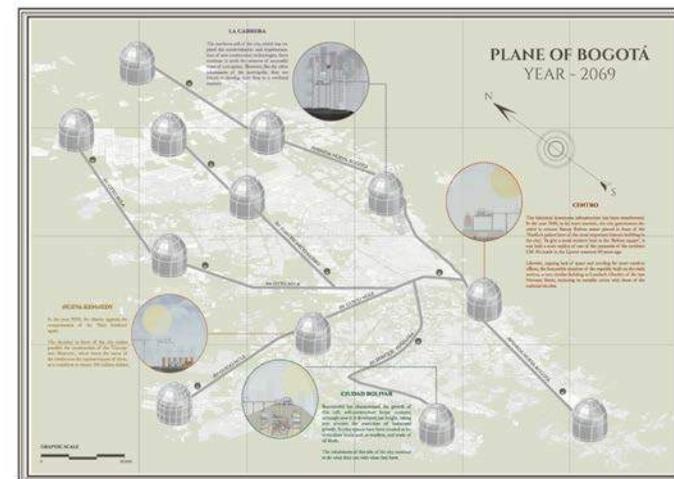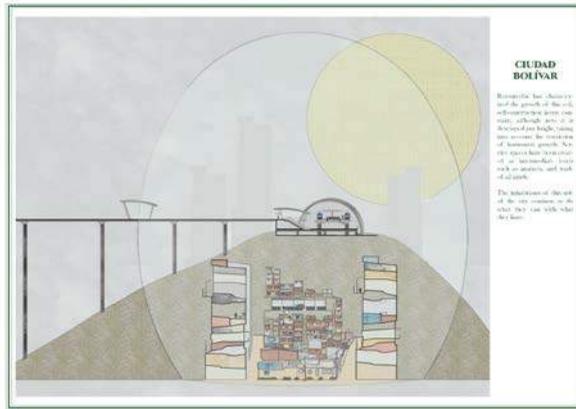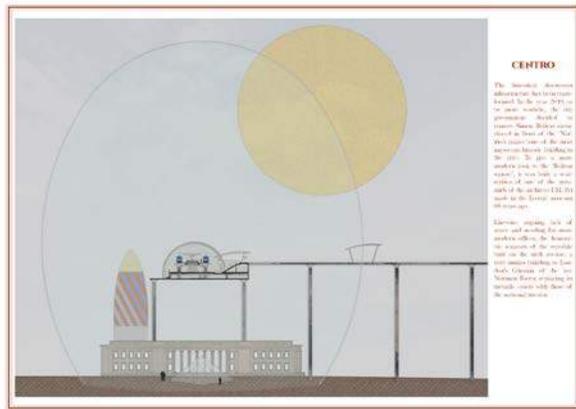
Starting from these two notions, the Bogota narrative was created in the year 2069 , where the future becomes discouraging since the excess of contamination has caused serious damage, isolating the inhabitants and condemning them to live in gigantic domes that would function as mechanical air filters. These cells that have been connected thanks to the subway project, that began in 2019 and have entrenched the social segregation and the story is told through the changes that have affected four areas of the city: 'El Centro', 'Nueva Kennedy', 'La Cabrera', and 'Ciudad Bolivar'.

The narrative of each one of these regions, was inspired by the results of the research and the people's appreciation of corruption as well as the vision of the future of a developing city like Bogota, and highlights the way this phenomenon crosses the origins or social classes.

It is important to explain that the idea is spread the vision 'Bogota dust and paper city' and generated reactions in people, but taking

3   See appendix 1

into account the development project time, has not been possible to make such exposure.

DISCUSSION

Through this project, it was possible to go further into the role played by professionals in the scenarios in which the threads of corruption move, but also in the ethical responsibility that we have as citizens to improve the society, although corruption is a phenomenon that sick our system and the impossibility of fighting it individually. Design is presented like a discipline that allows thinking about high importance issues in the community, and also as a tool that permits build knowledge, in particular in a city like Bogota, which suffers from lack of historical and social awareness, and when technology makes us easily lose the notion of the importance of problems that affect us.

More than a final conclusion, the project tries to be a reflection of the problems that affect Bogota at present, and the possible consequences if persist these problems. Without being a real vision of future or reality, is an invitation to use design not only to create products but as a tool for research, reflection, and construction of new knowledge.

Today, more than ever, taking into account the important Colombian reality events , are necessary several cultural and artistic manifestations that question the mentality of people in different scenarios. They invite the younger ones to ask, investigate and learn more about their own history. To question about the truthfulness of what is diffused through social networks, to a conscience awakening for social change we so badly need, to overcome the barriers of hatred and division in order to focus on restoring the social tissue of the nation that has been broken for so many decades and that has not allowed us to move towards a lasting and sustainable peace at last.

While a few, use political tricks to change attention from the great corruption scandals that have affected the country for years, they give us in exchange another war, that consist in defending political parties and positions, where the true losers are all. Since we do not know in the background that our interests are common; that in the end, we all want the same thing.

Wars generate transnational hatred, however, hatred in Colombia is among compatriots who do not know that we inhabit the same territory; and that it is absurd to distribute guilt among ourselves while the "crooks" and the real criminals walk in front of us delighting in our resources, dividing the booty among them, while giving us endless discussions of favoritism that do not favor anyone.

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APPENDIX 1

Bogota dust and paper city (A dystopic vision of the town)

It dawns in Bogota, in the year 2069. Unlike the experts' predictions, the metropolis conurbation was not materialized. Close to the year 2039, excessive pollution generated as a result of the rural migration to the city caused devastating damage, to which the best solution was creating urban centers surrounded by giant domes that through a mechanical process became air filters and the only survival possibility for Bogota citizens.

These cells were connected through the elevated metro system, proposed by Enrique Peñalosa, mayor in the year 2019, and entrenched social segregation in the citizens while isolating them as subregions:

'El Centro'. The historical downtown infrastructure has been transformed. In the year 2049, to be more touristic, the city government decided to remove Simon Bolivar's statue placed in front of the 'Nariño's palace'(one of the most important historic buildings in the city). To give a more modern look to the 'Bolivar square', it was built a scale replica of one of the pyramids of the architect I.M. Pei made in the Louvre museum 60 years ago.

Likewise, arguing lack of space and needing for more modern offices, the honorable senators of the republic built on Sixth Avenue, a very similar building to London's Gherkin of the late Norman Foster, replacing its metallic colors with those of the national tricolor.

'Nueva Kennedy'. In the year 2039, the district appeals the compensation of the 'Nule brothers'[4] again.

The decision in favor of the city makes possible the construction of the 'Corruption Museum', which bears the name of the brothers at the express request of them, as a condition to return 100 million dollars.

'La Cabrera'. The northern cell of the city, which has enjoyed the modernization and implementation Mf new construction technologies, there continue to settle the winners of successful cases of corruption. However, like the other inhabitants of the metropolis, they are forced to develop their lives in a confined manner.

'Ciudad Bolivar'. The best use of resources has characterized the growth of this cell, self-construction keeps constant, although now it is developed just height, taking into account the restriction of horizontal growth. Service spaces have been created at intermediate levels such as markets, and trade of all kinds. The inhabitants of this side of the city continue to do what they can with what they have.

In response to a press release that wanted to make a public statement of the prospects of corruption, the road system that connects these micro-societies, changed the name of some of the most important city avenues erasing some vestiges that still remained. The historical memory of the city, for example 'Americas Avenue' changed its name to 'Guido Nule Avenue' or the old 'Suba Avenue', now known as 'Otto Bula Avenue'.

As it has always happened, the city will continue to be a changing entity, growing and decreasing, its inhabitants will continue living, surviving and adapting to the times.

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4   '*Nule brother's*' was an important case of corruption in Bogota, related with the construction of a transportation system (Transmilenio) phase.

BIO-CURRENCIES: AN ALTERNATIVE TO PAYMENTS FOR ENVIRONMENTAL SERVICES (PES)

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In Colombia's Amazon piedmont, the cattle industry is one of the most important productive activities (IGAC 2016) due to a high demand and to the sturdy infrastructure built upon it that satisfies peasants' economic stability. However, in piedmont ecosystems, which shelter a great number of species and water springs, this industry has caused massive and irreversible environmental losses for community profit. As a result, how can communities' productive practices be adapted to reduce the environmental impact within their territories? Payments for Environmental Services (PES), for which landowners receive money (or other spurs) in exchange for conservation efforts, have been a way to redirect communities' activities. Nevertheless, PES has not proven to be a long-term solution. We studied the cattle industry system in depth (production, distribution, commercialization) in a community located in San Vicente del Caguán, and found that stakeholders have used non-traditional currencies that determine and influence several of their productive behaviors. We focus on identifying the (economic and non-economic) interests that foster certain behaviors as they might allow us to re discover and revalue the existing bio-currencies that trigger specific efforts, not only to stop (or reduce) deforestation rates, but to start (or increase) active recovery actions in highly affected areas. Bio-currencies could then be defined as alternative economic instruments that do not involve monetary transactions and do not try to compete with them. Their purpose is to trigger less harmful productive practices for the environment.

Keywords: bio-currencies, conservation strategies, participatory design, rural communities, environmental services.

SOCIALLY ENGAGED DESIGN AND ART EDUCATION PRACTICES FOR REINVENTING TERRITORIES

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The Lagoinha Complex is one of the most emblematic regions of Belo Horizonte, capital of the state of Minas Gerais, Brazil. However, nowadays, the place coexists with serious social issues and the absence of public regeneration policies contributes to the devaluation of its history and culture, generating a vicious circle of degradation and abandonment.

Dialoguing with theoretical references from the human and social sciences, we will present the experience of the project "Lagoinha_Heritage Design Development", linked to the Integrated Center of Social Design / CIDS – Design School of the Minas Gerais State University and implemented during the year 2018 with a group of elderly women living in Lagoinha Complex who participated in all stages of the project: from research to evaluation, through design and production.

A careful listening to the problems, desires and the imaginary of the community had a special relevance for the articulation of theoretical and practical actions, resulting in the production of collages, mixing Lagoinha of yesterday and today with individual and collective memories. The identification and valorization of these elements has sought to reveal subjectivities and different ways of assigning meanings to the territory, as a form of narrating and divulging life and territory stories, the group has chosen to create a product from the produced collages: a set of postcards.

Thus, in the article we will highlight the theoretical-projectual pathway, mediated by tools of design and art education as socially engaged practices for reinventing territories.

Keywords: Design, Art Education, Memory, Territory, Co-creation.

INTRODUCTION

The Lagoinha Complex groups several districts of the city of Belo Horizonte, Minas Gerais, Brazil. It has been relevant for the construction of Minas Gerais capital in many aspects, beyond its historical and cultural importance. With the city's growth, several interventions were implemented in the region causing a rupture - both spatial and symbolic -, affecting significantly. Common in the contemporary metropolises, the region has been ignored by government agencies and gradually became a social problem concentrated area. Among the main ones, it's possible to cite drug trafficking and consumption, growth of the street population, the lack of lighting and security, presence of irregular scrap metal, leading it to danger and inadequacy. These facts have resulted in the closure of traditional enterprises such as antiques trade markets, abandonment of its cultural heritage, migration to other neighborhoods and consequential loss of identity.

In a political and cultural crisis context, such as the one we are experiencing today, the process of degradation imposed on this area of the city, similarly to what happens in other city districts of Brazil and in other countries, has drawn our attention: the paradoxical coexistence between historical wealth, cultural and social issues, justifies our choice of the Lagoinha Complex for the implementation of the "Lagoinha_Heritage Design Development" extension project.

Linked to the Integrated Center of Social Design (CIDS), of the Design School of the Minas Gerais State University (UEMG), the project has aimed to produce an affective inventory of local cultural references to produce a material of identification, valorization and preservation of the culture and memory, in order to strengthen the processes of residents and neighborhood visitors identity construction[1].

The action in socially engaged design and art projects conforms our *praxis*, which considers the social design approach as an area of design that is concerned with the role of the designer and its responsibility in society. Using the tools of Human Centered Design and premises of participatory design and art education as guiding work principles, we invited a group of 19 elderly women from the region to work as co-researchers and co-creators of the process, that resulted in idealization and manufacturing a product: a set of postcards.

During the first immersions in the neighborhood, we identified this group of elderly ladies who would already meet weekly in craft

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[1] Approved of in PAEx 2018/01 public notice, in the Culture and Development category, the project received funding from the Institutional Support Program for Extension of the State University of Minas Gerais / UEMG.

workshops, and we decided to invite them to participate in the project. For this choice, we also considered the potential of these women – Mothers, aunts, grandmothers, teachers –, as multipliers of the experience lived in the project within their social circle.

Through the technique of photo collage, individual and collective memories were revealed in autobiographical visual narratives, based on daily life, personal assets and life stories, cultural references anchored in the territory. The territory, according to the Brazilian geographer Milton Santos (2005, p. 255), is "an impure form, a hybrid, a notion that for this very reason lacks a constant historical revision. [...] Territory are forms, but the used territory are objects and actions, synonymous with human space, inhabited space." Thus, agreeing with the author, we realize that throughout the project the territorial limits were expanded, resized and permeabilized by the relationships, creating new cartographies based on their sense of belonging to specific spaces in the neighborhood.

Next, a process of collective resignification of the territory will be presented.

DEVELOPMENT

To guide the actions of the project, we adopted methodologies from contemporary art education in dialogue with participatory design, using tools systematized in *Human Centered Design* (IDEO, 2013), which proposes "three lenses": desire (what people want), practicability (what is technically and organizationally feasible) and feasibility (what is feasible financially), articulated to three work stages: listening, creating and implementing.

In the conduct of the work steps, we also took on the perspective of Manzini (2015), in which - in addition to the understanding of the exercise of projective activity as an inherent characteristic of the human being. There are what the author names as "diffuse designers", subjects who are called upon for creating solutions to everyday issues using the knowledge and skills they have at their fingertips.

To Manzini (2015), the insertion of designers and professionals from the human and social sciences that use the "design mode" of problem solving in a given territory can lead to the diffusion of the design mode as a way of thinking in favor of the community, bringing it to the center of the ideation of solutions, products and services, stimulating the autonomy and participation in decision-making processes.

In this direction, a conceptual and methodological repositioning that calls the designer to move from the place of "finisher" to "mediator" of processes is also necessary, especially in projects that aim co-creation. According to what Noronha (2017, p. 229) says, we believe that

Thinking of a contemporary design as a mediation process puts us in a position where we need to understand the others' desires and perspectives. (...) The voices and courses, relations established in the field, are what generate the results, never defined a priori, but throughout the investigated course. (NORONHA, 2017, p. 229)

In this way, opening ourselves to listening to the narratives, hopes and prospects, we sought to find creative solutions to common problems through design and on this regard, we believe that we have met contemporary demand for researching and planning in design, because, as said by Celaschi and De Moraes, (2013, p. 55) "the dimension of the opportunities and the dimension of the new problems that emerge from a more radical integration of the human sciences and design have an unimaginable value."

From May to December 2018, actions were implemented to open dialogue with the community; research on local culture; photographic walks; the accomplishment of interviews with the neighborhood personalities; the understanding of the contents, know-how of the group. There was also a dialogued presentation of concepts related to the project such as design, heritage, memory and identity; communication and ongoing discussion about the purpose of the project and its implementation stages, as well as actions monitoring and evaluation that, of course, implied adjustments and corrections to the route.

The art education approach has taken a close look at the group's aesthetic references, visual cultures and multiculturalism as a starting point. In a context where women master many craft techniques such as embroidery, for example, they, experimenting with the photo collages technique, did not show any execution difficulty, but undoubtedly a conceptual challenge linked to the elaboration of a kind of self-portrait from fragments of the story itself. Cardoso, in the book "Design for a complex world" (2012, p. 73) states that: "The capacity to remember what has already been lived or learned and relate it to the present situation is the most important mechanism of constitution and preservation of one's identity".

This way, through the methodological approaches chosen we mediate the project as an educational and cultural process in continuous dialogue with the social performers involved in the design and decision making that resulted in the production of the postcards. We share Cardoso's (2012, p. 253) understanding of necessary increasing integration "project and research, professional practice and cultural activities, without losing sight of the essential nature of design as a project activity, capable

of enabling systemic and creative solutions to the immense challenges of the complex world".

Among the process' stages we would like to highlight here, we have chosen three that we will detail below: the briefing and product selection process; the realization of the photo collage workshop and the production of the postcard kits.

A product to transform the Lagoinha Complex together

The first two meetings with the elderly women group were dedicated to raising awareness, presenting the project proposal, listening to problems, identifying expectations and establishing trust ties. In the third meeting, we provoked reflection on the possibility of transforming together some aspect of the Lagoinha Complex. The debate revealed the collective desire to change the stigmata of the region and the common understanding that it would be necessary to disclose the history of the complex beyond its importance in the past, but also to discover what is valuable in the present.

We asked a burning question: "How can memory and heritage be raw materials for transforming the present and projecting the future of the Lagoinha Complex?"

From then on, the group was divided into subgroups that proposed and defended the following actions: the production of a calendar, the production of postcards, the production of a short film and the production of a newspaper.

In the next meeting we organized a vote to choose the action the would be technically, temporally and financially feasible in order to guarantee its implementation. For this approach, we retook the *Human Centered Design* (IDEO, 2013) guidelines regarding the *desire, feasibility and viability* of the chosen product or action, which helped us to mediate on the decision making about the images that would be inserted in the cards, its form of production and distribution - without losing sight of the result adequacy to the proposed objective.

The realization of the "Memory and Collage" workshop

The contemporary methodologies of art education are premised on the attention development and suggest transversal approaches in which the multiculturality and aesthetic references of those involved are valued, as well as the processes of artistic experimentation based on the daily life and the manifestations of the heritage in its cultural surroundings.

On the day of the "Memory and Collage" workshop 12 ladies attended: Adélia Mendes, Eva Ribeiro, Geracina Silva, Helena

Figure 1. Workshop participants observing and choosing images.
Figure 2. Project team reproducing photos of the personal collections brought by the participants.
Figure 3. Group during the workshop "Memory and Collage".
Figure 4. Maria da Conceição Augusto elaborating her photo collage.
Figure 5. Photo collage by Neide Araújo.
Figure 6. Photo collages and participants at the end of the workshop.

Pinheiro, Jamir Valverdes, Márcia Araújo, Maria da Conceição Augusto, Maria de Lourdes Souza, Marlene Feliciano, Nádia Mansur, Neide Araújo and Maria Bernadete Inocencio. We present the proposal and distribute reproductions of old photos of the region (collected with other community members) and current ones (produced by the project team during the photographic walks). To the images we selected, the participants added images of their personal collections: newspaper clippings, old photos, family portraits and daily life scenes of the Lagoinha Complex, which Walter Benjamin would call "dialectical images ". As the author pointed out:

It's not that the past sheds light on the present or that the present sheds light on the past; but the image is where the occurred encounters now, in a flash, form a constellation. In other words, the image is the dialectic in immobility. Because, while the relation of the present with the past is purely temporal and continuous, the relation of the occurred to the now is dialectical - it's not a progression, but an image, that catches the eye. Only dialectical images are authentic images - non-archaic - and the place where we find them is language. (BENJAMIN, 2006, p.504)

The photo collage technique allows the production of compositions in which different temporalities unite creating instigating images. Our choice was also guided by the low cost of

the needed material for the workshop: the photographs chosen were printed in black and white, cut and glued on a new support, originating the compositions that would be used in the postcards.

The production of the postcard kits

For being a participatory design project, the choice for postcards was guided by the group's desire, without losing sight of the financial viability of production and product distribution. The postcard refers to an affection practice: the exchange of correspondence by the post office was something common in a not so distant time in the participants' life stories and also tangents the issue of the bond built with people throughout life, decisive factor for the choice.

After making the collages, we proceed to the stage of the images treating and definition of the printing form. To maintain the handmade character that permeated the whole process, we chose risograph, a semi-handcrafted printing procedure that operates between photocopying and screen printing, resulting in a contemporary and thought-provoking aesthetic.

It is important to emphasize the relevance of the creative process around the collages elaboration for reactivating the perception of the neighborhood's cultural and patrimonial value, once the participants freely chose the images and the way they were arranged. The compositions reveal positive records of the experiences lived there and still communicate an understanding of the local culture importance.

Figure 7. Postcards just printed in risography. **Figure 8.** Cards cut off waiting for the kits to be assembled.

RESULTS

Postcards usually present iconic images, emblematic spaces of a territory, buildings, consecrated cultural patrimonies. The community's choice, however, indicated the desire to frame subjective landscapes based on autobiographies, individual and collective memories inscribed in the territory that, in

turn - as everyday actions of the social common level - conform the territory itself, as affirmed De Certeau (1994, p. 172), "an anthropological, poetic and mythical experience of space".

We understand that the postcard kit produced was conceived as a memory artifact, since, through mnemonic operations, the group composed visual narratives that reconfigure the notions of time and space, uniting historical, social and cultural experiences, occurred in the past and in the present, which was enabled by the choice of the photo collage technique, and the stimulus to the use of photographs. According to Rafael Cardoso,

There is a vast universe of objects belonging to the categories of "mementos" and "memorabilia" (...) they are the great repositories of the documentary sources from which our history is extracted. The artifacts most commonly used in our society to preserve and attest memories are photographs (CARDOSO, 2012, p. 76).

Emphasizing the centrality of the designer's role in contemporaneity as a mediator, who, such as the cultural and social mediators, use tools and methods of the human and social sciences to produce social innovation with the subjects involved in the research, we also agree with Celaschi and De Moraes (2013, pp. 44-45) when they say that

The challenge of the contemporary designer is linked, in our understanding, to how materialize objects and services within this paradigm that ties our design action in relation to the FUTURE, WELL-BEING and INTERDEPENDENCE. We believe that the main part of the problem is related to the nature of the projects processes of elaboration, that, from the technique, it must transformed into culture, or rather, into cultures. (CELASCHI and DE MORAES, 2013, pp. 44-45, emphasis added).

We, thus, consider that the process innovation resided in the mobilization of community skills to attract attention to its problems through its the affections and the imaginary - an action of art and participatory design as a social engagement experience. Through the postcards we hope that others understand the Lagoinha Complex's cultural value. So it can promote the reconstruction of the feeling of belonging, stimulating the community's autonomy and protagonism for acting in its future reinvention.

CONCLUSION

The term inventory - from Latin *inventariu* = to find (FERREIRA, 1986, p. 964) - applies to the cultural area when it is done with the goal of elaborating a "systematic survey of cultural assets, aiming at knowledge and protection of the cultural heritage".
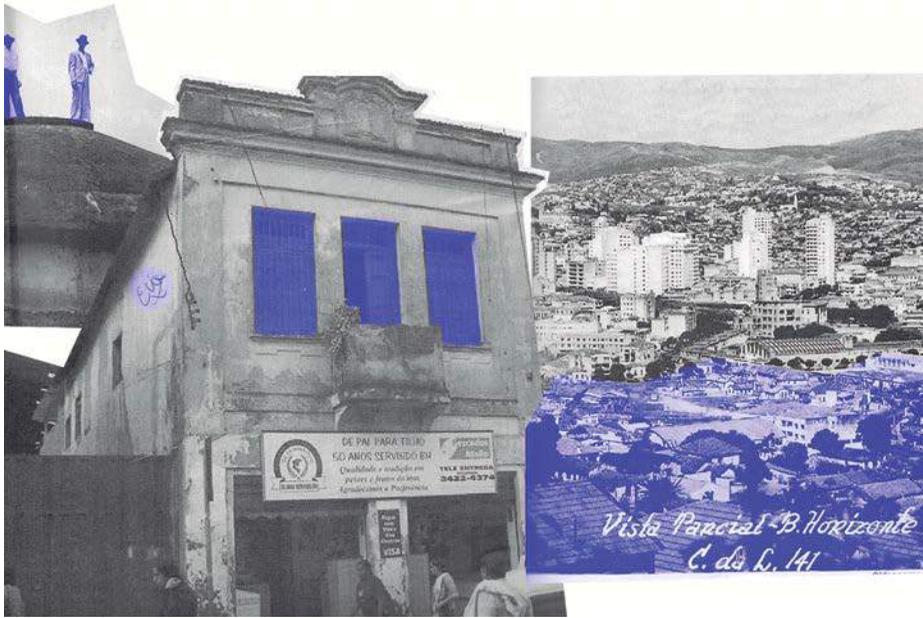
Since it should be systematic, the action of inventorying cultural goods has also assumed the responsibility of being consistent with inclusion/exclusion criteria and of being exhaustive, that is, presenting a definitive and complete list.

Lately, however, heritage scholars have reshaped these issues, and increasingly the inventories have been conducted in dialogue with various social actors imbued with the task of identifying, researching and describing cultural assets for preservation purposes. This process often leads to requests for registration and listing of *non-consecrated goods* (GRUNBERG, 2007), chosen from the meanings attributed by individuals and communities, recognizing the dynamic character of the assets and making the criteria for the production of cultural inventories. Thus, throughout the process and in close dialogue with the community, the group's desire led us to approach the *inventariar* (to inventory) verb of the verb *inventar* (to invent) (FERREIRA, 1986. p. 964), in the sense of creating, imagining, and devising; discover, find, guide us to the production of photo collages and postcards.

As a design project, plural and transdisciplinary in nature, an open process to the interests of the community, from the beginning we knew that the plan could change. However, we evaluated that the product created was totally adequate to the initial project purpose, resulting in the production of a material aimed at the preservation of the culture and memory, potentially capable of strengthening the processes of residents' and neighborhood visitors ` identity construction and enabling changes in a local scale.

In this regard, we defend that socially engaged design and art actions based on heritage and memory can stimulate protagonism and promote the development of small communities considering cultural, economic and social dimensions.

As an extension project articulated to research, it is also worth mentioning the continuous training of our team: teachers and students of graphic design, product design and design of interiors, in direct contact with a community and its issues.

The experience provided opportunities for knowledge exchanges and the collective construction of solutions aimed at creating alternative futures for the Lagoinha Complex. We envisage that this initiative and its unfoldings are capable of generating social impact through the valorization and reinvention of the Lagoinha Complex in a participatory and democratic way, but above all, it triggers reflection and stimulates the autonomy and engagement of the women involved, considering that they can be multipliers as well.

We hope, also, that the postcards can, affectively and effectively, spread the good news.

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THE TRANSFORMED SOCIAL FUNCTION OF RELIGIOUS ARCHITECTURE – TAKE "ZHUANGFANG" AS AN EXAMPLE

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In many areas inhabited by ethnic minorities, religious infrastructure still plays an important role in religious activities and community recreation. However, with the infiltration of modern lifestyle, the social function of these origin are changing, often resulting in confusion of cultural identity for ethnic groups and their risk of being marginalized. This paper uses "Zhuangfang" as a case study. Zhuangfang is a Theravada Buddhism building located in Husa Achang village, China, and is primarily used for the performance of sacred temple ordinances, worship or prayer, and the Buddhist monks' accommodation. However, its role has evolved over time.

This paper explores of the historic use of the temple, compares the site location and interior layout of the temple structure with the changing social status of the "Zhuangfang", and the selection of materials and construction techniques with the change in user experience over time.

The result indicates that (1) the tradition of Theravada Buddhism and "Zhuangfang" have successfully incorporated local traditions and values and (2) through the promotion of community organizations for both seniors and younger members, has helped to unify the tradition of family care with community care for the elderly, as well as encouraging the active participation of the young in community events and festivals. This study strongly suggests that the creative and adaptive use of historical religious buildings can be effective in promoting the healthy development of non-mainstream cultural communities, thus, gradually overcoming inequality and marginalization.

Keywords: Religious building, Social function, Zhuangfang, Marginalization

INTRODUCTION

Zhuangfang is the main building of the Theravada Buddhism temple in Mange village, Husa Achang nationality township, Longchuan County, Yunan Province. Ethnic minorities like Achang nationality along the Yunnan border are located in a relatively remote, poor and undeveloped area with slow economic, educational and cultural development (Li, 2014). This is an area where primitive customs and traditions are deeply rooted and reflected in devout religious beliefs, and where Theravada Buddhism has merged with the local culture and gradually become localized to exert a great influence on the regional society.

By recognizing the particular value of the temple in Theravada Buddhism in Achang Society, Zhuangfang, has been identified as not only a local Buddhist destination for religious worship, involving monastic life, religious activity, and a center for the prayers of the faithful, but also an educational and recreational gathering spot, where the youngest in the community are exposed to and benefit by from the expression of rules, virtues, and traditions of local culture and Buddhism. Moreover, social activities involving community leadership, important cultural events and festivals usually take place in Zhuangfang thereby increasing its' importance to the community.

However while Buddhism is deeply rooted in the Achang culture, unlike other Theravada Buddhist cultures in the region, the Zhuangfang has never been used as place for formal Buddhist instruction. Rather the function and importance of Zhuangfang has fluctuated throughout the history of the Mange village to serve many purposes such as religiouse and secular education (Ji, 2017). The original siting, form and structure, space distribution, and color decoration which determine the potential usage of the building are supportive of this evolution of use and of the contemporary social network of the community.

This article describes the qualitative methods used to evaluate the site, the design of the Zhuangfang and its function within the community along with a discussion of relative literature. The analysis of the correlation of location versus Zhuagfang's social status, the design of spaces and structures versus its local identity, and the materials versus user experience of the community group will be reviewed. A predictable trend of transformation and extension of the social function of Zhuangfang will reveal its evolving role in society, most recently the linking of youth with older citizens and the promotion of community care associated with traditional family care.

COMMUNITY NEEDS DETERMINATION AND DATA COLLECTION PROCESS

Social needs hierarchy and its application to Zhuangfang

The satisfaction of residents in a community relates directly to the fulfillment of their needs. Social needs are closely related to human motivation (Schuck, 2006). Maslow put forward the human motivation theory in the 1950s, which posits that human beings have five different levels of needs and corresponding motivations based upon personal as well as societal identity and maturity (1943). This hierarchy of needs can also be used to analyze the state of the larger community (Yao, 2015). For example, at the most fundamental level of the hierarchy, community residents are likely to only care about whether any construction of any building affects their physiological needs e.g., their ability to move throughout the community and whether a building provides shelter rather than whether the building will bring greater meaning or prestige to the community. Mange community basic physiological needs have been met and level two needs which include health, security and economic independence are currently being met by the Zhuangfang as it encourages community care for elderly when home care is not met with satisfaction. The third level of love and belonging is expressed in the Zhuangfang as a primary community public space for recreation and social gathering within the region. Esteem, level four can be discovered in the affection which the community holds for the Zhuangfang, in the maintenance of the historic spatial arrangement of the building and site, the continued use of traditional colors and materials throughout Zhangfang and its use by people of all ages. Finally, level five, self-actualization is reflected in the historic symbolism of the building. The "Zhuang" organization was formed centuries ago and the Zhuangfang was built only after this village organization was created to help settle the community and establish a Buddhist cultural leadership. Residents continue to get involved in community development and decision making at the Zhuangfang thereby increasing the effectiveness of communication and helping to foster community leadership (Xiong, 2011).

Architectural and Site Analysis Process

A Group of seven people went to Dehong Autonomous Prefecture to investigate the religious buildings of Theravada Buddhism and their users. During the process, temple sites and building structures were measured and recorded to determine the adaptability, diversity and sustainability of Theravada Buddhism. Taped interviews and on-site observation and documentation were also used throughout the field trip (Figure 1). The group

began their investigative journey on July 2nd, 2017 and traveled from Dali city, Yunnan Province to Mangshi township. The group sampled traditional regional food and measured residential building throughout day two in the Lianghe township region. On day three the team went to Longchuan township, Husa Achang nationality and observed and experienced the special decorations and culture associated with the region. The last day, two faculty brought the group to Mange village to study the architecture of the Zhuangfang. Section elevations, site master plan and decomposition drawings were created as needed. Overall this extended field trip enabled the team to more fully understand how Theravada Buddhist values and culture are expressed in physical design within the region and compare the design and role of the Zhuangfang in Mange with these examples.

Community Interviews

During the field trip, data collection relied on relationships with local friends and government connections who had knowledge of the history of Theravada Buddhism in the region and were aware of community social structure. Further review of local archives, cultural centers, folk museums and other institutions helped to further understanding of Zhuangfang's historical origins, site development and spatial layout (Figure 2). Overall the group obtained an understanding of vernacular cultural heritage for Longchuan county and Lianghe County through conversations with Achang scholars, museum staff, folk scholars, craftsmen and enthusiastic people along the way.

THE ROLE OF ARCHITECTURE AND DESIGN

In the field survey of the Husa Achang nationality, it was found that most Zhuangfang were renovated and rebuilt with new building materials, whereas the Zhuangfang in Mange village was perfectly preserved in terms of building structure, materials and decoration. Zhuangfang in Mange village is therefore an excellent example by which to summarize the regional characteristics of the Theravada Buddhism building in the village and its relationship to the functions beyond the religion itself.

Geographic analysis under changing social status of Zhuangfang

Zhuangfang used to be the most important public facility in the area. The site location is selected by either monks or "wisdom" scholars. Prominent terrain, quiet environment, and open space with best views of the village are the fundamental requirements. No other buildings should be located adjacently (Xing, 2014).

Today, Zhuangfang in Mange inherits its primary construction from the Qing density, and is located on the east side of the village (Figure 3). Not many changes to the plan have taken place in the village with Zhuangfang remaining a standalone structure set apart from the village. The main entrance of Zhuangfang is facing north which ensures an eastern orientation for the Buddha, since Buddha reached enlightenment by meditating upon the rising sun, according to legend (Ji, 2017). The occupation of the best high point in village demonstrates the special role of Zhuangfang in the community. However, Both the Buddhist Pagoda and flag column to the east are not on aligned with any one axis of the cardinal coordinates (Figure 4). The open space in and out of Zhuangfang provides a gathering point, increasing accessibility when Zhuangfang functioned more like a community center.

Form and structural comparison

The placement of beams and structural columns in the three-story interior of Zhuangfang creates a great deal of open space
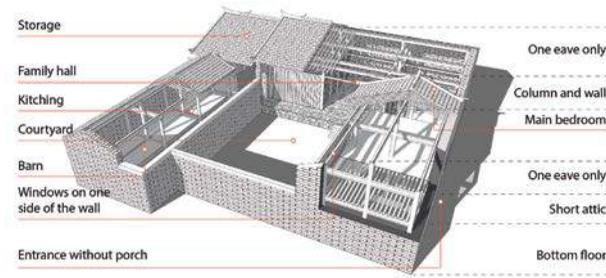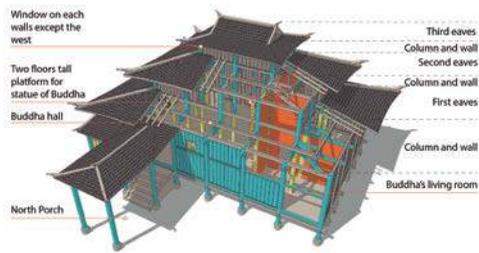
allowing for the placement of a large platform for the statue of Buddha facing east. The Zhuangfang is designed to block predominant winds from the west and the south with no open windows or light from these directions. Windows opened between the first and second eaves, three to the east and one to the north, focus sunlight on the statue as well as some light to the bodhisattva portraits pined on the south wall of the hall (Figure 5). The Buddha hall with a ceiling three stories high together with the atrium at the entrance of the building form a strong ritualistic space. These features coupled with detailed and colorful ornamentation and decoration creates an effective sense of awe. In contrast, residential dwellings (Figure 6) in the village have only one eave and single side windows. Overall there is a significant difference between the Zhuangfang interior spatial quality and grand volume and that of local residential dwellings making it the most prominent and iconic structure in the village.

Space Distribution Analysis

There are 4 different rooms show on the floor plan of Figure 7: (1) the Buddhist hall: a ritual space for regular prayer and main events (Figure 8, 11). Shoes must be left at the entrance with the interior being considered a place for family and neighborhood (Figure 9); (2) Fireplace/kitchen (Figure 10): A temple of Theravada Buddhism does not typically include a kitchen, however, with the development of recreational and social function of Zhuangfang, a fireplace, west of the entrance is used as a public kitchen where
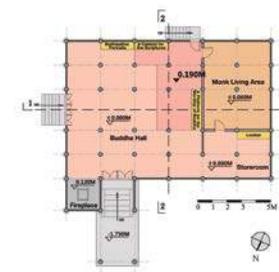
people can boil water for tea, share food, keep warm, engage in entertainment, study and pray; (3) Bedroom: a private space for the presiding monk; (4) The Utility room: temple storage space.

Color representation and the corresponding user experience

The colors of Zhuangfang are full of strong religious symbolism, and include white, red, yellow, green and black respectively referring to the Buddhist five roots of "faith, reading, progress, determination and wisdom". At the same time the inclusion of warm colors "softens" the religion representation into a community friendly language. The application of color throughout the Zhuangfang can be referenced to the Munsell Color System (Figure 12). The outdoor colors are more subdued, since the building has been exposed to the sun for many years. The interior color warms up the space and is brighter, creating an atmosphere of relaxation and comfort. Overall the careful selection of colors can be viewed as an expression of the communities need for historical connectivity and cultural esteem.

Decorative art and self-actualization through "Dan"

The Buddha's Umbrella, red couplets, and paper flags hang from the ceiling above the statue not only as decoration (Figure 13), but as a collection point for "Dan". Dan is a word from the language of the Dai nationality and means sacrifice, offering, support, and charity. Dan can refer to all kinds of dedication activities in Theravada Buddhism and is the most popular and frequent activity. After a long period of localization and nationalization, Dan has absorbed a large number of traditional folk activities within the region including, important festivals, and diverse religious and social functions.

SIGNIFICANT FUNCTIONS OF THE ZHUANGFANG

In Husa Achang nationality township, Longchuan County, almost every village will have its own temple in order to practice worship every month (Figure 14). The Zhuangfang is the most important place and center for the continuation of colorful Buddhist events and festivals. This is the fundamental purpose of any main building of Theravada Buddhism. Another purpose of Zhuangfang, historically, is education. After the introduction of Buddhism, Zhuangfang become a school that recruited Achang boys to master Buddhist culture along with the traditions of other nationalities

(Yang, 2010). It also a replaced formal schooling when the community lacked teachers. Recently, with a generalizing of contemporary education nationwide, Zhuangfang is no longer a place for general education, but functions to transfer historic religious culture, and also plays a role in promoting and spreading the traditional culture of the Achang nationality. Thus, the advantage of Zhuangfang in spreading Achang culture, traditional morality and customs, literature and art, craftsmanship, etc. (Wu, 2005).

Based on Maslow's theory, the promotion of education and culture can effectively impact the need for love and belonging. Ultimately this can benefit community cohesion and lead to self-actualization. "Generally, the cohesion of a religion can make different people and bodies of a society unite into a unified purpose, and promote internal unity (Ma, Wu, Wang, 1987)."

The elderly care derived from education is the third function of Zhuangfang. Elderly enjoy sharing their knowledge of life and community through the "senior committee" where members can either learn from each other or work with local youth. At the same time, the member of "youngest committee" may associate with the elderly by offering voluntary service and company. Overall, Zhuangfang provides an economically efficient and long lasting community network of elderly care services that benefit all members of the community as an extension of traditional family care.

Fourthly, Residents donate their time, goods and money into the maintenance and upkeep of Zhuangfang which gives the village a common goal that aids in the stabilization of the community (Figure 13, 14).

Finally, Due to the special status of Theravada Buddhism in the Achang nationality, the preparation, handling and decision-making of important folk events are usually held in Zhuangfang, and manifests the interdependence between the village committee and the village religious institutions at the present time (Xiong, 2012). In an area like Mange village, most recreational activities are related to religious events. Frequent Buddhist

festivals release social and psychological pressure not only by involving the community in exciting activities, but also through solemn, quiet, and mysterious experiences (Zhang, 2009).

CONCLUSION

There is no doubt that Zhuangfang is the psychological and physical center of the Achang nationality society and is a significant place that stewards public resources and values (Xiong, 2012). Zhuangfang began historically as a religious activity center of the village and has been sustained over time by its ability to incorporate changing local tradition and culture. Through the lens of a social needs hierarchy which includes physiological needs, independence, love and belonging, esteem, and self-actualization, the paper illustrates how the Zhuangfang meets the needs of community historically through design and contemporary function.

Zhuangfang is a typical product of non-mainstream design. In comparison with traditional mainstream dwellings and community structural, Zhuangfang is consistent with following non-mainstream culture characters:

1. From the perspective of primary function, (1) the Achang people have the tradition of using Zhuangfang as the center of localized, management, for the oversight of cultural events; (2) Zhuangfang has become a locus of Achang culture and tradition by integrating members of "senior committee" into the core functions of the community.

2. From a humanistic perspective, (1) the younger community members help the seniors manage and prepare various Buddhist activities (Tian, 2010) or volunteer to take care of or accompany with the elderly, that create an elderly care system. The exchange of wisdom and enthusiasm between people of different ages establishes a platform for ongoing, evolving cooperation and communication that can reduce the inequality of services; (2) The contribution of residents through Dan, fund raising, and efforts to build and repair Zhuangfang, also unite the members of the village and strengthen cohesion at the highest level of Maslow's hierarchy. Zhuang also plays an important role in organizing religious activities, organizing ceremonies, and mediating disputes. To some extent, the religious teachings and precepts of Buddhism have become the common moral norms for maintaining social life. Therefore, an exploration of the valuable non-mainstream culture of remote communities, and a creative development of the extensive social function of those traditional iconic buildings will be an efficient way to carry the non-mainstream culture forward with vigor and vitality.

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APPLYING HUMAN-CENTERED DESIGN AND BEHAVIORAL ECONOMICS TO DRIVE UPTAKE OF PREP AMONG SEX WORKERS

In 2016, the government of Kenya introduced oral Pre-Exposure Prophylaxis (Oral PrEP), a method which uses antiretroviral drugs to protect HIV-negative people from getting infected. The key goals of the project—the first of its kind to deliver PrEP widely across a health system while promoting a sustainable service delivery model[1] —was to understand and develop new communication strategies targeting Female Sex Workers (FSWs) across five regions in Kenya, to increase the uptake of oral PrEP to prevent HIV. Past prevention strategies such as the widespread promotion of condom use, abstinence, or remaining 'faithful' to one's sexual partner have failed to make the progress needed. This project used Human-Centered Design and Behavioral Economics to understand the latent motivators, decision-making pathways, and behavioral norms that could be optimized in this context.

Keywords: Oral PrEP, behavior, science, design, strategy

1   Ministry of Health, National AIDS & STI Control Programme. (2016). National AIDS & STI Control Programme. Guidelines on use of antiretroviral drugs for treating and preventing HIV infections in Kenya. Retrieved from https://www.prepwatch.org/wp-content/uploads/2016/08/Guidelines-on-ARV-for-Treating-Preventing-HIV-Infections-in-Kenya.pdf

INTRODUCTION

The government of Kenya recently introduced oral Pre-Exposure Prophylaxis (oral PrEP), a recent biomedical intervention that has the potential to substantially reduce HIV acquisition among those most vulnerable to HIV[2]. The drug reduces the risk of HIV infection by taking one pill once a day. Despite important milestones, HIV prevalence remains high in certain geographic pockets and among key populations; including Female Sex Workers (FSWs) in Kenya.

The key goals of this project were to understand and develop new communication strategies targeting FSWs (as well as other key target groups) across five regions in Kenya, to increase the uptake of PrEP.

So many traditional communication strategies are grounded in harm reduction theory where the objective is to use fear-based messaging to reduce harm immediately. For this project, a different approach was taken. By utilizing a unique research strategy and methodology where solutions were designed not only at the individual level (using aspirational messaging to encourage adoption and retention) but also designing at the broader peer group and community level (stimulating long-term social norm change). Human-centered design is predominantly a qualitative process, which seeks emotional understanding of the users for whom it is creating value and drives an action-oriented, creative process from this strong emotive foundation. For this reason, FSWs were engaged very early in the process, and some of them were even trained to conduct research in an environment that was familiar to them and their peers. Complementarily, behavioral economics takes a more data-driven approach to understanding the psychology behind human behaviors and attitudes.

In the process, qualitative insights were discovered by exploring the contexts in which FSWs expose themselves to risk and make decisions. This research phase informed the creation of a quantitative tool used for segmenting the target population into clusters based on self-reported sexual behaviors, decision factors and objective-subjective risk levels. Following which, personas were defined in the quantitative data to make population level inferences and provide clues on ideal intervention strategies.

Several co-design sessions around the country, made it possible to invite members of the relevant communities to design together,

2   Pilgrim, N., Mathur, S., Gottert, A., Rutenberg, N., & Pulerwitz, J. (2016). Building evidence to guide prep introduction for adolescent girls and young women. Retrieved from https://www.popcouncil.org/uploads/pdfs/2016HIV_PrEPGuidanceForAGYW.pdf

including members who resembled the key personas that were identified and subject matter experts. At the end of this process a diverse range of concepts emerged, the most promising ones were chosen to be built and tested.

The types of interventions that were co-created and tested with FSWs achieved individual, social and structural change. The communication strategies focused on influencing the FSWs as an individual and her decision-making process, as well as social behavior change interventions.

METHODS

An integrated approach utilizing Human-Centered Design and Behavioral Economics had the ability to help understand the 'world' of the FSWs, at a deeper level, and think about not just individual adoption, but wider social norm change and sustainable long-term diffusion of PrEP.

Qualitative instruments, taking an exploratory approach to uncover insights

A day in the Brothel and at the Hotspots

Full days and nights inside brothels and also with sex workers operating from the street at designated "hotspot" zones speaking with women during free periods in between clients, allowed to naturally observe what a typical day for them looks like. This included the flow of clients in-and-out, the decision-making processes behind how clients are assigned, and how staff members communicate with each another. Observing internal politics in this way furthered the understanding of the various influences that impact the decision-making behavior of brothel sex workers.

Peer interviewing

In this method of research, active sex workers were engaged to conduct research in an environment that that was familiar to them. They were trained on effective research methods and also on how to achieve the objectives of this research phase. This tool allowed the discovery of unique and in-depth insights, as well as data translation that genuinely represented the sex work landscape.

Activity themed interviews

This method involved engaging participants in a themed activity with uninterrupted opportunities for observation. One such activity could be; challenging a group of 4 sex workers to create a model of the ideal sex worker friendly health center using Lego

blocks. As they did so, researchers were attentive to cues on what the 'builders' find to be challenges or wins for topics such as accessibility and service delivery. Engaging participants in a mentally challenging and fun activity improved their likelihood of sharing information genuinely.

After a first round of qualitative research, FSWs were classified into segments using a machine learning approach (an appropriate unsupervised learning clustering algorithm). The tool identified the key features that differentiated FSWs across segments given a user-inputted set of features observed. These features were the relevant data collected as part of a quantitative survey, as well as behavioral indicators uncovered by the qualitative research (risk aversion, subjective and objective perception of HIV risk, etc.). This input was fundamental in the development of the 4 *personas* of the project (key archetypal users that represented the needs, values, and behaviors of larger groups of FSWs).

Quantitative research methods

Before conducing the survey, community entry was carried out in each location with the aim of establishing links with organizations/ mobilisers, identifying 'hotspots' and gaining

Figure 1. Emerging personas: Applying Human-Centered Design and Behavioral Economics to Drive Uptake of PrEP Among Sex Workers (2018) [3]

3. Rodriguez, J (2018). Sex Work Is Real Work. Retrieved from https://designawards. core77.com/Strategy-Research/75627/Sex-Work-Is-Real-Work

contextual knowledge. After which, the client's mobilisers and peer educators assisted in carrying out recruitment by utilizing their links with FSWs to provide the field team with a steady stream of individuals who met the criterion. In addition to this, respondents referred friends who met the criterion to take part. The final sample consisted of 296 FSWs.

The interviews took place in venues that were familiar to respondents, such as local organizations or their place of work. This ensured they were in an environment that was both comfortable and convenient for them. The interviews lasted approximately 1 hour and were conducted one – on- one using a tablet device. The survey focused on several key areas and included a bean activity where respondents allocated beans to various categories as a visual representation of their decision-making processes and perceptions of risk.

Co-design[4]

The most effective way to design for a specific audience is to have them design alongside design and subject matter experts. When the time to converge came, key design principles such as working collaboratively to broker innovative solutions were explored, always maintaining a sense of curiosity and creativity throughout the course of this phase. The co-design process brought together a wide range of perspectives, to design concepts based on the research. At the end of this process a diverse range of concepts were generated, then a small amount of the most promising ones was chosen to build and test.

Testing and iteration with the target cohorts of FSWs of the co-designed concepts were led. The concepts were tested qualitatively, RCT style testing was conducted, used phone sensing, which gave the target group phones so that their behaviors and actions could be tracked and iterated on the concepts, based on the outcomes seen in testing.

BEHAVIORAL INSIGHTS

Throughout the research, a hierarchy of barriers was designed which had to be addressed in order to increase adoption of oral PrEP amongst FSWs in Kenya. The barrier-based approach discovered that one cannot effectively change people's behavior with only rational mechanisms, such as incentives, but that it is necessary to induce changes in unconscious behavior[5]. The

challenge was to create decision architectures[6] to positively take advantage of the unconscious forces of the human mind, in order to motivate more rational behavior. With the barrier prioritization approach, came the need to design and implement nudges[7] that could effectively surpass barriers towards the PrEP intake and adherence among FSWs.

The proposed approach is based from the realization that all individuals have cognitive limitations, that are incapable of rationally process large amounts of information, that emotions influence their decision-making process, that they are subject to biases when handling probabilities and are often willing to sacrifice their own interest to satisfy different forms of social or cultural preference[8]. People do not have the experience to always make the right decision in a complex modern world, but they enjoy having the right to choose.

Therefore, the hierarchy of barriers showed that the top of the pyramid was likely to be what the project has the most influence on and what should be addressed first in terms of communication strategy. This approach is derived from breaking down barriers into groups that could help generate more targeted strategies to create more value per contact with users. These categories were:

Highly protected against HIV or no risk at all

No risk of HIV infection is a direct barrier to PrEP adoption, as a person that is not at risk has no utility for protection. Sex workers that fell into this segment were not part of the strategy in terms of intervention and communication action plans.

Authority to make decisions about your body

One's ability to make decisions about sexual activity and sexual partners are often impacted by skewed power dynamics within the negotiation process[9]. When it comes to PrEP uptake, the

4   Body, J., & Terrey, N. (2017). Designing what matters: Applied design thinking for innovation and impact. London, United Kingdom: Taylor & Francis Ltd.

5   Samuelson, W., & Zeckhauser, R. J. (1988). Status quo bias in decision making. Journal of Risk and Uncertainty, 1, 7-59.

6   Miller, K., Ludvig, E., Pezzulo, G. and Shenhav, .A (2018) Re-aligning models of habitual and goal-directed decision-making. In: Bornstein, Aaron and Morris, Richard W and Shenhav, Amitai, (eds.) Goal-Directed Decision Making : Computations and Neural Circuits. London San Diego, CA: Cambridge Academic Press, Elsevier , pp. 407-428.

7   Thaler, R. H., & Sunstein, C. R. (2009). Nudge: Improving decisions about health, wealth, and happiness.

8   March, J. (1978). Bounded rationality, ambiguity, and the engineering of choice. Bell Journal of Economics. P. 589.

9   Kline, A., E. Kline and E. Oken. (1992). Minority women and sexual choice in the age of AIDS. Social Science and Medicine 34, 4:447-457.

consideration of who does and does not have the authority to make proactive decisions about their bodies was very meaningful. Research around authority and decision-making included understanding spheres of influence and expectations amongst the various user segments in the context in which they live and socialize.

Valuing your sexual health

This segment refers to one's perception of their own level of risk as a barrier to uptake. Simply, if someone does not think about and calculate their own potential for risk, then they are unlikely to consciously make behavioural changes in response to it[10]. Valuing sexual health would include the process of conceptualising one's personal risk, and then subsequently prioritising it above external influences.

Financial access

A lack of finances and access to supportive economic resources could directly impact one's ability to uptake PrEP. When assessing financial access as a barrier, various costs that are indirectly associated with PrEP enrollment were also considered. Transport fare, for example, can deter someone from traveling to and from clinics in order to visit their doctor and obtain the drug. Additional indirect costs associated with uptake could include time spent during travel, time spent at the clinic, and productivity lost due to the potential side effects.

Product awareness

Not knowing about PrEP is an obvious, but critical barrier to uptake. Understanding the pervasiveness of general product unawareness within the various user segments was critical in the process of designing strategy that responded to exiting these awareness gaps.

Clinic visit and testing

The assumptions that one has about their clinic experience and their actual experience pose very real barriers to PrEP adoption. PrEP adoption is not possible without an in-person visit to a participating health facility, which means that it is critical to understand how people anticipate and experience the clinics around them.

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10   Lewicki, P. (1985). Nonconscious biasing effects of single instances on subsequent judgments. Journal of Personality and Social Psychology, 48, 563–574.

COMMUNICATION INSIGHTS

Communication Insight 1: Show me that you understand that sex work is my profession, and that I am proud of it.

FSW discuss retirement from their profession, similar to the way other types of working professionals plan for their future post-employment. For FSW who work full-time in brothels or out of hotspots, sex work is their profession, and they want this to not only be acknowledged, but also accepted. Strategies that are aimed at the career sex worker needs to legitimize the profession before introducing PrEP.

Communication Insight 2: Give me information that I can take read later

In general, it is challenging for FSWs to fully engage with PrEP material while they are actively working. The transmission of information if effective while FSW are on-the-job, usually when they have idle time in between clients. The digestion and full comprehension of information, however, is unlikely during this same window. Most FSW requested information that they can read on their own time, at their own convenience.

Communication Insight 3: Motherhood is a highly influential experience shared by the majority of FSW

A large number of FSW are mothers, often single-mothers, and are highly motivated by their children. FSW that are mothers typically report that their primary behavioral driver is the need to earn for their children.

Communication Insight 4: Reach me through my networks

Most bar owners, particularly at bars frequented by FSW, are willing to support efforts of increasing PrEP awareness among their clientele. Some brothel owners were unwilling to hang posters in places where clients could see them, fearing that it would impact overall business. Many are, however, open to conversation around testing and PrEP. These individuals have one of the highest rates of contact with FSW, making them potentially effective messengers and reinforcers of PrEP.

Communication Insight 5: Loyalty and camaraderie are both critical components of the sex work community

This is particularly evident in the peer-to-peer networks that exist at "hot-spots" throughout Nairobi and beyond. One Peer Educator told us that she has from 60 to 100 women who can call her at any time for support and information. She explained that "even if I am

not in the city, I make sure to connect them with someone who can help." Health facilities (53%) and Peer Educators (23%) are the most trusted sources of information regarding sexual health information.

SOLUTION APPROACH

"Sex work is real work" was created as a communication strategy that targeted not only FSWs who have an attitude to avoid contracting HIV in order to achieve a high level of success or improve their current situation in life, but also FSWs who had the ability to speak openly about their lifestyle with others.

Messaging

Prove to me (by design) that you understand me: FSWs respond well to messaging that shows that their lifestyle is understood and accepted, the challenges that they face, and the preferences that they have.

Voice and tone

A confident FSWs to the world: The tone of messages should be as if they are being spoken, in the first person, directly from an FSW herself, talking to the world. Therefore, messaging should be clear, firm and should not coddle the FSWs sensibilities but reach out to her in a way that is real and respectful.

Imagery

FSWs want to see more imagery, language, and depiction of sex workers that are successful in their work and their personal lives. There is a strong undertone of professionalism and the need to be legitimized among FSWs. Being direct about PrEP as it relates to the empowered, professional sex work is critical in catching their attention. Most FSWs who are mothers explained their roles as sex workers in direct relation to their children, therefore PrEP should be introduced as a compliment to healthy sex work and fiercely loyal motherhood.

Channels

The following were the proven effective channels for strategically disseminating PrEP information:

WhatsApp

Using WhatsApp as a message delivery channel is an effective way to connect with the career FSW. The typical day of an FSW includes a great deal of idle time, as she waits for clients and travels to and from places of work. Most FSW have cellphones and access to WhatsApp, where they communicate with friends, Peer Educators, and family. FSW use WhatsApp to communicate the status of certain hotspots as well as to keep in touch with clients.

11   Rodriguez, J (2018). Sex Work Is Real Work. Retrieved from https://designawards. core77.com/Strategy-Research/75627/Sex-Work-Is-Real-Work

12   Rodriguez, J (2018). Sex Work Is Real Work. Retrieved from https://designawards. core77.com/Strategy-Research/75627/Sex-Work-Is-Real-Work
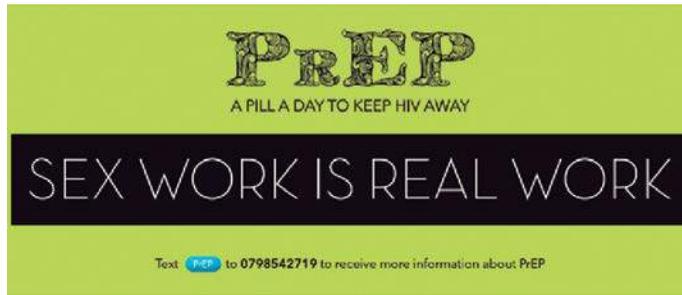
Brothels and lodgings

FSWs tend to work either within specific geographical areas (on the streets) or within lodgings such as sex dens and brothels. They spend a lot of their time in these areas and are prime for receiving information in their down time. FSW tend to stick together, both geographically and figuratively. The nature of their work requires them to wait consistently, and often in groups with other FSW.

Public transport

FSW utilize public transport on a daily basis, oftentimes moving into the city for work from their homes outside of it. Unapologetic and direct communication within public transport demonstrates to FSW that the brand supports their movement and that is not afraid to let the public know. This ultimately increases trust in the brand, as well as familiarity among FSW and other members of the public.

Interpersonal communication

Peer educators are FSW who speak from experience, which means that they are often very successful in developing rapport with FSW while on outreach. Knowing when to engage with an FSW, versus when to give her space, is something that PEs can do very effectively in-person.

Influencers

FSWs look to male management and clients for advice and guidance. Getting especially, pimps and managers of brothels on board is key to success for any intervention. They have the potential of being used as a channel for information but also as a gateway to make sure that channel interventions are uptaken by this segment.

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13   Rodriguez, J (2018). Sex Work Is Real Work. Retrieved from https://designawards. core77.com/Strategy-Research/75627/Sex-Work-Is-Real-Work

CONCLUSION

The innovative approach utilized in this project began with exploratory and immersive research to more build empathy and understanding of the design context and the users of the potential communication solutions. The insights gleaned from this research were used not only to inform a design-and-build process in which users were brought in to play an active role in how prototypes were constructed, but also a new research approach to the FSWs population and HIV prevention spheres. Challenges within low-resource contexts - are diverse, complex, and often complicated by local interpretations and values. This research and design methodology, proved that these kinds of systems are defined by non-linear decision-making, shifting problem definitions, and interconnected issues, and they require a unique approach that can lead to a depth of understanding into systems-level interventions that have the most potential for bridging the gap between intention and action.

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CLASSROOM AS RESISTANCE: MICRO-STRATEGIES FOR DESIGN EDUCATION

In the design classroom, students should be invited to represent the culture they aspire to encounter in the workplace and by extension in society. The classroom is a participatory space that each student contributes to defining. We believe that within the institution, the classroom can become an act of resistance if we implement strategies that counterbalance the forces that build systems of dominance. Which strategies can render the classroom as a place to reclaim social agency for those who have been excluded by lack of privileges, access, or estrangement toward apparatuses of power? How can we, as teachers, encourage a culture of agency? And inspire a culture of critical reflection and responsibility?

This paper presents a series of approaches accompanied by a micro-strategy, a procedure designed to enable small moments of change and agency within a larger system; here, the classroom is recognized as a leverage point within the larger system, where smaller everyday actions build towards movement. The micro-strategies presented are: (1) Teacher as Participant, discussing authority in the classroom; (2) Knowledge of Power, discussing structures of power and privilege as they manifest in design and society.

Keywords: design education, design pedagogy, decolonization, strategies

INTRODUCTION

In the design classroom, students should be invited to represent the culture they aspire to encounter in the workplace and by extension in society. The classroom is a participatory space that each student contributes to defining. The concept of potent mini-society solicits a classroom that in the words of Giroux (2013) "provides students with the competencies they need to cultivate the capacity for critical judgment, thoughtfully connect politics to social responsibility and expand their own sense of agency in order to curb the excesses of dominant power, revitalize a sense of public commitment, and expand democratic relations." Education not only provides opportunities for employment but it is essential to establish a culture of values and social relationships that "enable individuals to wield power, learn how to govern, and nurture a democratic society that takes equality, justice, shared values, and freedom seriously" (Giroux, 2011). We, as teachers, need to resist the reproduction of social injustice in school. Our institutions are responsible for providing the formative culture that is indispensable for a democratic society. In the design classroom, students participate in the public sphere by means of their design practices and definition of their professional identities. As Gillen states, "students in any school can and do participate in the 'enormously rich and heroic drama' of the country. 'Protected spaces' do exist within which the young people dramatize and drive home their human personhood, with 'elaborate style' of language, dress, gesture, and stance, enacting symbolic strategies and plans" (Gillen & Moses, 2014).

We believe that within the institution, the classroom can become an act of resistance if we implement strategies that counterbalance the forces that build systems of dominance. Which strategies can render the classroom as a place to reclaim social agency for those who have been excluded by lack of privileges, access, or estrangement toward apparatuses of power? How can we, as teachers, encourage a culture of agency? And inspire a culture of critical reflection and responsibility?

CONTEXT, METHODOLOGY AND DISCOURSE

This paper presents a series of approaches accompanied by a micro-strategy, a procedure designed to enable small moments of change and agency within a larger system which often feels overwhelming and oppressive. Rather than large, radical, systemic change, which can seem overwhelming, these moments by moment approaches hand power back to the teacher and the student. This article proposes a framework for conceptualizing teaching as a form of resistance. The authors posit that by

reflecting on their authority and by discussing types of power, teachers can offer a safe space for students' expression where critical thoughts can thrive.

This paper uses a traditional methodology of the Scholarship of Teaching and Learning. It presents the results of a practice of reflection summarising "expert knowledge gained by self-reflection and experimentation" in one's teaching as instructed by Nelson in his article "Doing It: Examples of Several of the Different Genres of the Scholarship of Teaching and Learning" (2003). Following Nelson method, we integrated the broader conceptual framework of decoloniality in design and conducted a dialogical inquiry into each other teaching practice. Critical inquiry and self-reflection directed the methodology as described by Larrivee (2000) and others (ref). "Critical reflection involves a deep exploration process that exposes unexamined beliefs, assumptions, and expectations and makes visible our personal reflexive loops. Becoming a reflective practitioner calls teachers to the task of facing deeply- rooted personal attitudes concerning human nature, human potential, and human learning. Reflective practitioners challenge assumptions and question existing practices, thereby continuously accessing new lens to view their practice and alter their perspectives."

The authors engaged in pedagogical action research by evaluating their classroom experiences through a dialogical analysis. The results are a series of strategies we encountered and showed to be very powerful in changing our class dynamics. This research was not designed to test these strategies but to produce what Schön (1995) defines as approximate and suggestive knowledge: "Learning and teaching are complex activities where approximate, suggestive knowledge can be very helpful, and, indeed, may often be the only kind that is practical or possible." The micro strategies presented are practical implementations of what was successful in our Scholarship of Teaching and inspired by critical, anarchist, red and feminist pedagogies within a contemporary classroom (Coté, Day, & de Peuter, 2007; Grande, 2015; Haworth, 2012; Macdonald & Sánchez-Casal, 2002; Macedo, 2016; Maher & Tetreault, 2001). Critical pedagogies are the precedents of this research and provide its historical framework: we recognize that issues of social justice and democracy are intrinsically connected to acts of teaching and learning. Anarchist pedagogies in the editorial work of Haworth (2012) created a theoretical framework for our desire to "cultivate dissent against a system that has been so oppressive to young people and anyone living outside of dominant cultural practices." The feminist approach to the epistemic role of experience and identity, as described by Sánchez-Casal and MacDonald (2002), have informed our practices, and we are indebted to them. Finally the critical examination of how democracy needs to be re-envisioned from an indigenous

perspective in Sandy Grande's Red Pedagogies has informed our work (2015).

This paper is an attempt to contribute to the discourse on design and decoloniality. Decolonizing design and design education is a popular theme that still lacks clarity, definition, and structure. Few are still the publications on this topic (Khandwala, 2019); the discussion requires redefinition and depth and would benefit from a variety of approaches that build on previous work. In this context the term is appropriated from the issue of repatriation of Indigenous land and used metaphorically; Tuck and Wayne (2012) opposed this misuse as it "turns decolonization into an empty signifier to be filled by any track towards liberation (...) and kills the very possibility of decolonization". Even if we agree that indigenous issues should play an essential part in the conversation on decoloniality, we still believe that this term allows the beginning of a discussion on power-knowledge (Foucault, 1990).

Decolonization is at its core a conversation about supremacy, being in command of authority, power, resources, media or infrastructures. Mainstream design discourse on the topic often renders colonization as the lack of diversity in the field, or more specifically as the focus on Eurocentric/Anglocentric ways of designing and knowing that has excluded minorities and had marginalized other modes of cultural production. Practitioners in the field recognize the need to create opportunities for different modes of thinking, doing, and designing. But as the Decolonize Design collective explains in their editorial: "It is not sufficient for design institutions to simply include a greater diversity of actors or perspectives. This only goes to serve a delaying and offsetting demands for radical systemic change. (...) there is little point to diversifying institutions, practices, and processes that ultimately sustain colonial imperatives." (Abdulla et al., 2019)

There are different paths to systemic change; this paper discusses the type of change enabled and supported by self-organization as a means to create islands of order or as John Takara describe citing Ilya Prigogine "small islands of coherence" (Croci, 2018). We believe in the possibility of impacting a system by applying force on in specific areas of intervention. Donella Meadows (2008) highlighted twelve leverage points to intervene in a system and initiate change; we are here addressing the teacher agency on classroom practices as a form of self-organization: a "system's ability to change itself by creating new structures, adding new negative and positive feedback loops, promoting new information flows, or making new rules".

We argue that such a change could arise from approaches that would allow teachers to disseminate alternative values within our educational system. These approaches leverage the agency

of the teacher as a participant and their freedom to reimagine the educational experience from the ground up. "The ability to self-organize is the strongest form of system resilience. A system that can evolve can survive almost any change, by changing itself" (Meadows, 2008).

In the next paragraphs we present two approaches and related microstrategies: 1. **Teacher as Participant:** reconfiguring what authority means in our classrooms is a potent strategy for a decolonized education and a vital instrument for our democracy. 2. **Knowledge of Power:** a student examining structures of power and privilege is a student that can contribute to society, an active citizen and force of change.

TEACHER AS PARTICIPANT

Teacher's authority traditionally comes from a perceived superior knowledge of the discipline and subject under discussion. In the creative fields, this is often equated with long-term professional experience. This association has raised doubts as professional designers have been proven not to be necessarily the best teachers: they are commonly unable to articulate what instructional method they are using, or is appropriate, for a specific condition (Oh, Ishizaki, Gross, & Do, 2013). Professional practice requires mastery of methods and procedures, but often does not provide space for analysis, interpretation, and commentary on these processes.

A good design teacher should be able to describe and explain procedures and methods, and often the Designerly ways of knowing are intuitive, tacit and difficult to illustrate (Cross, 2007). Furthermore, the apprenticeship learning model, where a student is assessed based on her ability to replicate a professional task, has been replaced by an emphasis on creativity and originality and a focus on process rather than outcome. The teacher in a studio-based education is more often a facilitator dedicated to supporting, monitoring and challenging students' iterative progress through trial and error. "The interaction between student and tutor becomes more of a participatory process in which the articulation of principle during the dialectical process of design becomes the responsibility of the tutor as an articulator of the values and issues which motivate changes in the subsequent stages of the design representation as a process of search (Oxman, 1999)." In design education, the Confucian ways of learning - "By three methods we may learn wisdom: first, by reflection, which is noblest; second, by imitation, which is easiest; and third by experience, which is the bitterest" (Attributed to Confucius in Montapert, 1986) - all play a fundamental part of how students perceive their teacher's authority. The ability to

provide relevant examples (imitation), to recognize and explain their modus operandi and suggest options to move forward (experience) and to illustrate the connection between design exploration and learning outcome (reflection) are highly estimated in student evaluations. In creative fields, building authority in the eyes of students requires flexibility and a profoundly humanistic approach. Without empathy toward their aims, goals, and dispositions and without trust in them as full human beings, a teacher is not able to build a respected position in the classroom despite the desire to do so.

Microstrategy: Pluralistic role of the teacher

This first micro-strategy recognizes the authority of the teacher in the classroom. To work towards actualizing a decolonized classroom, the teacher, as a figure of authority, must first contemplate on their role and how it impacts all conditions within and surrounding the classroom space. As authority is fluid, the tool below (see diagram), allows for reflection and negotiation of this fluidity. Negotiation of the typologies of authority in the classroom encourages a reflexive teaching practice prompting the teacher to self-question. Where does my authority come from? Where do I want my authority to come from?

By exploring this diagrammatic visualization of the authority landscape, teachers can select their roles in the classroom. Roles can change during class time - during a lecture a teacher can be an expert and vs being a questioner during critique - or during the course of a semester - a teacher can be a coach during
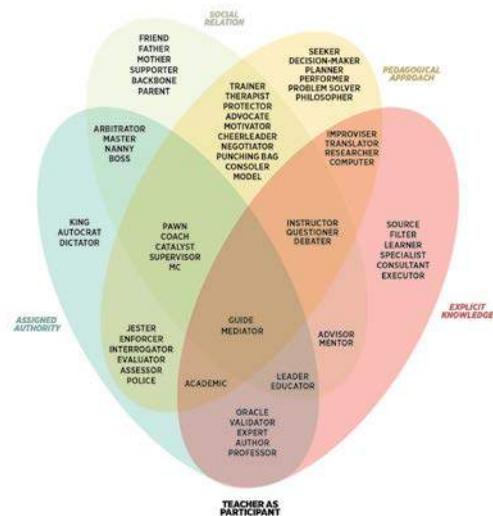
Figure 1. The tool details how different roles are positioned based on their social relations, degree of authority, approach and degree of knowledge.

the semester until final formative assessment where they will be an evaluator; different course might suggest a different role - a seminar class might suggest a debater role, while a test preparation course might suggest a motivator role.

In her essay, Lunsford explores how the attempts to reconfigure the classroom authority have most often worked against the teacher's aim. The need to be a trusted figure in the classroom seems to be essential and enduring, and the question is how to build this trust.

Lunsford (2007) suggests using the term ethos or presence when discussing the role of the teacher: "Later, that same student decided to substitute 'presence' for 'authority', for in contrast to the highly negative connotations that worried him about the latter term, presence as he defines it, seems less absolute, suggesting both positive and negative qualities of teacher and texts. I rewrote my teaching philosophy: my 'authority' in the classroom became my 'presence' in the classroom, and the 'authority' of academic discourse became the 'presence' of academic discourse." Authority becomes an action rather than a status, semantically closer to the concept of charisma; an authority figure in a classroom does not receive her power through institutional investment or superior knowledge, but by creating a performance that engages students' identities in their full complexities.

This pluralistic approach recognizes that the teacher is responsive to the condition of the students and the classroom, thereby framing and reframing classroom culture and their posture within it.

KNOWLEDGE OF POWER

Teacher authority should come with the responsibility to discuss privilege and power relationships between gender, class, race, religion, culture, how they play out within the class and how they will influence the design practice of our students. The assumption that all students are equal and the same within the classroom, especially if overlooking their sociocultural identities, conflicts with the idea of a potent mini-society; this approach reflects a pernicious strain of utopianism (or dystopianism) that permeates our contemporary discourse (especially in tech) - one that willfully rejects the realities of many in favor of facile assumptions that serve the status quo.

The discourse on positionality has profited from the contribution of different scholarships: critical pedagogy has introduced the importance of students' positionality, feminist pedagogies discussed the idea for both teacher and students, multiculturalism presented it as a lens that distorts the way we perceive the world.

In this context, we propose that positionality of teacher and students not only shapes the classroom dynamics but is also a determining factor in how we shape our design practices and how those are perceived by our users.

The relationships between the individual, the social structure and the systems of power one lives in determines and influences one's design choices. When not openly addressed and discussed, positionality and intersectionality tend to generate design projects that blindly reproduce social injustices and systems of privilege, as much as exclusion in design teams damages product quality and business. Systemic issues around diversity, for example, have become sadly famous for producing insensitive auto generated social media messages, racist algorithms, discriminating interactive platform and sexist language machine translators; (ref?)

Design is a particularly fertile field to acknowledge different forms of power as we are continually rediscussing the role of designers within a project, system and in society: designer as craftsman, as author, as auteur, as translator, as facilitator, as performer, as curator, as entrepreneur, just to quote some.

Due to the impact of technology in society and the changing role of designers in the market, the promise of design education is evolving from a skill-based vocational training to a learning approach designed to prepare students to deal with complexity, diversity, and change. This description resonates with the definition of liberal education, and it is undeniable that design education is taking over some of the responsibility traditionally associated with liberal education: empowering individuals with broad knowledge and transferable skills, and a stronger sense of values, ethics, and civic engagement (...) by challenging encounters with important issues, and more a way of studying than a specific course or field of study (Association of American Colleges & Universities, 1998). As teachers, we have a responsibility to show our students the many different ways and strategies to deconstruct and reconstruct power so that they can iterate the process in communities and society, as designers and as citizens.

Microstrategy: make power structures visible

In the classroom, as a teacher, the first power to acknowledge and make visible is our own. As discussed above this is done in part through reflection and negotiation of the teacher's authority and intersectionality through the lens of the classroom infrastructure.

Additionally, we must acknowledge the systems of privilege relative to gender, class, race, religion, culture and how they play out in society. To do this, we must make visible the power play in the production of a student's work; negotiating the systems and structures the work is operating within and in dialogue with.

In the context of design and decoloniality, structures of power become evident when we discuss issues of legitimacy. When we ask in a class what makes an object a legitimate piece of design we are offered an opportunity to discuss invisible power structure that construct our definitions what Foucault calls an 'episteme' in the Order of things (2005): "In any given culture and at any given moment, there is always only one episteme that defines the conditions of possibility of all knowledge, whether expressed in a theory or silently invested in a practice."

Students attempts to define design are good indexes of socioeconomic forces and how colonised our knowledge framework are. For example, the current obsession on the digital determines much of what we label as design; that obsession highlights in which hands we concentrate power today. As Krippendorff (1989) argues when defining design as Making sense "a bit of a paradox between the aim of making something new and different from what was there before, and the desire to have it make sense, to be recognizable and understandable": the "current meaning [of the word design] amplifies the aspect of making or, more specifically, of applying a technical-functional rationality to the material world at the expense of the sense that was to be achieved thereby. Perhaps, the pendulum has swung too far. Perhaps, technology has moved too fast for culture to keep up with it."

Discussing what is defined as craft rather than design constitutes another example of visualizing power structure, as Khandwala (2019) describes in her recently published article "Classifying traditional craft as different from modern design deems the histories and practices of design from many cultures inferior. We should aim to eliminate the false distinctions between craft and design, in order to recognize all culturally important forms of making."

BRING TO CLASS
AN IMAGE OF A PIECE OF DESIGN

DISCUSS:
WHAT CAN BE CONSIDERED

DESIGN
CRAFT
VERNACULAR
AESTHETICALLY PLEASING
INNOVATIVE
ICONIC

WHO ASSIGNS
THESE LABELS
AND WHY?

EXAMINE ANY PIECE OF DESIGN
DISCUSS

WHO MAKES IT
WHO BENEFITS FROM IT
WHAT TECHNOLOGIES,
RESOURCES,
LANGUAGE,
KNOWLEDGE
ARE REQUIRED TO ACCESS IT

WHAT ASSUMPTIONS ARE IMPLIED,
WHICH STEREOTYPES
ARE PERPETUATED,

WHO DOES IT EXCLUDE?
WHO DOES IT INCLUDE?

VISUALIZE
POWER

Figure 2. An example of a simple Classroom brief to discuss issues of power with students.

And Foucault (2005) himself can inspire the process of render our colonized episteme invalid by making it visible: "It is here that a culture, imperceptibly deviating from the empirical orders prescribed for it by its primary codes, instituting an initial separation from them, causes them to lose their original transparency, relinquishes its immediate and invisible powers, frees itself sufficiently to discover that these orders are perhaps not the only possible ones or the best ones; (...) It is on the basis of this newly perceived order that the codes of language, perception, and practice are criticized and rendered partially invalid."

LIMITATIONS

This paper presents pedagogical approaches as strategies of activism and accountability. In this political climate implementing radical pedagogical tactics in the classroom serves as a form of activism and participation. It is an act of civic engagement aiming at systemic changes. It is also a matter of responsibility as teachers are prompted to evaluate the cultural and political equipment they provide to students within the class. "It highlights the necessity of making educators ethically and politically accountable for the stories they produce, the claims they make upon public memory, and the images of the future they deem legitimate" (Giroux, 2003).

We recognise the limits of our research and knowledge. We as authors see the long path of self reflection and self critique which we need to embrace in order to recognise our own episteme, privilege, power and biases. We here intend to share our stances and experiences. As Inoue discussed in the chair's address of #4C19 (2019), we address that most of our academic practices are inherently informed by a white racial habitus and we share her commitment to "a continual articulating of paradoxes [in our] judgement that complicate how [we] make judgements, how [we] read and make meaning of the symbols [our] students give [us] and that [we] give back to them, how White language supremacy places limits on and pressures [us], despite [iur] efforts to counter such things, just as they do [our] students".

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FROM SELF-CARE TO WE-CARE: PRACTICAL TOOLS FOR FIGHTING ORGANIZATIONAL BURNOUT

In social sector organizations, internal care practices are often neglected or taken for granted, leading to a growing epidemic of overworked and burnt out employees around the world. As designers, we have a unique opportunity to address this crisis in the workplace by making care something that is concrete, measurable, and urgently desired within an organization's cultural ecosystem.

Keywords: burnout, organizational culture, behavior change, social reproduction, care sector

INTRODUCTION

Shifting organizational cultures away from their susceptibility to burnout is a time-intensive and long-term project. Whether an organization is responding to a period of high stress or addressing this issue]preventatively, it is necessary to realign a team around their values of care, both in terms of the role of care within their mission-driven work as well as the role of self-care within the workplace environment. This realignment is a developmental process that includes identifying problematic group norms, building team capacity to practice new behaviors with stronger social support, and resetting of unsustainable expectations. Ultimately, an organization's investment in a thriving culture of care returns value to the organization in cost savings associated with reductions in worker absenteeism and health costs and increases in team morale, retention, and productivity[i].

As designers, we have a unique opportunity to make these practices and values of care more concrete, measurable, and urgently desired. This study addresses the "crisis of care" in the workplace and in society at large through the development of cultural interventions.

Our workplace-based interventions begin with the **Care Map** toolkit, an interrogative tool for employees to individually and collectively assess perceptions and practices of care (or lack thereof) in their places of work. Then, to encourage more regular and personal reflections on self-care amongst colleagues, we created **Accountabili(tea)**: a product that helps ritualize this behavior using a menu of teas corresponding to various "practices of care." Finally, to operationalize this at an organizational level, we designed **Tea Time**, a digital tool that streamlines a system of peer-accountability and aggregates feedback and data about the team's collective practice of care.

Drawing from our theoretical and design-led research, we propose the following conclusions: Organizations can become sustainable sites of well-being through a long-term commitment to the following three conditions: (1) "interdependence" - the organization facilitates opportunities for employees to value and perform better self-care in and beyond the workplace; (2) "time recalibration" - the organization actively sets boundaries on productivity-focused time; and (3) "mutuality" - the organization ensures that workers have agency in determining the specific kinds of care that are most valuable to them and that managers

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i   "The Employee Burnout Crisis: Study Reveals Big Workplace Challenge in 2017." Kronos. January 9, 2017. Accessed February 10, 2019. https://www.kronos.com/about-us/newsroom/employee-burnout-crisis-study-reveals-big-workplace-challenge-2017. "About." Caring Economy. Accessed May 01, 2019. http://caringeconomy.org/about/.

are held accountable to model cultural realignments around care for the broader team. These three conditions have functioned as the design principles for the prototypes enumerated upon in this study, and we encourage other practitioners operating in this context to build upon them.

These design principles and interventions are informed by the growing transdisciplinary discourse on design and care that considers the power dynamics inherent to care and aims to restore greater agency to the subjects of care (in our case: an organization's workers). Building on a feminist economic analysis that identifies capitalism's simultaneous disavowal of and dependence on care/social reproduction: the efforts that maintain society and are often undertaken as unpaid labor, ultimately these interventions aim to challenge this dominant cultural paradigm and propose a more ecological understanding of care within the workplace.

BURNOUT AS AN ACUTE REALITY IN SOCIAL SECTOR ORGANIZATIONS

Workplace burnout has gained increasing recognition across industries, however it is particularly magnified in individuals who work in service-oriented sectors, such as healthcare, education, and humanitarian work. In a study examining burnout prevalence in human service work, workers who occupy roles that directly work with beneficiaries (e.g. nurse aides, prison officers) exhibited significantly higher rates of burnouts than those who worked within more traditional office roles (e.g. executive assistants, supervisors).[ii] We also see consistently high prevalence in care-involved occupations such as nurses[iii], physicians[iv], social workers[v], teachers[vi], attorneys, and humanitarian aid workers[vii].

Christina Maslach highlights illustrative first-hand accounts of care-oriented work in *Burnout: The Cost of Caring*. The book identifies emotional exhaustion, callous indifference overtime, and a sense of inadequacy around one's ability to set realistic expectations around their ability to affect social change in their work as the three main thematic drivers of burnout.[viii] As such, it is common for social sector workers to over-idealize achievable impact without setting constraints around their individual well-being.

Many people who choose to work in social sector jobs do so because of a passion to pursue meaningful work that aligns with their personal values. However, across the board, many of these organizations lack the necessary tools and structures to align and dynamically maintain their workplace cultures with the values of care that attracted their talent to the field in the first place.

GOVERNANCE AND ACCOUNTABILITY WITHIN SOCIAL SECTOR ORGANIZATIONS

According to the Office of the New York State Attorney General Charities Bureau, one of the roles of the board of directors for a nonprofit is called "duties of care." According to the list of general responsibilities that define this duty, board members are responsible to "participate in risk assessment and strategic planning discussions for the future of the organization."[ix] With our case study organization, the IRC explicitly addresses this on its Duty of Care website by including employee burnout in its duties of care and risk assessment language. Unsurprisingly, when we asked a group of six Airbel team members whether they had ever visited this page, no one had. Furthermore, while the wider IRC operations team is actively evolving these tools, as evidenced by an April 2019 rollout of a new 90 minute "personal resilience" online course, unfortunately these efforts are not reinforced in other cultural practices nor do they consider the importance of applied learning modalities.

ii Aiken LH, Clarke SP, Sloane DM, Sochalski J, Silber JH. Hospital Nurse Staffing and Patient Mortality, Nurse Burnout, and Job Dissatisfaction. JAMA. 2002;288(16):1987–1993. doi:10.1001/jama.288.16.1987

iii Aiken LH, Clarke SP, Sloane DM, Sochalski J, Silber JH. Hospital Nurse Staffing and Patient Mortality, Nurse Burnout, and Job Dissatisfaction. JAMA. 2002;288(16):1987–1993. doi:10.1001/jama.288.16.1987

iv Rotenstein LS, Torre M, Ramos MA, et al. Prevalence of Burnout Among Physicians: A Systematic Review. JAMA. 2018;320(11):1131–1150. doi:10.1001/jama.2018.12777

v   Bride, Brian. "Prevalence of Secondary Traumatic Stress among Social Workers." 51, no. 1 (January 2007). Accessed March 5, 2019. https://www.ncbi.nlm.nih.gov/pubmed/17388084.

vi Williams, Cheryl Sc. "Combating Teacher Burnout." Expert Perspective. November 03, 2011. Accessed March 04, 2019. https://thejournal.com/articles/2011/11/03/teacher-burnout.aspx.

vii Jachens, Liza, Jonathan Houdmont, and Roslyn Thomas. "Effort–reward Imbalance and Burnout among Humanitarian Aid Workers." Disasters Overseas Development Issues43, no. 1 (January 2019): 67-87. Accessed March 5, 2019. doi: 10.1111/disa.12288.

viii Maslach, Christina. Burnout: The Cost of Caring. Los ALtos, CA: Malor Books, 2003.

ix "Right From The Start: Responsibilities of Directors of Not-For-Profit Corporations", May 15, 2015. https://www.charitiesnys.com/pdfs/Right-From-the-Start.pdf https://airbel.rescue.org/

DEVELOPMENT / ANALYSIS / EVIDENCE

To cultivate thriving cultures of care in the workplace, we believe that every organization must set its own standards. However, design can help incrementally and dynamically improve individual and group well-being by creating the conditions for greater individual self-efficacy and social support amongst workers.

For this particular case study, we worked with the Airbel Center for Innovation as our organizational partner. Airbel is the research and development wing of the humanitarian group, the International Rescue Committee (IRC), headquartered in New York City. This team is currently composed of 17 full-time employees (10 female, 7 male). The department's mission is "to develop life-changing, highly scalable solutions that meet the needs of people affected by conflict and crisis."[x]

In our preliminary ethnographic research, we observed a misalignment between the organization's mission around treatment of its beneficiaries and the values of care practiced internally at both an organization and individual-level. We observed that employee care needs were often compromised, due to two of the top three 2017 Kronos study burnout contributors[xi] - unreasonable workload and too much overtime work. To better understand why these burnout contributors exist, we conducted a series of internal conversations with the team. From these, we came upon an employee-initiated staff survey conducted in November 2018. Findings from this survey suggested a collective desire to cultivate awareness and action around ways to improve team culture, such as having strategic direction around group identity, feeling supported in doing one's job well, and identifying career growth pathways. This survey included a culture map which listed most highly agreed upon adjectives to describe the team's culture. Though the survey included highly reported words such as "friendly", "curious", and "open", it also included "ambitious", "hardworking", "fragmented", and "directionless", suggesting a culture ripe with acceptance and growth, but also susceptible to burnout and collapse. Though 69% of staff reported "agree" or "strongly agree" to having a good work life balance, these findings were not consistently supported in our ethnographic research. We therefore explored alternative participatory methods for uncovering and problem solving drivers of burnout within this group.

x   The Employee Burnout Crisis: Study Reveals Big Workplace Challenge in 2017." Kronos. January 9, 2017. Accessed February 10, 2019. https://www.kronos.com/about-us/newsroom/employee-burnout-crisis-study-reveals-big-workplace-challenge-2017.

xi   "About." Caring Economy. Accessed May 01, 2019. http://caringeconomy.org/about/.
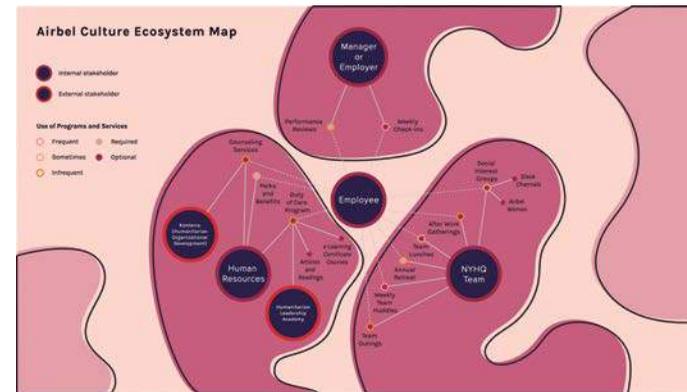
Research Methods

1. Prior to conducting design-led research with the Airbel team, we began our initial research by
    a. conducting twelve interviews with individuals working across social sectors, including the fields of medicine, education, criminal justice, human rights, and in informal family settings. From these interviews, we identified current and ideal practices of care that individuals followed in order to find meaning in their work and cope with regular work pressures. We then

2.
    a. underwent four content reviews with organizational change and behavior experts in both academia and industry. Throughout this process, we

3.
    a. reviewed a variety of secondary literature on burnout, wellbeing, organizational culture, organizational psychology, gender studies, and design theory.

Diagnosing the organizational culture of care with The Care Map

The first prototyping tool that we developed was called "The Care Map." The care mapping toolkit operates as an interrogative and reflective tool for employees to individually and collectively assess perceptions and practices of care (or lack thereof) in their places of work. These tools are included as follows:

The "Intention Behavior Gap" Model asks employees to:

A. Acknowledge the group's "bright spots" - *What practices of care are you currently doing and succeeding at?*

B. Acknowledge the group's "intentions" - *What are your top 5 desired organizational practices of care you want in your life that you currently don't have?*

C. Conduct a "behavior gap analysis" - *What's preventing you from practicing this self-care?*

Designing team rituals with the Accountabili(Tea) workshop

Accountabili(Tea) is a product that helps ritualize peer accountability for practices of self-care using a menu of teas corresponding to various practices of care. Note: This selection of practices of care were largely the same as those in the Care Map exercise.

This workshop leveraged the symbolic and sensory qualities of a tea ceremony to bring a sense of novelty to the workplace for this applied learning experience, using the following workshop model:

xii Falko F. Sniehotta Dr., Urte Scholz & Ralf Schwarzer (2005) Bridging the intention–behaviour gap: Planning, self-efficacy, and action control in the adoption and maintenance of physical exercise, Psychology & Health, 20:2, 143-160, DOI:

A. Set up: The 1.5 hour workshop began with an informational presentation that helped ground the experience in evidence-based research about burnout, self-efficacy in stress management, and the role that social support plays in preventing organizational burnout.

B. Personal reflections: Participants then selected two teas. The first selection represented a practice of care that the participant had done in the previous month, and the second represented a practice that the participant identified as something that would ease stress around a current challenge they were facing at work. These tea selections were facilitated with supplemental worksheets that asked participants to map the activities and emotional arc of their day from the time they woke up until the time they went to bed. This was used later to prompt participants to make decisions about when and where they might take action on the practice of care that they identified.

C. Embedding intention in ritual: Participants were invited to steep their tea while reflection on the positive emotions they associated with their selected practice of care, (e.g. "to simplify what's going on in life," and the emotion associated with that as "ease.") Then, participants paired up and shared from their personal reflection exercises and completed a simple checkin about each other's current physical, emotional, and mental state—all while sipping tea.

D. Wrap up: At the end of the workshop, we asked participants to schedule follow up meetings with each other, using the approach from the workshop: 1) A well-being checkin and 2) Asking each other, "What practice are you doing this week?"

Operationalizing the system with Tea Time

Tea Time is a plugin, designed for Microsoft Office (Airbel's existing communication platform). The digital tool streamlines a system of peer-accountability and aggregates data about the team's collective practices. The name "Tea Time" is intended to evoke a temporality distinct from work time, rather than a literal suggestion to drink tea. The goal behind this product is to operationalize and embed the cultural values and behaviors set up in the Accountabili(Tea) workshop. The plugin performs the following functions:

- Schedules your weekly 15-minute Tea Time date with a colleague
- Select and store personal data about practices of care goals
- Surveys/collects data concerning personal follow through on one's selected practice
- Aggregates data of individual and team performance

The design of this tool was informed by research on the impact of mobile apps to support mental health treatment. Following best practices, we created a simple user-interface and incorporated self-monitoring features in accordance with the literature: "App-based features that enable users to self-monitor their mood by periodically reporting their thoughts, behaviors, and actions can increase emotional self-awareness (ESA), which has been found to be implicated in anxiety, depression, and substance abuse."[xiii]

FINDINGS

Below is a summary of our main learnings from testing our prototypes. The findings for the Care Map are documented in the "Care Report," a bespoke report which we delivered to Airbel as an assessment of the wellbeing of their culture. Findings from Accountabili(Tea) and Tea Time are summarized through observation and additional survey collection.

The Care Report

We compiled the group's results into the following organizational "Care Report" which communicates trends and patterns we observed.

xiii Chandrashekar, Pooja. "Do Mental Health Mobile Apps Work: Evidence and Recommendations for Designing High-Efficacy Mental Health Mobile Apps." MHealth, AME Publishing Company, 23 Mar. 2018, www.ncbi.nlm.nih.gov/pmc/articles/PMC5897664

- Bright spots: We observed signs of high emotional intelligence and "teamminess," due to the group's ability to practice hospitality, to foster meaningful relationships with each other, and to put themselves on the same level as their clients.
- Susceptibility to Burnout: We observed a strong pattern of compromised self-care for the mission driven cause of the organization, as indicated by the group's self-reported inability to manage time well and create a separation between home and work lives. Employees suggested the following as possible drivers of burnout:
- The work is both emotionally rewarding and intellectually interesting, which brought people together but also blurs the line between over-exerting oneself due to conflation of the organization's mission and an individual's ambition
- Group working norms are currently set top-down by overworked managers, which reinforces burnout norms for all staff
- Work-life balance conversations are always informal; the organization has never addressed this topic in formal ways
- Acts of other care frequently come at the expense of self care, often without self-recognition
- One employee acknowledged, "we have a culture where we're supposed to constantly respond. Responsive emails on the weekends, that kind of thing."

The Accountabili(Tea) workshop

We received the following vocalized feedback from the Airbel team during the Accountabili(Tea) workshop:

- The tea-ceremony brought a sense of novelty that was much appreciated.

- People wanted more time than was allotted to continue their conversation with their buddy.
- Given that the informational component of the workshop was framed around burnout, people questioned whether this was best suited for Airbel given that they do not perceive themselves to be acutely burnt out.
- There needed to be a clearer "ask" at the end of the workshop.

Post-workshop evaluation

One week after the Accountabili(Tea) workshop, we distributed a user survey to inquire 1) whether participants had completed their practices of care and 2) what catalysts and barriers were influencing routine uptake of these practices.

Based on the feedback, we identified a gap around lack of "safe spaces" for employees to comfortably discuss issues in the workplace. This led us to design an add-on to the service concept in the form of a routine one-on-one check-in that would allow employees to intimately share their progress.

The Tea-Time plug-in

Two weeks after we conducted the post-workshop evaluation, we joined the team's weekly meeting to introduce Tea Time, our interactive, digital prototype. During this followup, we sent out a survey and conducted a live feedback session with 12 out of 18 employees on the team.

Based on the team's feedback, we arrived at the following insights:

- When asked about perceived impact of the plug-in on team and individual well-being, 25% of employees reported *high*

Our Impact Framework

5. Scale	**ORGANIZATIONAL CULTURE** ▣ Implement plug-in across the company's entire system infrastructure. Operationalize company wide HR policies and regulations to support this implementation.		**A MOVEMENT** ⊠ Gather stories and anecdotes from individuals in high burnout fields to surface the urgency of wellbeing and need for culture change in the American workplace
4. Test	**ACCOUNTABILITY SYSTEM** ■□ Develop and implement an Office plug-in that systematizes buddy check-ins and tracks adherance to wellbeing practices		**NEW SOCIAL NORMS** ■ Visibly aggregate the team's wellbeing practices in a public dashboard to foster a culture that normalizes and prioritizes wellbeing
3. Co-design	**WELLBEING PRACTICES** □ Offer a set of strategies and approaches to address THE DRIVERS and SYMPTOMS of burnout	**ACCOUNTABILITY** □ Identify a workplace buddy to check in with and to hold accountable for wellbeing goals	**RITUALS** □ Embed wellbeing practices into a weekly calendar for consistent and routine uptake
2. Diagnose	**THE DRIVERS** ■□ Identify specific challenges and conflicts (e.g. workplace norms, communication barriers) at work that are driving burnout and/or preventing wellbeing practices	**SYMPTOMS** □ Recognize how burnout affects other behaviors, emotions, and attitudes	**GAPS** ■□ Identify intention-behavior gaps (i.e. why are we not acting upon our wellbeing needs?)
1. Define	**INTENTION** ■□ Identify unmet wellbeing needs and desires	**BEHAVIOR** ■□ Investigate prevalence of burnout in team culture through the lens of wellbeing	Factors addressed on the following level: ■ INDIVIDUAL ▤ ORGANIZATION □ TEAM ⊠ SOCIETY

Figure 10. This graphic, created by the authors, explains the impact model for how this project can affect the scale of individual, team, organization, and society.

impact on team well-being but 0% reported *high* impact on individual well-being. We presume this preliminary finding is supported by both an individual superiority bias ("illusory superiority") and prioritization of concern for others, due to the high achievement and service-oriented culture of the team. This supports our previous secondary research that many employees normalize burnout symptoms within themselves but are more willing to see it as an issue in others.

- We received overall strong interest to embed the plug-in within Airbel's digital infrastructure (reported 25% somewhat interested, 42% very interested, 8% extremely interested).

CLOSING REFLECTIONS

One of the greatest challenges that our project faces is that of many bottom-up platforms. By building capacity amongst workers to address issues of burnout, we risk being a band-aid solution to which the institution or system can become entitled without investing in other necessary resources. As we mentioned in our theoretical discussion of the three conditions of care in the workplace, an organization's commitment to "interdependence" is ineffective and potentially harmful without an economic roadmap that ensures that this investment does not compromise existing benefits. The investment and development of new cultural infrastructure should be done with "mutuality," e.g. including workers as stakeholders in the planning process.

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ABRACEMOS LO NUESTRO: ENCOURAGING NEW IDEATION WITH TRADITIONAL PARAGUAYAN TEXTILES

Traditional artisan work is deeply rooted in Paraguayan cultural identity. Specifically, the traditional textiles of ñanduti, a'ó po'í, encaje jú, and po'yví promote a significant sense of pride and self in the Paraguayan people. However, in recent years textile artisans have been exhibiting an increasing lack of innovation and newness in their design ideation, resulting in analogous products flooding the market and diminishing public appreciation for conventional Paraguayan textiles.

In partnership with Paraguayan Institute of Artisans (IPA), this research embraces and builds upon Milton's design objectives that encourage communication, adaptability, expansion, and connectivity to improve interaction and cooperation between the artisans and with those that appreciate their craft. This project implements industrial design strategies to enhance the value of the Paraguayan artisans' pieces by providing customizable ways to approach product design for both the IPA and the artisans. It encourages cross-disciplinary explorations through the combination of traditional and modern ideation through various production techniques.

The Abracemos lo Nuestro Project provides new tools to artisans through a partnership with the IPA and encourages the production of more empathic, creative, and innovative products for both the Paraguayan and international markets. Its goal is to improve the appeal of the new products, the passion of the artisans, and ultimately ensure the future preservation of this important element of Paraguayan cultural identity.

Keywords: textiles, Paraguay, artisans, design strategies, social design

INTRODUCTION

Traditional artisan work is deeply rooted in Paraguayan cultural identity. Traditional handicrafts such as textiles, ceramics, and woodworking, play an important role in the communication of cultural values and iconic objects. These products offer a unique cultural signature. Specifically, the traditional hand-made textiles ñanduti, a'ó po'í, encaje jú, and po'yví promote a significant sense of pride and self in the Paraguayan people. However, in recent years the textile artisans have not exhibited much newness nor innovation in their design ideation, resulting in analogous products flooding the market and diminishing public appreciation for conventional Paraguayan textiles. It is necessary for artisans to reinvent and evolve their product offerings to include updated design styling and enhanced value & functionality to address contemporary consumer needs.

The Instituto Paraguayo de la Artesanía (Paraguayan Institute of Artisans (IPA)) was established in 2004 by the passing of Law 2448, to promote the development of national crafts, encourage and protect the artisans, find marketing channels for artisan goods, and foster training opportunities for the craftspeople (Ley No. 2448/2004, 2004). In partnership with the IPA, this case study embraces and builds upon Milton's design objectives that encourage communication, adaptability, expansion, and connectivity (Rogers & Milton, 2011) to improve interaction and cooperation between the artisans and with those that appreciate their craft.,

The Abracemos lo Nuestro Project implements industrial design strategies to enhance the value of the Paraguayan artisans' pieces by providing customizable ways to approach product design for both the IPA and the artisans. Cross-disciplinary explorations are encouraged through the combination of traditional and modern ideation via various production techniques, new tools, and additional artisan resources through a partnership with the IPA. The goal of this research is the production of more empathic, creative, and innovative products for both the Paraguayan and international markets. By improving the appeal and relevancy of artisanal products and the passion of the artisans themselves, it is hoped to ultimately ensure the future preservation of this important element of Paraguayan cultural identity.

PARAGUAYAN TEXTILES & ARTISANS

"In every country, cultural and traditional products identify the nation (Fayolle, Fenoglio & Lecourt, 2009)." For centuries, Paraguayan artisans have passed down their empirical knowledge

from generation to generation in efforts to preserve their cultural heritage through their handicrafts. Today's Paraguayan textile traditions in particular developed out of the agricultural society of the Guaraní people during Spanish colonialism, starting in the 1500s. It is unknown exactly when or how, but the Guaraní adapted Spanish lace-making traditions into their own. It is important to note, "from that moment on what became significant was no longer the technique but the ornamental motifs (Sanjurjo, 2015)." Paraguayan textile patterns are "inspired by landscape, nature, behavior, food and physical, social and cultural development of people (Plá & González, 1983)."

Paraguayan Textiles

While there are many traditional textiles still in production in Paraguay today, this research focuses on the four most well-known techniques (IPA, 2019):

- Ñandutí: needle lace made on radiating warp threads, named in Guaraní for the white and tight net of the spider
- A'ó po'í: fine & delicate embroidery
- Po'yví: thick woven cotton fabric
- Encaje jú: geometric needle lace on a square net or mesh ground

All of these textiles exhibit natural motifs, many of which are extremely recognizable and meaningful to the Paraguayan people, including *arasá* (guava fruit flower) and nicho (bird's nest).

Figure 1 - Ñandutí & Encaje jú (Photos by the author); Po'yví (Photo by Pombero); A'ó po'í (Photo by C. Fadul)

Paraguayan Textile Artisans

All artisans learn how to produce their textiles, ceramics, and jewelry by observing family or other community members producing long-established designs, as no formal training or apprenticeships are available (MIC, 2008). There is very little, if any, cross over or collaboration between artisans of different genres of work. Today, 80% of traditional artisans are between 30 and 70 years old, as the Paraguayan youth have lost interest in traditional textile production. Only 20% of today's artisans have the means to travel outside their immediate area to sell their

merchandise. This limits their market to smaller locales that have significantly lower expendable income than in the capital area where more middle- & upper-class citizens live and tourism is more prevalent (IPA, 2019).

While there is variation in execution from artisan to artisan, overall the work is repetitive and generally analogous throughout the marketplace. Both the IPA and MCI report 80% of Paraguayan textile artisans lack design innovation and product application (2019). Without adding any aesthetic or functional variety to their products, their lack of creative innovation results in few designers or design companies creating modern fashion or product collections using artisanal work. According to the 2012 census, Ministry of Commerce and Industry, and Industrial Chamber of Textiles (MIC, UTEPI, JULY 2018), only 37% of traditional Paraguayan textile artisans are active IPA members who participate in the main activities organized by the institution. The Office of the Secretary of Tourism in Paraguay (SENATUR) and the IPA report there is very little interest in promoting artisanal work both domestically and abroad, due to lack of perceived value to modern lifestyles (SENATUR, 2019; IPA 2018).

INDUSTRIAL DESIGN STRATEGIES

By applying industrial design principles to their work process, artisans can improve the value, innovation, creativity, and applicability of their products. In partnership with the IPA, the artisans will be introduced to new strategies that will encourage them to continue their traditional textile production but deliver new results to market. There are four main components for the IPA Product Design Strategies: Design, Research, Marketing, and Manufacturing.

Design Strategy

By encouraging collaboration between artisans and industrial designers, new forms, shapes, and functions of the final product will better meet customers' contemporary needs. The design process should "involve the participation of new disciplines that will help to make more efficient design construction (Ulrich & Eppinger, 2012)," such as the adaptation of weaving technologies, pattern production, and product design using aesthetics, ergonomics, user interface, and modern applications.

In addition to the textile artisans, the IPA currently supports additional Paraguayan artisans specializing in woodcrafts, leather working, karaguata and karanda'y basketry, and silver & gold filigrana jewelry (IPA, 2019). The new proposed design strategy will assist the IPA to facilitate and encourage cross-disciplinary

collaborations between the various artisans, to broaden product design offerings both within and across artisan specialties.

Research Strategy

Industrial designers increasingly act as researchers, looking at the world's cultures and cultural processes through the lenses of anthropologists and ethnographers, using Milton's methods of observation, research, and documentation of people, events, and artifacts (Rogers & Milton, 2013). Artisans need to understand how their customers are using or not using their product to assist in making intentional design decisions for their product offerings. The industrial designer as researcher will help interpret "the process of exploring the real needs and desires of the consumers and social needs (Ulrich & Eppinger, 2012)" to the artisan, increasing the understanding of customer interaction and use of artisan works. The information obtained through this process will support the design and development of new products by allowing the artisans to combine their empirical expertise and skill with anthropological data to create more relevant products for today's market demands.

Marketing Strategy

Per their mission statement, the Instituto Paraguayo de la Artesanía was established to promote craftsmanship as the cultural heritage and identity of their nation, to promote its conservation as a way for the economic development of the artisan producers, and preserve the artisanal heritage of Paraguay (IPA, 2019). For this reason, it is a natural fit for the IPA to manage marketing developments & strategy, as it is at the intersection of artisanal product development and contemporary consumer needs. The IPA will facilitate the following:

- Dissemination of product information – communicating materials & technique, brand, packaging & services
- Increased promotion – establishing community & retail partners to expand market opportunities
- Develop product placement – encourage collaboration between artisans and production of "cross-over" products to reach new customers
- Price determination – help customers realize the value and importance of traditional works to support a living wage for artisans

The IPA will also be responsible for the marketing efforts to launch, promote, and communicate new products to the marketplace, as emphasizing their cultural importance will, in turn, increase their value and demand.

Manufacturing Strategy

Integrating the "participation of the [industrial] designers in the manufacturing process (Lockwood, 2010)" of artisanal textile production will expose artisans to new manufacturing processes. Laser cutting, laser engraving, and 3D printing will expand artisanal product offerings, while potentially increasing production speeds and improving quality consistency. It is important to note, however, that the intent is <u>not</u> to replace traditional textile production methods with newer mechanization and manufacturing methods. The new technologies will be used alongside traditional production methods to increase market shares and product categories.

PROJECT OBJECTIVES

Industrial designers participating in traditional Paraguayan textile production will help artisans to (a) discover new uses for their textiles, (b) updating their application of textiles, and (c) better address user needs and contemporary desires.

There is significant opportunity to optimize "bringing together complementary functionalities (Fayolle, Fenoglio & Frédéric, 2009)" to artisanal textile products. This will be done by using traditional patterns and production methods in new ways. Expanding and suggesting new uses for textiles will provide more interest in artisanal products and enhance the functionality of what was previously simply a handmade decoration. Updating the application of textiles into new products and market segments will improve sailability and expand the economy of the artisanal sector. Addressing consumer needs will also increase sales and make traditional textiles more relevant to today's societal needs.

CASE STUDY

An industrial design graduate thesis project entitled The Pyaha Collection was developed as an initial case study for evaluation. The design concept was to create a small tableware collection for traditional Paraguayan food, based upon traditional artisanal motifs & textiles. The collection should also enhance not only the value of the products but also the dining experience itself. The *arasá* (guava fruit flower), *nicho* (bird's nest), and *canastito* (little basket) motifs commonly found in ñandutí lace were the main inspiration for the Pyaha collection.

Design Process

The standard Industrial Design Process was followed for the development of this collection: research, ideation, refinement, prototyping, and final model development. The work was completed over the course of two academic semesters.

Extensive research was done on traditional textile production methods and materials to understand the artisans' viewpoint. Interviews with IPA officials and Paraguayan designers increased industry understanding and helped identify areas for improvement and innovation. Traditional textile motifs were researched and selected according to classification of nature, flora, fauna, landscape, and according to the weaving system to make this pattern of these textiles.

Through sketching and small-scale models, initial concepts were developed and shared weekly with 11 others 2nd year Industrial Design MFA thesis students and faculty. Prototyping concepts were selected by the patterns of textiles related to themes that are connected to the purpose. In this case was narrow down in a tableware collection focus for Paraguayan food with ingredients from our nature. An example is that one of the designs is a tableware that represents the guava flower that in Guarani is Arasá and is for serve guava cake.

Many techniques and technologies were explored, including 3D printing, laser cutting, laser engraving, CNC cutting, textile starching & forming, as well as more traditional cut & sew methods. Several material explorations were performed using wood, clay, acrylic, and ceramics.

Final design concepts were selected on March 2019 and took 8 weeks to produce. The Pyaha Collection was named for the meaning of the word in Guaraní *Traditional textile*, and each peace has different name according to the textile pattern represented by the shape of the pattern.

Pyaha Collection

The Pyaha dinnerware collection is designed specifically for serving Paraguayan snacks, such as *chipitas*, and is made from ñandutí, wood, ceramics, and glass. The collection presents the opportunity to intentionally display, arrange, and rearrange the dishes into different positioning, making them more modular and versatile in their uses. Several traditional Paraguayan textiles and motifs combine in new, innovative applications to enhance the dining atmosphere and more closely tie the experience to Paraguayan culture.

Arasá bowls

The Arasá bowls are made from ñanduti textiles in the *arasá* pattern. This guava fruit flower motif represents a very traditional plant in Paraguay that produces the sweet fruit for several popular desserts, including guava marmalade and pastafrola. The colors are representative of the various colored guava blossoms found throughout Paraguay. The needle lace has been starched and formed over 3D-printed forms to create and maintain their shape. This process is both food-safe and water-resistant, allowing the dishes to be cleaned & reused.

Figure 2 - Process photos by Author

Figure 3 - Pyaha Collection: Arasá. Photos by Author

Canastito Plates

The Canastito plates integrate the ñanduti textiles in the *canastito* pattern with a 3D-printed underlayer centered on a wooden coaster. The "little basket" motif represents the traditional Paraguayan baskets made from dried Palmera leaves. The center floral motif symbolizes one of the most traditional flowers that bloom beautifully pink every August on the lapacho tree, which is the national tree of Paraguay. For this prototype, the needle lace has been hand stitched together, but in practice could easily be woven in this trilobal shape.

Nicho Platter

The Nicho platter and bowls successfully explore the *arasá* (guava flower) and *nicho* (bird's nest) motifs using newer production technologies. The bowls were cast and then pressed with *arasá* ñanduti to capture the radiating floral pattern in the porcelain. Due to project time constraints, the flameworked glass underlay in the *nicho* pattern was simulated through 3D modeling and laser cut acrylic. For the wooden platter, the *nicho* pattern was digitized, put into repeat, and laser engraved. In production, this could continue to be laser engraved wage hand carved by woodworking artisans.

INITIAL MARKET RESPONSE

A traditional Paraguayan restaurant in Asunción has already expressed interest in the Pyaha collection and discussions are in progress to begin preparing the designs for production. Currently, the restaurant uses standard disposable paper dishes for their food but feel incorporating the Pyaha Collection into their dining experience would be a good way to distinguish themselves from their competition. While they would most likely reuse any wooden or ceramic dishes, the starched ñanduti bowls would be an easy take-home souvenir that would be very comparable in price to their current disposable options.

CONCLUSION

By integrating industrial designers into the traditional artisan ideation and production processes, new ideas, innovations, business growth, product applicability, and artisan advancement is achievable. Next steps of this research involve a closer partnership with the IPA to develop and strategize a plan to disseminate these strategies to the artisans, ideally through workshops and community outreach. As most artisan communities specialize in only one medium or technique, the Industrial Designers with assistance from the IPA can encourage, foster, and act as connections for cross-disciplinary design developments. There is also great potential in establishing partnerships with various universities and design programs to promote further artisan advancement, both within Paraguay and internationally. Market research must be done across Paraguay to determine and identify consumer needs, potential new product categories, and new distribution avenues.

This preliminary research and test study make it possible to visualize the opportunities available to explore and apply more versatile applications of Paraguayan textiles for future product development. The Abracemos lo Nuestro Project provides new tools and resources to artisans through a strategic partnership with Instituto Paraguayo de la Artesanía and encourages the production of more empathetic, creative and innovative products. Using traditional textiles in new ways will preserve important cultural traditions, heritage, and sensibilities while improving the artisan way of life and recognition in the society.

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PHOTO-ETHNOGRAPHY AND POLITICAL ENGAGEMENT: STUDYING PERFORMATIVE SUBVERSIONS OF PUBLIC SPACE

As a result of the development of digital technologies, the production, editing and publication of photographs is fully incorporated into our daily lives. We routinely use images as language to describe, comment on, interpret, laugh with, captivate, or ironize others. However, scant attention has been paid to how these technologies have been incorporated into research methods. The word continues to be the hegemonic source of the codes and categories used to analyze and engage in discussions in the academic community. During our research on performative practices at the Santiago Gay Pride Parade, we discovered a visual phenomenon that is impossible to describe using words alone. This led us to engage methodologically to approach our field of study using design, digital media and photographs. We believe that an eminently visual phenomenon such as the performative appropriation of public spaces must be studied using a method that preserves the richness of the spectacle and allows for narrative consistency.

Keywords: Performative protests, visual research, public space, gay pride parade, political visibility

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