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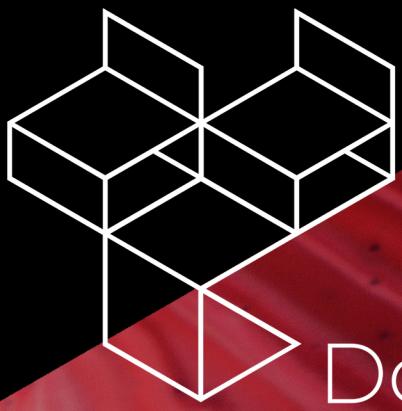

Doctoral Design Conference'19

TransFormation

Universidade Europeia
LAUREATE INTERNATIONAL UNIVERSITIES
UNIDCOM | IADE
FCT Fundação para a Ciência e a Tecnologia

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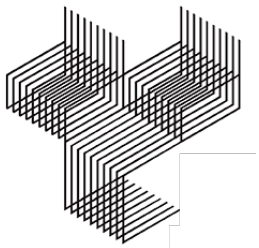

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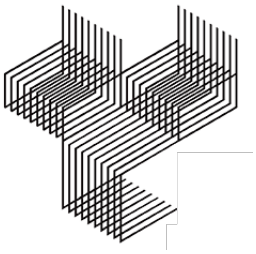

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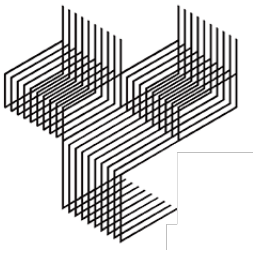

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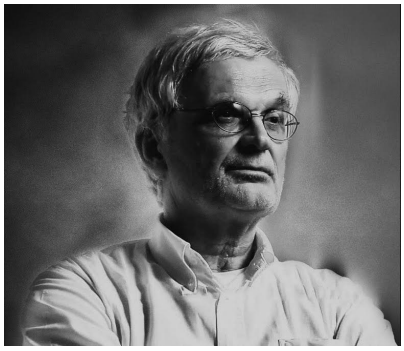

Ezio Mazini
Title: **Hyper-local transformations**

For over two decades he has been working in the field of design for sustainability. Most recently, his interests have focused on social innovation, considered as a major driver of sustainable changes. In this perspective he started DESIS: an international network of schools of design, active in the field of design for social innovation and sustainability (http://www.desisnetwork.org). Presently, he is a Distinguished Professor of Design for Social Innovation at Elisava-Design School and Engineering, Barcelona, Honorary Professor at the Politecnico di Milano and Guest Professor at both, Tongji (Shanghai) and Jiangnan (Wuxi) Universities. In addition to his continuous involvement in the design for sustainability arena, he has explored and promoted design potentialities in different fields, such as: Strategic Design and Service Design. Most recent books: “Design, When Everybody Designs. An Introduction to Design for Social Innovation”, MIT Press 2015 (currently translated in 7 languages); and “Politics of the Everyday.” Bloomsbury (February 2019).

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Paulo Teixeira Pinho
Title: **The Zero Museum**

Doctoral Design
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Characterization of Toilet Design

Socio-Cultural Perspective of Innovative and Sustainable Sanitation

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ABSTRACT

Proposed paper is a part of the ongoing PhD research in design with focus on the research of existing environmental and social requirements for the sustainable innovation within urban sanitation, focused on toilet design. Main questions of the research are aiming the Portuguese environment, where we are characterizing aspects of water and sanitation through the five dimensions - culture, technology, government, economy, and environment. In this paper the main objective is to determine systemic characteristics of the socio-cultural dimension of water and sanitation, which will be later incorporated in written final guidelines – directives raised from the research results which shall serve as operational knowledge for the ones involved in the implementation of the sustainable toilet innovation. The paper as well serves as theoretical orientation for the practical applications of the research.

Keywords: Design culture, water toilet culture, sanitation, sustainable design, toilet design

HUMAN CULTURE AS A PROBLEM-MAKER AND PROBLEM-SOLVER

The proposed paper is a part of the ongoing PhD research in design with focus on the research of existing environmental and social requirements for the sustainable innovation within urban sanitation, and with specific focus on toilet design. Main questions of the research are focusing on Portuguese environment. It is important to take into consideration that according to one of the latest studies on environmental challenges, Future heat-waves, droughts and floods in 571 European cities (Guerreiro et al., 2018), in the following twenty-five years, Portugal will be exposed to the extreme weather conditions: heat waves, irregular precipitation, and severe or extreme droughts. If that is possible foreseen future in Portugal and other similar countries around the world, we should credibly ask ourselves, 'How we are going to flush our toilets once we don't have drinkable water to flush it away'?

If we take into consideration the convergence of environmental global challenges we are facing at the moment, we can evidently define the most basic subliming factor for the emergence of all these issues: human factor. Problems are emerging as a consequence of irresponsible human acts, which are mostly disconnected from the needs of the natural biodiverse environments that we inhabit (see Escobar, 2018).

As such, we can understand human factor ambiguously – as a problem creator and as a problem solver. We can relate human culture as problem-maker to the concept of "anthropocene", but at the same time we can consider human factor as well as a problem solver. In that regard we can perceive the human being as an agent of change (game-changer) (Korčulanin et al., 2016), which can create needed change for the future and common well-being.

The concept of the "Anthropocene," whereby "the Earth has moved into a novel geological epoch characterized by human domination of the planetary system" (Malhi, 2017, p.77), captures these dynamic relations and their negative consequences (Olsson et al., 2017; Tokinwise 2015). The social drama of the Anthropocene also leads us to enter new "game-changer" times, when "humans will become a positive force on Earth" (Olsson et al., 2017, p.5). We, people, are the answer and a solution for the challenges we are facing, be it environmental per se or its micro-related components, at on stage inevitably toilet design.

Design by itself is being culturally predetermined and it also simultaneously pro-creates cultural meanings and beliefs (Cardoso, 2016). Within our research we understand that water-related behaviours and 'water culture' are being intrinsically related to the 'toilet culture' and consequently to the toilet design. Bearing this in mind, we here present short introduction to the cultural predetermination of toilet design and cultural dependency between the water problem and existing unsustainable western system, flushing toilet design. Facing eventual scarcity of water, active involvement of individuals and society at large towards sustainable future becomes a must.

Specifically, the discussion in this paper is focused on the characterization of the socio-cultural dimension of urban water management and sanitation. Five dimensions of coherently related water and sanitation aspects – culture, technology, government, economy, environment - are perceived as barriers and risks of the issues we face in western sanitation system. Furthermore, dimensions of water are understood and presented as possible promoters of change and enablers for the implementation of sustainable innovation within sanitation system in the city (Korčulanin et al., 2018).

Between March 2018 and January 2019, at Roca Lisbon Gallery, during the workshops Aqua Labs – sobre a água nas cidades futuras, open to the public and with invited stakeholders, general patterns, values, norms, overarching perspective of people's relation to water resource and sanitation culture were examined. Principally, we were searching for hunches about main barriers and promoters that they are stopping the dissemination of existing western system of toilet design.

As the main objective, paper determinates systemic characteristics of the socio-cultural dimension of water and sanitation, which are later on going to be included in the written final guidelines – directives raised from the research results which shall serve as operational knowledge for the ones involved in the implementation of the sustainable toilet innovation.

CULTURE AS A FUTURE ASPIRATION

Social and individual realities, thoughts, actions, relationships and politics are context depended and they are always culturally pre-determinate and culturally mediated (Johnston et al. 2012; Strang, 2009). How we understand, engage, speak, express, and create our knowledge, values and belief system depends of life path - socialization and educational process (Bourdieu, 1984) and relational experiences with the society and world we inhabit locally and contextually. In this manner everything is relational and culturally predetermined. If we have a look into definitions of culture, we understand that they are plentiful:

> "They all configure relations – relations on multiple scales, among multiple planes, along multiple vectors. Heritage, traditions, habits and customs are usually emphasized, but futurity has a crucial role as well, generating ideals: culture can be seen as a capacity to aspire (Appadurai 2004). It is in a dialogue between traditions and aspirations that engagement or involvement emerges. The effectiveness of cultural diversity is predicated upon the capacity to be involved." (Johnston et al., 2012, p.6)

The moment of now and the future (re)production of culture has a crucial role on how to aspire cultural meanings which are going to inform positive and sustainable future attitudes, beliefs and values towards creation of sustainable design artefacts, services and systems. Toilet culture is something naturalized and inherited through the time, and to be able to innovate in toilet design in sustainable way it's cultural and behavioural habits should be considered.

CULTURAL DETERMINATION AND DESIGN

There is a significant connection between culture and design. Design is coding and producing the cultural artefacts, meanings and values in society through its use in everyday life. At the same time, on the other hand, culture is determining the orientation of design production (Cardoso, 2016). Through design process we are coding objects with meanings, values and information, which are later on being embedded in the use and having its own existence. Though there exists a correlation between the two parts, once the design object is being normalised, its socio-cultural meaning becomes internalized, inhabited with "habitus" (Bourdieu, 1984). The way we relate to objects, artefacts, services, systems, nature and our resources is always predetermined by the environment and culture we inhabit.

In the origin of every design project and every design product there is a project of the narrative imbued in every production, fabrication, industrialization, distribution and commercialization with help of storytelling, marketing advertisement, and personalized approach to user/consumer in society. (Mostly) with visual part of design, we are suggesting 'right attitudes', stimulating and creating behaviours and consequently also contributing to the complexity of the positive or negative consequences (Cardoso, 2016, 118; see also Nunes, 2013), which with time become normalized.

Now the question arises on how we relate to our daily 'normalized' objects? If we take an example of baby feeding bottle (Pt. *mamadeira*) analysed and critically evaluated by the designer, Cristine Nogueira Nunes, we understand that normality of its usage within our society in first years of babies development it is being conditioned by the credibility and assumption taken over the media and pharmaceutical and food industry lobbies (2013). Consequently, the design culture of the industrial production of feeding bottle is being

questioned as such. Reflecting on Nunes, we can learn that is essential to understand a design process as an action process, where we don't just satisfy existing needs as 'business as usual' but where we see a design process with holistic vision and understand it as a systemic process (2013, p. 117). We should start to think about the design process itself and not focus only on the final product (Tokinwise, 2015; Nunes, 2013; Manzini, 2015) and final results.

Though normality is being constantly produced and reproduced (Quitzau, 2004) and questioned from the different standpoint depending of the individual who is looking to them, we believe that normality of the use of western system of flushing toilets became naturalized ease through the socialization process in the society we grew up. Daily use of western system of flushing toilets is contributing to the "relational" complexity of the problem – relation between culture and design product and use of the object. 'How do we use the toilet?' 'How much water we flush down the drain?' 'Do we use the toilet paper to clean ourselves?' 'Do we sit or squat when we are defecating?' All of this it is related to the cultural predetermined behavioural patterns, values and norms.

Existence and use of unsustainable western system of flushing toilet for the last two centuries within our daily life's is being mostly overlooked and underestimated as a complex issue of today's society due to the normalization of its use and its existence. We question the normality of using the toilet design, where purified and drinkable water is wasted and discharged with every flush - we dispense between 3-7L of drinkable water in every flush, and this habit is transferred from generation to generation as regularized behaviour, imprinted as part of its cultural "habitus" (Bourdieu, 1977). It could be also translated to the (un)conscious environmental apathy: »The issue of normalization is connected to a sense of community in society. In each of our specific everyday lives we carry out normalized actions, e.g. routines. The phenomenon of normalization is shaped and re-shaped through an on-going process of co-construction between technological, societal and cultural dimensions« (Quitzau, 2004, p. 1).

To be able to overcome normalities we practice in our daily lives, we should provide conditions for the different ways of doing the same act which can/could be supported by different motivations. Common norms and behavioural patterns can/could start to change only if the norms and relational values with our resources itself change (Tokinwise 2015; Quitzau 2004; see Stebbing and Tischner 2015). It is essential to study and understand invisible forms of practice and understand where "the construction of normality and the dynamics of habit and routine" (after Quitzau 2004) come from.

Also, we should put a question, 'What is the relationship with the shape and meaning of the object?' Or: 'How the concept of design can inform its use and cultural way of relating to it?' In our case, in research related to western system of flushing toilet design, we question the two possibilities: how toilet design can/could/should inform the sustainable and environmental friendly habits from users, and, on the other hand, how existing toilet habits could be re-shaped by sustainable innovation in toilet design. Furthermore, our main concerns as well are aimed to find a question on how new ways of relating to nature and natural resources could lead users to search for sustainable innovation in toilet design.

Through the general remarks about cultural meanings in connection to the water and toilets, I further discuss some general characteristics that create abstinence of innovation in toilet design.

WATER CULTURE: HUMAN AND ECO-SYSTEMIC NEEDS OF WATER

Water is a natural and cultural substance at once. It is the essential resource for our existence and well-being, and probably the only natural resource to touch all aspects of human civilization – agricultural, industrial, economic, cultural and religious values. All the world cultures have evolved around it. Orlove and Caton urge that we should treat water as a "a total social fact" (2010, p. 402) and as such understand that the way we relate to water and manage water resources always depended on particular local cultures and mediated in different societies.

Strang (2009) refers to water and culture as:

> "Every social group and every actor in society has a cultural engagement with water. Some of this human/water engagement are manifested in the form of water culture: the knowledge, traditional customs, and behaviour that support the development and reproduction of a stewardship ethic, or the political organization of societies to manage and maintain water resources." (Johnston et al., 2012, p. xv.)

In this manner culture is one of the main dimensions on how we use, manage and value our water, also it is the factor that shape both, conflict and collaboration in society (Johnston 2012). To guarantee safe water for all-inclusive and sustainable water management needs to be practiced. Lately, global water initiatives are focusing on integrated water resource management (IWRM) – with multi-stakeholder approach and tools applied to it (see Korčulanin et al., 2018): "IWRM takes an ecosystem perspective of water together with its human uses; encourages broad stakeholder participation; and stresses that water, in all its competing uses, must be valued as an economic good. /.../ A core goal of IWRM is to balance human and ecosystem needs of water" and to sustain "environmental flows" (Johnston et al., 2012, p. XVI). Though IWRM approach looks into water resources mostly through its quantifying values and may in some places lack holistic approach integrating cultural differences, we find its goal and purpose unifying with our core vision within design practice – creating design strategy and design guidelines which are going to inform innovative sustainable sanitation systems within toilet design.

CULTURE AND INNOVATION IN TOILET DESIGN

We cannot construct conscious and sustainable design solutions without understanding where the issues occur; we need primarily to understand human relation to the resources and artefacts. Body and mind are predetermined with symbols of that local contextual culture, symbol of society reflected through how we treat our body fluids, how we think about our body experience and how we think about what we see, smell and feel (Douglas 2002).

In our research toilets are observed in western urban society in Portugal, where we can observe that use and adherence of western system of flushing toilet design is conditioned by the socio-cultural relationship to it. Mostly through the existing prejudice of 'reject and taboo stigma' of human faeces and consequently of our toilets (Korčulanin et al. 2015; Douglas 2002). Pierre Bourdieu, sociologist, anthropologist and philosopher, argues that judgments of taste become embodied and internalized social meanings, which with the time become a natural entity for the individual (1984, p. 56). Prejudice of our own faeces and correlated stigma with normalization of the toilet use, observed as an artefact, is being regulated by parameters of the society, with

psychological games of shame, disgust ('feeling sick'), danger and immorality (Douglas, 2002; see also Bourdieu 1984). Functionality of toilet design with its water flushing system remains (almost) the same from the first practical English patent for a flush toilet design invented by Alexander Cummings from the 1775 (Benedickson, 2007).

Slow or almost none innovation within toilet design could be attributed to the socio-cultural rejection and unacceptability of our own faeces. Also, it is related to the normalized, inhabited practice of how we use toilets and how do we relate to our faeces. It is something that we are used to do one way and not the other. We are used to flush (mostly the drinkable water) away our faeces after we use the toilet and as such we dissociate from our own resource. On the other hand, looking into example described by Mary Douglas, we understand that use of toilet and relation to it may drastically refer from culture to culture and place to place. In India "water, not paper must be used for washing after defecating, and this is done only with the left hand, while food may be eaten only with the right hand. To step on animal faeces causes impurity" (2002, p. 35).

Interesting that water and human faeces are being inherently related through many positions of its opposite. Hygienic reasons, which clean away 'the dirt' after defecation, are just one the aspects. On the other hand, there is cultural determination of what is pure and what is dangerous; what is clean and what is dirty; what is resource and what is waste. Predominate differentiation between what is a resource and what is waste is being quite clearly established from its cultural pre-determination. Furthermore, this water is impure and dirty, since it came into touch with its binary opposition, 'dirty' faeces. We are also speaking about the psychological "yuck factor" (Schmidt, 2008), germ syndrome, shy bladder syndrome (paruresis) or pee-shyness which are all related to social anxiety disorder, sort of defecation anxiety or rejection of what happens in the act of performance meantime visiting the toilet. Anyhow, the bizarre part of the correlation is that the vital resource water is considered waste right after it is flushed down the drain. Due to the study of Maj-Britt Quitzau, about Danish bathrooms and Environmental impacts of embedded bathroom practices, environmental impact of western system of toilet design is conditioned by the normalized every day practices of using a toilet (2004).

Combining her research with our observation we can resume that assumptions listed here are the main challenges and barriers to overcome the implementation of innovative sustainable sanitation systems: *doing as usual, uniform practices, water-flush as norm, isolated practice, distinction and separation from other functions/practices, old values stick to the toilet, hygiene, functionality and privacy, stabilized norms, bathroom space infrastructure as predetermination for wasteful actions*. Once the subject and object is normalized within our society and also taken out of our view/perception, it becomes invisible and unwanted subject for the discussion and as such conditioned to be addressed as an urgent place for the intervention of design.

CREATING CONDITIONS FOR THE DISSEMINATION OF TOILET DESIGN

All civilizations were developed by and with the culturally specific use of water. Our own civilization as well established specific ways in dealing with resources and created kinds of biomimetic environments to sustain our way of living. Today we should reconsider and re-design our ways of being, thinking and essentially our way of living at this planet.

Regenerative, restorative and sensitive urban water design are essential approach for the inclusive and sustainable cities, which should start to intervene on both sides – micro-scale of our case study – toilet design and macro scale of re-designing infrastructure of urban water management in cities.

Innovation in toilet design should be always context-dependent and focused on environmental impacts considering natural resource flow (Quitzau, 2004). The focus is not on production of more high-tech solutions for toilet design, ergonomically friendly seats or visually trivial appearance, but on understanding of how to overcome the non-use of existing sustainable technologies and how this is conditioned by the cultural habits and practices and prejudice of existing culture. Innovation in toilet design should be based on established 'normalized' practices in the particular culture and shouldn't interfere to much with the way we are used to 'do it'. It should happen as a natural adaptation to something that we are accustomed with doing. It should integrate naturally and locally determinate practice within the individual daily use of their toilets. Simultaneously we focus on the innovation, which should satisfy users' need and be recognizable to their established practices and act of defecation in the local culture. We learned by now that innovation in toilet design is going to be accepted and disseminated, only if people identify with it and adopt it as part of their own cultural habit and norm. "The whole universe is harnessed in the trials of human beings to force each other how to be a good citizen" (Douglas 2002, p. 28).

Human factor is part of the existing problem in Western system of flushing toilet design, but it is also the main factor for the change to happen towards sustainable paradigm within urban sanitation in our lives.

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Circular economy - Tools for designers

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ABSTRACT

The circular economy is seen as a new concept and a new way of responding to the needs of society in a more sustainable and efficient way. The transition from the traditional linear model to a more innovative and circular approach in the development of the economy implies the design of new products, services, and systems, supported, in most cases, by the re-thinking and creation of innovative business models. To achieve a successful and wide implementation, the concept must be accepted and applied in practice by businesses along the whole value chain and meet the current and future needs of consumers through design. Several methods, principles, practices, tools, training initiatives, and many resources are being developed globally, but there is still a large gap between what is available to companies and designers, and what is applied in practice on product and service development. This paper, aligned with a Ph.D. research project focused in the promotion of Circular Economy through design, explores results of an in-deep review of circular economy tools available that can be used by designers to systematize and guide their development process. The analysis will be a basis for the future development of a toolkit oriented to the practical implementation of the circular economy in the design (Camocho, Ferreira, & Vicente, 2018).

Keywords: Circular Economy, Tools, Design Practices and Principles, Innovation, Sustainability

INTRODUCTION

The Circular economy approach to the development of the society is seen as a potential solution to attain a sustainable future by increasing prosperity while reducing the critical dependence on primary materials and energy (Ellen MacArthur Foundation, 2015). In the past, during many decades, designers and other professionals have been working to achieve sustainability in the development process, aiming to increase the efficiency and innovation exploring several approaches, from cleaner production, eco-design, design for sustainability through product services systems, however, despite several good examples, mainly linked to niche markets, the results were far from been globalized and integrated widely in the society. Nowadays, Circular Economy claims to be a new path to achieve sustainability and welfare, promoted strongly by governments, research institutions, academia, associations, and many other stakeholders.

This new economic model that aims to work in closed circuits, catalyzed by innovation along the entire value chain, is promoted as an alternative solution to minimize resource consumption and energy losses (Ministério do Ambiente, n.d.) and designers should have the skills, knowledge and the tools to leverage this process (Vicente, 2012).

Today, designers and product development teams face new challenges in their daily practice. The design is recognized as a catalyst to transition from the traditional model of take-make-dispose to achieve a more restorative, regenerative and circular economy(Moreno, De los Rios, Rowe, & Charnley, 2016) and the design of products and services in a smarter and innovative way, extending their useful lives and adjust the function of such products and services within the system will be crucial to the achieve the transition to circularity (European Environment Agency, 2017).

The design practice relies on methods and tools. The evolution of the design profession and the solutions proposed by designers to solve the problems and needs of the society is linked, at some extent, to the evolution of the tools available to designers, (Vasantha G., 2014; Vicente, 2011). The tools designers use, which have a significant impact on the development process, are changing constantly, new tools appear frequently, especially in the digital environments (Witkowski, 2017), however, and although tools related to circular economy are starting to appear, it seems that in most of the cases, designers are integrating circular economy strategies in an ad-hoc way, without the support, guidance, and validation of tools at different stages of the process.

The current paper explores the results of an in-deep review of circular economy tools available that can be used by designers and product developers to systematize and guide the development process of industrial products and services.

CIRCULAR ECONOMY

We can find in literature many definitions of circular economy. The concept has been widely explored and each author or each project tends to develop a definition that best suits their interests. This proliferation and diversity of definitions do not help in the communication and practical implementation of circular economy by businesses.

One of the most known and spread definition is the one developed by the Ellen MacArthur Foundation. However, many others were published. In 2017, an article analyzed 114 definitions of circular economy and concluded that there is not one coherent understanding or definition of circular economy (Kirchherr et al., 2017), and from 2017 till now, many other definitions were developed.

Within the KATCH_e EU funded Project (KATCH_e, 2019) focusing on the reinforcement of the skills and competences in the field of product-service development for the circular economy and sustainability, the consortium, building on several definitions and concepts from the main key players on circular economy developed a definition that is the definition adopted in the current research by the authors:

"Circular economy is a system that is restorative and regenerative by intention and design, which maximizes ecosystem functioning and human well-being with the aim of accomplishing sustainable development.

It replaces the end-of-life concept with closing, slowing and narrowing the resource flows in production, distribution and consumption processes, extracting economic value and usefulness of materials, equipment, and goods for the longest possible time,

in cycles energized by renewable sources. It is enabled by design, innovation, new business, and organizational models and responsible production and consumption".

DESIGN FOR CIRCULAR ECONOMY

The design plays a key role in the definition of the profile of products and services, and a more sustainable way of design, produce, and consume is a crucial objective for the development of the society (Bhamra & Lofthouse, 2007; Braungart & McDonough, 2009; Manzini & Vezzoli, 2010; Margolin, 2014).

New methods and effective design-oriented tools are needed to support and promote the transition to a circular economy. Designing products in a smarter and innovative way, extending their useful lives and changing the role of such products within the system is crucial to the achievement of a transition to circularity (Camocho et al., 2018; European Environment Agency, 2017) from a society that has been actively seduced by the over-consumption of new and better goods and services, leading to massive consumption of natural resource and the generation of waste and emissions, (Medkova & Fifield, 2016) and this had been promoted globally by industries through design.

The transition to circular economy is not only a design issue but design has a massive role. The potential for design to influence and impact the way that we produce, consume and dispose of products is huge. The Portuguese National action plan to circular economy includes concrete actions to promote the transition to a circular economy and in these the design plays a crucial role (PAEC, 2017).

The design practice in circular economy can be seen as more complex, requiring changes in the way of thinking and conduction projects focusing on a shift from product-based solutions to system-based or function-based approaches (RSA, 2014).

Designers need to align their development process with the concept of circular economy in order to replace the conventional end-of-life concept in which the materials and components of a product are disposed after the fulfilling of the function by closing, slowing and narrowing the resource flows in production, distribution and consumption processes (Bocken, 2016) by applying several strategies in the development process.

As for strategies to achieve circularity, several approaches in the literature that are related to design were identified. As an example, the Ellen MacArthur Foundation proposes 3 main principles (Ellen MacArthur Foundation, 2015):

1. Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows,
2. Optimize resource yields by circulating products, components, and materials in use at the highest utility at all times in both technical and biological cycles,
3. Foster system effectiveness by revealing and designing out negative externalities.

These three principles are then translated into the ReSOLVE framework which considers six actions that should be considered in the design process (table 1).

Regenerate	Shift to renewable energy and materials; Reclaim, retain, and restore the health of ecosystems; Return recovered biological resources to the bio-sphere
Share	Share assets (e.g. cars, rooms, appliances); Reuse/second hand; Prolong life through maintenance, design for durability, upgradability, etc.
Optimize	Increase performance/efficiency of the product; Remove waste in produc-tion and supply chain; Leverage big data, automation, remote sensing and

	steering
Loop	Remanufacture products or components; Recycle materials; Digest anaerobically; Extract biochemicals from organic waste
Virtualise	Books, music, travel, online shopping, autonomous vehicles, etc.
Exchange	Replace old with advanced non-renewable materials; Apply new technologies; Choose new product/service (e.g. multimodal transport)

Table 1. ReSOLVE Framework, Ellen MacArthur Foundation - Growth Within, adapted

METHODOLOGY

The literature review under development aims to identify which tools are available to designers and their adequacy to the design practice for circular economy, having in mind the principle of circular economy and the needs of the design process.

The results of the search resulted in a collection of relevant academic and non-academic resources that are available to be implemented by designers.

Within the current study, only the tools that indicate their relevance to circular economy were selected. Despite the fact that many sustainability and eco-design tools are available in diverse platforms (online, software's, board games, etc) and that their application in circular economy project is relevant (as an example LCA software like SimaPro), the study considers mainly those that were developed and disseminated claiming to be oriented to circular economy.

To perform the analysis of the tools, besides the general information such as the identification, editor/publisher, author, source, availability and short description, a set of variables were used to access the potential for application by designers.

The variables were the following:

- The aim of the tool
- Scope - Circular economy; Eco-design, Design for sustainability, LCA, etc
- Assessment indicators/strategies - how the tool is applied? Which indicators or strategies are applied?
- Life cycle perspective – indication if the tool has an LC perspective or if only focus on a specific stage
- The influence on the design process - How can the tool influence the design?
- The influence in the business model - Can the tool and the results influence the business model?
- Type of inputs - Qualitative or Quantitative
- Inputs - Which inputs are needed to use/apply the tools
- Level of complexity - Level complexity in using the tool by design professionals
- Sectoral focus - sectoral, to which sector the tool is applicable or if it has a generic approach
- Expected results – which type of results are attained with the tool
- Pros and cons – Analysis of the main Pros and cons of the tool related to the design practice in the development of circular products and services

In the next chapter, the authors present seven tools that were analyzed within the research project under development according to the variables explained above. These resources address circularity aspects to develop new products and services and can be applied by design professionals.

TOOLS

Circularity Check

The Circularity Check developed by Ecopreneur, Wesustain, and MVO is a free tool to assist companies to become sustainable and circular or resource-efficient. The tool is primarily intended as an instrument for self-evaluation by companies, based on a questionnaire with about 60 questions that determines a circularity score for a specific product and/or service.

The checklist consists of a free questionnaire that can be filled out online covering five main indicators: Design, procurement, and manufacturing; delivery, use, recovery, and sustainability and the outcome is a total score on circularity (0-100%) and partial scores on the five indicators (0-100%) showing the overall strengths and weaknesses for the product or service.

The tool calculates the score and presents it in a few graphs, and by analyzing and answering the questions, and the scores on each indicator, the design team should identify potential ideas to improve and redesign the product or service (Ecopreneur).

Circular Economy Toolkit

The Circular Economy Toolkit is a free online resource for businesses to find Circular Economy opportunities.

The tool is based on a set of 33 questions related to the strategies and by answering, the analysis will result in the indication of the improvement of potential strategies: Design, Manufacture and Distribute; Repair/Maintenance of the product; Reuse/Redistribution of the product; Remanufacturing/ Refurbishment of product or part; Products as a Service; and Product Recycling at end of life. Besides the assessment features, the tools provide useful information in each strategy.

Based on a simple and user-friendly structure, the results cover the life cycle stages and highlights the potential in each one, and by analyzing the questions and results, the user can identify ideas to improve the product under analysis (circular economy toolkit)

Material circularity indicator

The Material Circularity Indicator (MCI), developed by Ellen MacArthur Foundation and Granta Design, is a tool aiming to measure how restorative the material flows of a product or company are.

By comparing to a similar industry-average product, the MCI for a product measures the extent to which linear flow has been minimized and the restorative flow maximized for its component materials, and how long and intensively the product is used. The tool is built from a combination of three product characteristics: the raw material used in production, the unrecoverable waste that is attributed to the product, and a utility factor that accounts for the length and intensity of the product's use.

The tool is easy to fill in with a user-friendly interface and useful to demonstrate the circularity level of a specific product.

The indicators may be used by designers to analyze a reference product or service and the assessment of potential changes in new designs, as well as for internal reporting, procurement decisions, and the evaluation or rating of companies (Ellen McArthur).

KATCH_e tools (KATCH_e 2019)

Within the EU research project KATCH_e - Knowledge Alliance on Product-Service Development towards Circular Economy and Sustainability in Higher Education, several tools were developed to support a transition to a circular economy.

The following four tools are the ones with a higher potential to be applied in the design practice from the above-mentioned research project under development.

KATCH-Up Board game

This tool is based on a creativity board game and aims to create an idea-value of a new product/service according to the needs of the users and to define the most appropriate circularity design strategies and business models to launch the product/service into the market. The objective of this game is to stimulate the users to generate valuable ideas from a business challenge, applying circular design and circular business strategies.

Based on six basic steps: a) Defining the problem context; b) Way to the solution-focused in the circular economy strategies that can be applied, c) Idea creation, with the development of a solution to meet the needs of the challenge; d) Business model, defining the most appropriate business model; e) Market launch, to define how the solution can be placed on the market and f) Presentation of the results of the exercise, the game acts as a guide to get an idea about an innovative product-service or to solve a real business problem and generate improvement opportunities.

KATCH_e CE Strategist

This tool helps the user to identify for a specific product in a specific context, Circular Business Opportunities and provide ideas and inspiration along the process of defining a Circular Business Model.

The tool starts with an assessment of a product or business to identify circularity strategies that fit best to the predefined circular business strategies.

After assessing the opportunities, the tool proposes several strategies to choose from and shows a definition of each strategy, providing existing business examples and shows how the strategies are connected to specific Design Strategies. The final step is a definition of the Circular Business Model using an adapted version of the Business Model Canvas framework. The Canvas, describing the business model highlights the implications and effects of circular models and guides the user towards circularity.

KATCH_e CE Designer

The CE Designer is a semi-quantitative tool for prioritization, assessment and idea finding of circular solutions for product and/or service design. It consists in a checklist structure organized in 8 strategies that address the most relevant issues a design team needs to consider in the development process of new products or services to support the transition to a more circular society.

The tool, in the first step, starts by asking the user to reflect on each strategy, their adequacy, and relevance for the project under development. In the next phase, the user evaluates the profile of the reference product in each strategy according to a set of

predefined criteria. This step has two objectives, the first is the assessment of the reference products, identifying the hotspots in the product which can be improved, and secondly, by answering the questions in each criterion, the user can identify improvement opportunities that can be implemented in the project.

The identification of the hotspots and opportunities are useful resources to be used as background information to brainstorming sessions and development activities.

In the third phase, the tool is used to compare the reference situation with the new concepts or new products /services resulting from the project.

The tool is simple to be used by designers and development teams and the process and results allow the development of new and innovative circular solutions.

KATCH_e Circular Economy Journey

The tool aims to help the players to assess the overall Product / Service / System journey, in the three stages (uphill, top hill and downhill) according to several factors: materials, producers, stakeholders, and users.

Through a visual canvas, the tool consists in a visual representation of the journey, it aims to identify the touchpoints between the factors identified, providing a model for analysis and identification of opportunities to optimize the journey and to enhance the closing of the loops to develop a more circular solution for a specific problem.

Being a physical tool composed by a printed canvas, cards, pins and color threads, the tool promotes innovation, discussion and brainstorming in creativity sessions.

CONCLUSIONS

Designers have at their disposal numerous tools oriented to support the development of sustainability and eco-design projects, both qualitative and quantitative tools with different levels of complexity, costs, orientation, typologies of results, among others. These tools have been extensively developed, but their use is not as wide as expected and most designers and development teams have not used them in practice in a systematic way. Currently, the concept of circular economy is gaining attention worldwide and being widely disseminated at various levels of society, and tools with a specific orientation towards the development of circular products and services are beginning to appear. In order to ensure that the products and services developed are indeed circular, it is necessary to apply several methods and tools that support the development, validation, and communication of their circularity aspects. In order to become widely used tools, it is necessary that these combine the perspectives of circularity with the needs of the design practice.

The seven tools presented address the challenge of integrating circularity in design, however, due to the nature of the tools, which are not mature yet, their characteristics and the needs of the design practice, there is still the need to develop an efficient and innovative tool or a toolkit to support the design of innovative circular products and services. These new or redesigned tools must address the design practice and supply efficient results perceived by all stakeholders as an added value to design projects showing clearly the benefits of their utilization.

FURTHER RESEARCH

The identification, test, and analysis of circularity tools will continue along the project and other relevant activities will be developed such as the analysis of the designers and product developers' perceptions, methods, and approaches on the development of circular products in order to understand how designers translate the user and business needs in product development. The identification of which methodologies and tools are applied in practice by designers and which are the needs, barriers and drivers in their adoption in product/service development will promote the development of the efficient resources to support the transition to circular economy through design.

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Envisioning the Next Generation of Designers:

A participatory workshop on Design Education for Social Impact and Sustainability

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ABSTRACT

This paper describes the methodology of a workshop done with design students during the Design Week of Mérida, at Universidad de Extremadura – Spain. The activity was based on the premise that – due to the growing complexity of the challenges faced by society today – designers need to act as part of the solution being agents of change. The workshop discussed the skills, methods, and partnerships for design to achieve such a change on its approach and how Design Education plays a part in preparing the future generation of designers to tackle social innovation and sustainability problems. The results showed how the students understand the future of design and the possibilities for improvement in a system that struggles to be resilient and respond at a faster pace.

Keywords: Design Education, Participatory Approach, Social Innovation, Sustainable Development Goals, Sustainability.

INTRODUCTION

As society faces challenges of growing complexity, the practice of design is also expected to respond to this new paradigm. Design education plays a crucial part in preparing designers to be an active part of the future society. A paradigm shift in design and design education is due to respond to changes coming from society (Ferreira, Souleles, & Savva, 2019; Souleles, 2017; Souleles, Savva, & Ferreira, 2017). As part of the Agenda 2030, the United Nations has challenged the world to rethink its practices towards the future through the Sustainable Development Goals (United Nations, n.d.).

As part of a Ph.D. research on Design, we facilitated a workshop to discuss with part of the design community the future paths for Design Higher Education, envisioning the designer as an agent of change (Bernarda & Ferreira, 2016), focused on social impact and sustainability. The activity took place on March 14, 2019, as part of the Design Week of Mérida (Semana del Diseño de Mérida), at Universidad de Extremadura – Spain.

THEORETICAL FRAMEWORK

Two main pillars guided the framework of the workshop to introduce the students to what we believe to be critical answers to the sustainability problems faced today. Those pillars are the Sustainable Development Goals and Product-service systems (Mcaloone & Andreasen, 2002; United Nations, n.d.; Vezzoli et al., 2014).

Sustainable Development Goals (SDGs)

The dynamics of the activity was based on the discussion of how design education should respond to the challenges faced by society today and how design can forge social innovation and promote sustainability (Bernarda & Ferreira, 2016; Findeli, 2001; Rocha, Ferreira, & de Azevedo, 2018). To frame the challenges and make them tangible the students were asked to work with the Sustainable Development Goals (Figure 1), defined by the United Nations and adopted as part of the Agenda 2030, in 2015. The SDGs are

> *an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests. (United Nations, n.d.)*

Figure 1
Sustainable Development Goals. Source: https://www.un.org/sustainabledevelopment/news/communications-material/

The SDGs worked to raise awareness about the responsibility of design to tackle those issues and also as a focal point during the group discussions and decision making for the participatory part of the workshop.

Product-service systems (PPS)

It is argued that there is need to shift the design of a simple artefact into focus into the development of the whole product-service system "in which the traditional manufacturer-vendor-user relationship is rearranged, in order to deliver environmental and (for the company) economical benefits." (Mcaloone & Andreasen, 2002, p. 51).

> *"The idea of product service system (PSS) development is that all three stakeholder groups – customer, company and society – benefit from the service systems related to each one of these dimensions, rather than simply one of the above" (Mcaloone & Andreasen, 2002, p. 51).*

Vezzoli at al. (2014, p. 30) contributes with this thought affirming that the PPS is the result "of an innovative strategy that shifts the centre of the business design and sale of products only (physical) to systems offering products and services that are jointly capable of satisfying a given application."

The PSS worked as a guideline to help the participants think of products, services, and systems that could respond to the SDG challenges as they fill the canvas for the participatory part of the workshop.

EXPECTED RESULTS

Our goal was to understand how design students see the role of the design towards the solution of wicked problems (Buchanan, 1992). Their understanding of the needed Skills to the solution, the Methods, and Tools to be used when designing for social innovation and sustainability.

WORKSHOP FACILITATORS

The workshop was facilitated by two design researchers with different backgrounds and educational experience. Hugo Rocha is a junior researcher and graphic designer, Ph.D. Candidate in Design at IADE-UE in Portugal, and teacher at Instituto Federal Fluminense in Rio de Janeiro (Brazil). Ana Margarida Ferreira (Ph.D.) is Industrial Designer and Assistant Professor at IADE-UE, and a senior researcher at UNIDCOM/IADE (Portugal) in Creativity, Design, Social Innovation, and Sustainability.

PARTICIPANTS

The workshop aimed at design students. For this first edition participated 12 students from four different courses and two distinct universities, all from Spain.

THE TOOLKIT

We designed a toolkit based on card sorting and canvas as a way for the students to show, within the presented options, what they believed to be the best answers to the proposed challenges. The toolkit was composed by a canvas, a set of cards, a cheat sheet, sticky notes, and permanent markers.

The set cards

Categories and colours for visual aid grouped the cards (Figure 2), titled *Theme, Skill, Method or Tool, Human Resources, Time, and Investment*. For the Skill, Method or Tool, and Human Resources cards there were blank cards available so that the participants could add any information if they found necessary. There was no minimum number of cards that could be used for each category, but there was a maximum which was written on the designated part of the canvas.

Figure 2: Set of Cards

Theme cards (yellow)
The theme cards were based on the Sustainable Development Goals defined by the United Nations (UN) (United Nations, n.d.). The cards had the Theme on one side and a QR Code on the other side to access directly the United Nations website of the respective Theme for a deeper understanding of the targets defined to the given SDG.

Skill cards (orange)
Contained a list of soft and hard skills, based on literature review, of what are the abilities of a designers today as well as what authors (Brown, 2009; Pryce & Whitaker, 2011; Vezzoli & Manzini, 2008) believe to be the skills necessary for a designer to tackle wicked problems and address social innovation and sustainability.

Method or tool cards (red)
This set of cards grouped tools and methods collected from Design Toolkits (Amsterdam University of Applied Sciences, n.d.; IDEO.ORG, n.d.). There was no more in-depth explanation on each of the tool or method, so if necessary, the participants could go online to understand a particular topic better. Links and QR codes to specific toolkits were made available to the students could have direct access to the toolkits.

Human Resources cards (purple)
In order to present the participants to the idea of co-design and participatory processes, the Human Resources cards listed professionals and stakeholders that could be helpful to tackle the goal chosen by the group.

Time cards (blue)
These cards displayed the amount of time necessary to complete the project (product, service or system) in questions. The cards were titled *short*, *medium*, and *long-term* cards.

Investment cards (green)
The investment cards listed the level of capital needed. The options were *low*, *medium*, and *high investment*.

The canvas

The participant had available for completion an A1-size printed canvas where according to instructions given by the facilitators, they filled with the cards made available during the participatory block of the workshop. On the upper left corner of the canvas, there was the placeholder for the theme card. The canvas also contained a table was divided as followed:

- Rolls: Titles, Product, Service, System
- Columns: Solution Universe, Skills, Methods and Tools, Human Resources, Time Frame, Investment Level, and Potential Solution.

The cheat sheet

Due to the practical and intensive nature of the workshop, there was not a long moment for theoretical explanations of in-depth content. To help the participants dive deeper into some concepts, the facilitators made available a cheat sheet with links to the videos used during the overview presentation and to design toolkits.

WORKSHOP STRUCTURE

The 4-hour workshop was divided into three parts, as followed:

Overview

For 30 minutes the facilitators introduced the SDGs for 2030 in an attempt to put the students into the mindset needed work on the exercises to follow. Videos on the SDGs were presented to clarify the concept and level the knowledge of the students on the theme.

A brief presentation on Product-Service System used the Sustainable Development Goal 14 – life below water – to exemplify how the development of such systems can tackle the SDGs proposed by the UN. In order to do not influence the students the referenced goal used as an example was withdrawn from the option that students could for the participatory activity.

Participatory activity

The participants were divided into four groups of three components each. The facilitators presented the first set of cards containing the Themes. The groups had then fifteen minutes to choose and research about the particular SDG. The members were encouraged to learn more directly from the UN website but also free to find information on the internet.

After this activity, they were asked to start working on the product universe. For ten minutes the groups brainstormed, using sticky notes, about product ideas that could respond to the theme in question. They were rallied to come up with as many ideas as possible in a diverging process. With the product ideas placed in front of them, they were then required to vote on the best ideas. Each member of the group had three votes, followed by a final and brief discussion to choose one product, completing a converging phase. This exercise also meant to illustrate the process of design that relies on diverging-converging cycles.

Once the students had concluded this preliminary study, the facilitators distributed the remaining cards and for thirty minutes, feeling the canvas with the options as following (Figure 3). For the Skill, Methods and Tools, and Human Resources columns, the participant could choose up to six cards. For the Time Frame and Investment Level ones, one card each. The participants were also reminded and encouraged to use the blank cards to add any information they believed could fit but was not found on the available cards.

Figure 3
Students during the workshop

For the two following universes, Service and System, the cycles were repeated equally, except for the maximum number of cards that could be chosen for the Skill, Methods and Tools, and Human Resources columns which were three for the Service universe and two for the System.

Presentation

All the presentations were recorded with audio and video to maintain the integrity of the discussion and dialogues and to allow for further consultation and referencing in future researches. Each group had ten minutes to present their results (Figure 4). They were asked to go over every selected card and explain the reason that supports each choice.

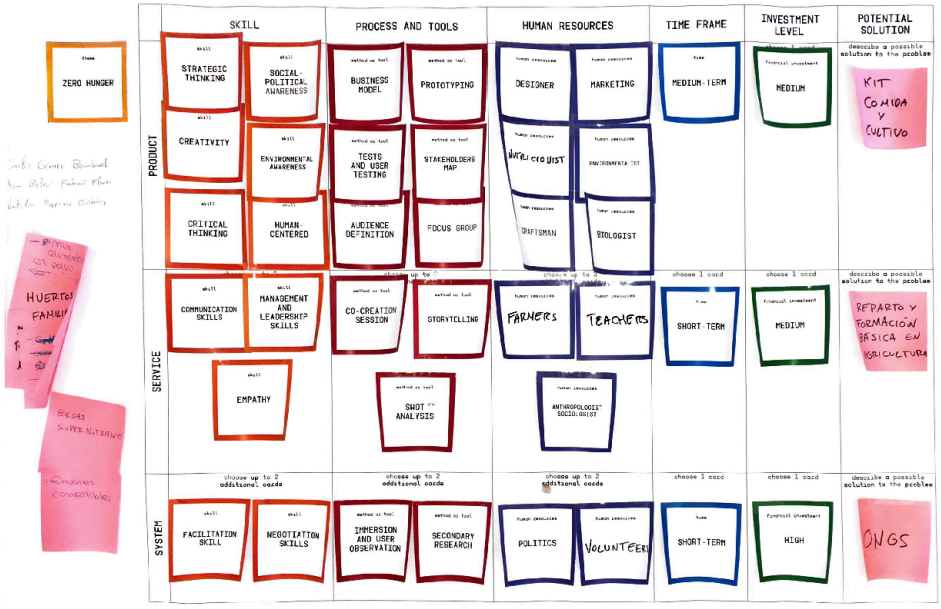

Figure 4
Canvas filled with one group's choices

THE RESULTS

It is understood that for a robust inquiry process more editions of the workshop need to be done and more data should be collected for any definitive and scientific conclusions to be drawn from it. Though it is interesting to highlight what was understood as valuable quality information aroused from the groups' presentation. One aspect found essential to bring are the common choices of the groups (Figure 5), as following. The numbers correspond to the percentage of groups that choose the option in question.

Skills: Communication Skills (100%); Empathy (100%); Human-Centered (100%); Social-political Awareness (100%); Strategic Thinking (100%).

Methods and Tools: Immersion and User Observation (100%); Prototyping (100%); Storytelling (100%).

Human Resource: Anthropologist / Sociologist (100%); Designer (100%); Marketing (100%); Politics (100%).

Figure 5

Most selected cards

It was clear from both the cards of choice and the discussion during the presentation that the students focused their options on a designer that needs to develop their soft over hard skills, giving a particular emphasis a humanistic approach.

By choosing stakeholders/partners such as Marketing professionals, Anthropologists, Sociologists, and Politics, show how not only they believe that the designer still has to act as a part of a commercial market, but also to bring to the process closer to the user, building a human-centered process.

FINAL CONSIDERATIONS

The workshop *Design Education for Social Impact and Sustainability: Envisioning the Next Generation*, proposed by the authors during the DIME 2019, was an innovative and one of the first attempts to discuss with the design community, namely design students, the future of Design Education in an approach towards social innovation and sustainability.

It is intended to replicate the workshop in Portugal and Brazil to gather more information and have both quantity and quality of data, and to promote further discussion on how should be the role of the designer as an actor of change and how Design Education can shift its practices to be able to address the societal challenges that we will face in the near future.

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Exploring Sustainable Behaviors Embedded in Everyday Life in the City:

An overview of suggested behaviors in the context

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ABSTRACT

The study presented in this paper is a part of a doctoral research in Design which aims to promote sustainable behaviors through the use of fashionable wearables. The comprehension of what kind of behaviors can be considered as sustainable is needed for selecting the behaviors that may benefit from the inclusion of wearables. Thus, we conducted a literature review and content analysis intended to explore and frame the behaviors that are considered as being sustainable in literature. The attained results suggest a trend for the sustainable behaviors to be associated with topics such as energy consumption, mobility, recycling and food consumption. "Effuse" behaviors that target positive impacts such as reusing, recycling, conserving and innovative are also frequently suggested.

Keywords: Sustainability, Sustainable Behavior, Sustainable Lifestyle, Behavior Change

INTRODUCTION

The promotion of sustainable habits, having people and their behaviors as a starting point for the change has been suggested as one of the main keys to achieve sustainability (Lilley, 2009; Sustainable Consumption Roundtable, 2006; Bhamra, Lilley, & Tang, 2011). Previous studies developed design strategies, theories, models and frameworks to influence sustainable behavior and lifestyles. The majority of their approaches were mainly focused on "how" to persuade users to behave in a particular way and mainly from the point of view of behavior change models (Spencer, 2014). The majority of the ways used to implement behavior change models/ theories comprehend the perception and psychology of users in order to persuade them. Although these are beneficial and significant concerns, a gap of knowledge is found on understanding "what kind" of sustainable behaviors needs to be explored.

This paper presents findings of a literature review that is part of doctoral research aiming to support the design of fashionable wearables that can work as active elements in the promotion of behaviors considered more sustainable, as part of a system in smart cities context. We assume that the combination of functionality and seductive/ motivating power of fashion products design, combined with IoT technology, can make

an important contribution to sustainability. One of the first methodological steps was to grasp what is the current understanding of sustainable behaviors, what kind of behaviors can be considered as sustainable in order to find how can fashionable wearables match with these behaviors. In this sense, the main question that this paper tries to answer is - "Which type of sustainable behaviors are suggested or promoted as a target of behavior change studies towards sustainability?".

HUMAN BEHAVIOR AND LIFESTYLES IN THE CONTEXT OF SUSTAINABILITY

Human behavior refers to a range of actions made by humans and that is typically influenced by several determinants (Hemakumara & Rainis, 2018). These independent determinants are, according to the Theory of Planned Behavior (Ajzen, 1991), "attitudes towards behavior", "subjective norms" and "perceived behavioral control" and they contribute to the behavioral intentions that inform later actions. Behavior is mainly a response to various stimuli or inputs, unconscious or subconscious, voluntary or involuntary. When these responses or actions focus on the overlap of environmental, social and economic concerns, it can be considered as sustainable behavior.

Manning (2009, p. 7) argues that the transition to sustainability introduces new ideas and behaviors as well as ambiguity. Even though people are optimistic about sustainability, they are uncertain about how to behave in a sustainable way and implement it in their everyday lives. They are either in need of social proof that convinces them that the effort serves the purpose or have difficulty in changing some social norms.

Many unsustainable actions are considered perfectly normal such as driving alone, living in a very large house that requires unnecessary heating, eating foods that have travelled long distances, constantly shopping for new products. However, sustainable behaviors such as buying second hand products or taking short showers are seen as lower status or undesirable (Manning, 2009; Sadalla & Krull, 1995). Many other behaviors that take place in everyday life, compose lifestyles. Plus, lifestyles are representative of how humans interact with each other in the decisions and choices they make that can have strong impacts on the environment and community itself.

Lifestyle refers to a pattern of consumption reflecting people's choice in terms of spending time and money, usually attitudes and values come attached to these behavioral patterns (Solomon, Bamossy, & Hogg, 2006). Patterns of choices or demands based on lifestyles mostly consist of many components that are shared by others in similar social and economic circumstances, however, each person provides a unique "twist" to this pattern and makes each lifestyle unique. Solomon, et al (2006, p. 558) give this example: "a 'typical' student may dress much like his or her friends, go to the same places and like the same foods, yet still indulge a passion for running marathons, stamp collecting or community service, activities which make him or her unique". This unique twist which can be rephrased as seeking for individuality, might come into surface in various activities, interests or opinions. These three categories of variables - activities, interest and opinions (AIOs)- are suggested as the dimensions to assess lifestyles. Wells and Tigert's (1971) psychographic research argues that one can understand lifestyle "by discovering how people spend their time (activities), what they find interesting and important (interests) and how they view themselves and the world

around them (opinions), as well as demographic information" (Solomon, Bamossy, & Hogg, 2006).

Creating sustainable lifestyles, which means rethinking the ways of living and individual actions (UNEP, 2011), is quite important to empower sustainable behavior. Creating this particular lifestyle also means rethinking how people organize their daily life, altering the way of socialization, exchange, share, educate and build identities. It is about transforming the society towards more equity and living in balance with the natural environment. "Everyday life" or "lifestyle" expressions are mostly highlighted in various studies that contribute to sustainability in terms of behavior (Manzini & Jegou, 2003; UNEP, 2011; Petersson, 2016; Thieme, et al., 2012; Barr & Gilg, 2006; Marchand & Walker, 2008). Furthermore, many concerns in the base of encouraging sustainable behavior and altering lifestyles towards an environmental base are considered in the context of urban life (Manzini & Jegou, 2003; UNEP, 2011) as well as inside and around the home (Barr & Gilg, 2006).

METHODOLOGY

To better understand, examine and characterize sustainable behaviors in the context of everyday life in cities, both quantitative and qualitative data were gathered from literature review, semi-structured interviews and observations. However, this paper only presents findings from the literature review part, which was conducted into 4 phases: (1) knowledge expansion and selection of publications, (2) review for framework selection, (3) data collection, framing and content analysis, (4) interpretation of results.

The following databases were selected: EBSCOhost, Elsevier, ScienceDirect, Google Scholar, OATD and bibliographic catalogue of IADE Library. The keywords used were: "sustainable behavior", "sustainable lifestyle", "sustainable actions", "design for sustainable behavior" and "design for behavior change". Academic journals, conference materials, reports, books and dissertation/thesis were the type of sources included. After a manual sorting, evaluating titles and abstracts, 41 publications were selected. Among these publications and after analyzing the alignment of the titles with the objective of the research, the availability of sustainable behaviors in the form of strategies, case studies, scenarios and the examples given in theoretical background, selecting one work of the same authors (directly proportional the amount of proposed behaviors), 10 publications remained (Table 2).

Table 2 *List of sources*

Sources	Type of source	Brief topic
(Akenji & Chen, 2016)	Report	Shaping sustainable lifestyles - Framework
(Thieme, et al., 2012)	Article	Designing persuasive system to promote sustainable lifestyles – User study
(Bhamra, Lilley, & Tang, 2011)	Academic journal	Designing for sustainable behavior - Case study
(Wever, van Kuijik, & Boks, 2008)	Academic Journal	User-centered design for sustainable behavior – Case study
(UNEP, 2011)	Report	Recommendations to develop efficient sustainable lifetyles based on survey
(Petersson, 2016)	Report	Strategies to enable sustainable choices in everyday life – Guideline
(Monroe, 2003)	Academic journal	Encouraging environmentally responsible behaviors – Review / Theoretical Study
(Manning, 2009)	Report	Psychology of sustainable behavior – Theoretical study

(Lidman & Renström, 2011)	Dissertation	Design for sustainable behavior – Framework / Applied study
(Manzini & Jegou, 2003)	Book	Promoting sustainable everyday life by urban life scenarios – Framework / Case study

The Framework – Everyday Life Domains

Everyday life or daily life is briefly "what we do every day" (Manzini & Jegou, 2003, p. 63) and consists of series of actions conducted by people and eventually is an output of unique lifestyles. These two terms "lifestyles" and "everyday life" were interchangeably used in the previous studies. In this study, we prefer to use the term "everyday life" because lifestyle has set of complex drivers such as personal situation, external social and economic conditions, as well as physical and natural boundaries (Akenji & Chen, 2016). The focus is based on promoting behaviors, therefore "what we do everyday" or "how we act everyday" is found more relevant in this context. Existing literature on promoting sustainable everyday life are also linked with city life. Increasing population towards urban areas (United Nations, Economic & Social Affairs, 2016), as well as individuals' "hope for a better life" (Eremia, Toma, & Sanduleac, 2017) and "gain access" (Etezadzadeh, 2016) to necessities were considered as the reason.

The first example in the city context was found in Manzini and Jegou's (2003) sustainable scenarios in urban life. In that project, the point of reference was "the daily dimension of human's existence" starting from local environment. The project offered possible scenarios and practicable alternatives by answering the question: "What might life be like in sustainable society?". Scenarios which promote sustainable urban life, were divided into different topics which are listed as "eating", "things", "work", "cities", "energy" and "vegetation". Another example was found in UNEP's (2011) Global Survey that asked young adults, living in urban areas from 20 countries, to examine their current lifestyles. The survey's main objective was to analyze young adults' perceptions and attitudes in everyday life as well as the visions of sustainable lifestyles, to encourage participation of sustainable scenarios, and to develop policy recommendations, focusing on opportunities, actors and responsibility. Sustainable lifestyles were divided into three major climate-related areas: "mobility", "food" and "housekeeping". "They were also three major consumption areas that have great impacts on environments and societies, and need to be looked at closely to tackle global challenges such as climate change" (UNEP, 2011, p. 18).

Recently, another UNEP's report was proposing "evidence-based framework design" to enable lifestyle choices that contribute to sustainability (Akenji & Chen, 2016). The report argued that there were encouraging signs that society understands the impact of daily choices and the various ways of actions, models and surveys are helping people to live more sustainable lifestyles. However, there was still the need of a holistic vision of what constitutes a sustainable lifestyle. In this matter, based on consumption categories and groups of products that have the highest environmental impacts, as well as "equally problematic" social impacts, the key domains proposed were "food", "housing", "mobility", "consumer goods" and "leisure". Additionally, water, energy, and waste were not addressed in isolation but as cross-cutting elements that affect and were affected by almost every lifestyle domain (Akenji & Chen, 2016, p. 5). Regarding these three approaches (Table 1), the main focuses were observed as daily activities inside home, eating habits and mobility. However, some dimensions were found unnecessary as they might be considered as sub-element under some proposed titles. Furthermore,

considering consumption as a high impact of daily basis, and leisure time activities were also important as people spend considerable time as leisure.

Table 1 *Findings of key domains based on different sources*

Key Domains of Everyday Life	Source
Eating (food preparation) **Things** (taking care of the house and household objects) **Work** (the organization of activity networks for work, study, entertainment, socializing) **Cities** (urban mobility) **Energy** (energy production and management) **Vegetation** (the creation of urban and non-urban green spaces)	"Daily dimension of human's existence" (Manzini & Jegou, 2003)
Housekeeping (Being at home) **Food** (Getting some food and eating) **Mobility** (Getting around, getting out)	"Major climate-related areas" (UNEP, 2011)
Food (What we eat/drink, how it is produced, processed, provided and disposed) **Mobility** (How/how often we travel) **Housing** (How/Where we live, what is used to build, heat and cool) **Consumer goods** (The type/quantity of products we buy, how we use and how often we replace) **Leisure** (How we spend leisure time, choice of tourism destinations, activities, how we use facilities)	"Key lifestyle domains" (Akenji & Chen, 2016)

For our research, Akenji and Chen's (2016) approach was chosen as a framework due to its recency, practicality and holistic point of view. This framework was not used only for proposing the domains of daily life, but also the components of "everyday sustainability actions" (REDuse), which are formed as Refuse, Effuse and Diffuse. "Refuse" targets negative-impact activities and actions by individuals/households to avoid or reduce unsustainable practices. "Effuse" targets positive impact activities by individuals/ households that are sustainable. Finally, "Diffuse" collaborative engagement actions with wider communities that provide solutions and reduce environmental impact. These components are used to categorize reviewed behavior types in terms of sustainability. On the other hand, lifestyle domains are renamed as "everyday life domains" and the behaviors found on previous cases which are not considered in any of these domains, are framed as "Other".

RESULTS AND DISCUSSION

Framing different target sustainable behaviors according to the selected framework enables a number of observations to be made (Table 3).

Table 3 *Framed behavior types and frequencies from the sources*

Everyday Life Domains	***Refuse*** *Boycott* *Avoid* *Reduce*	***Effuse*** *Eco-innovate* *Do-it-yourself* *Reuse* *Conserve*	***Diffuse*** *Share* *Collaborate* *Localize* *Evo-innovate*
Food	• Avoid food waste**** • Distinguish the 'sell by', 'best before' and 'use by' dates (some foods are safe to consume even after use by dates* • Avoid overconsumption of animal products (red meat)* • Stop eating, selling, serving giant prawns* • Reduce impact on global warming by not drinking heated beverages*	• Choose local, fresh, in-season and/or organic produce over exotic and out-of-season options**** • Urban gardening, urban farming, self-producing vegetables and fruits*** • Eating more fruits and vegetables*	• Initiate healthy, delicious and balanced low-impact meals at work canteen/schools* • Participate in local farmers market* • Support and invest in Food coop* • Food sharing, extra cooking for others to take away** • Guerilla gardening*
Mobility	• Avoid/reduce private car use; single-occupancy driving****	• Public transport as part of or all the way to work** • Walk or cycle for very short	• Car-pooling scheme, car club*** • Car-sharing for work commute***

		journeys such as the ones to local convenient store* • Using bike in the city**** • Using energy efficient vehicles**	• Teleconferencing facilities instead of long-distance face-to-face meetings*
Housing	• Avoid large houses (with low occupancy)* • Avoid unnecessary product promotions/discounts* • Avoid multiple/large electronic and electrical appliances (TV, fridges)* • Reduce fridge door opening times* • Reduce energy consumption****** • Reduce household wastes* • Switch-off the devices you don't use instead of stand-by*	• Home insulation** • Energy and water efficient behavior**** • Opt for renewable energy option** • Construct "passive houses" (reduce building's eco footprint)* • Use energy efficient light bulb* • Recycling in the household* • Correct dosing of cleaning agents (toothpaste, detergent)*	• Initiate/join a (neighbourhood) tools library or rarely used household tools/appliances** • Collective laundry washing in buildings* • Organized help-network, do-it-yourself support* • Neighborhood co-operation/exchange services*
Consumer goods	• Avoid one-time use products (plastic bags, razors, plastic cups, single use cleaning products)* • Stop buying goods that comes from slave labor* • Stop buying goods that causes destruction of environment*** • Use less washing detergent then recommended (safety margins)* • Decrease the need for purchasing new clothes** • Decrease amount of waste*	• Repair* • Recycle**** • Purchasing green products based on degree of their environmental friendliness** • Use reusable sanitary protection instead of disposable ones* • Alter consumption habits* • Reuse/repair clothes*	• Give away old but still usable items (clothing, electronics, furniture)* • Rent less-frequently used goods instead of buying*
Leisure	• Boycott tourism to sensitive biodiversity hotspots*	• Choose low impact yet enjoyable activities/experience for leisure (gardening, visit parks, local museums, theatre, cycling, volunteering, family party/picnic)* • Put up bird boxes* • Plant sea oats* • Re-use towels at hotels* • Clean the beaches from rubbish* • Keep streets clean/ nudging litter into the bin*** • Look up information, reading articles/books*	• Participate events and courses for lifelong learning** • Actively participate in leading environmental initiatives*** • Be kind and caring to all living things*
Other		• Recycle papers and cups at work* • Count wildlife populations* • Promoting prescribed fire* • Reduce waste in the production process*	• Make voluntary donation to charities** • Vote** • Establish mortgage criteria for energy efficient houses* • Sue a polluter* • Use legal system to force compliance with environmental law* • Protest, speech-making, letter-writing* • Invest in environmentally responsible companies* • Lobby to motivate others*

**The frequency of suggested behavior*

These observations become clearer when presented in the frequency chart (Figure 1) by offering structured way for understanding the pattern of different approaches by grouping them in the form of quantitative data.

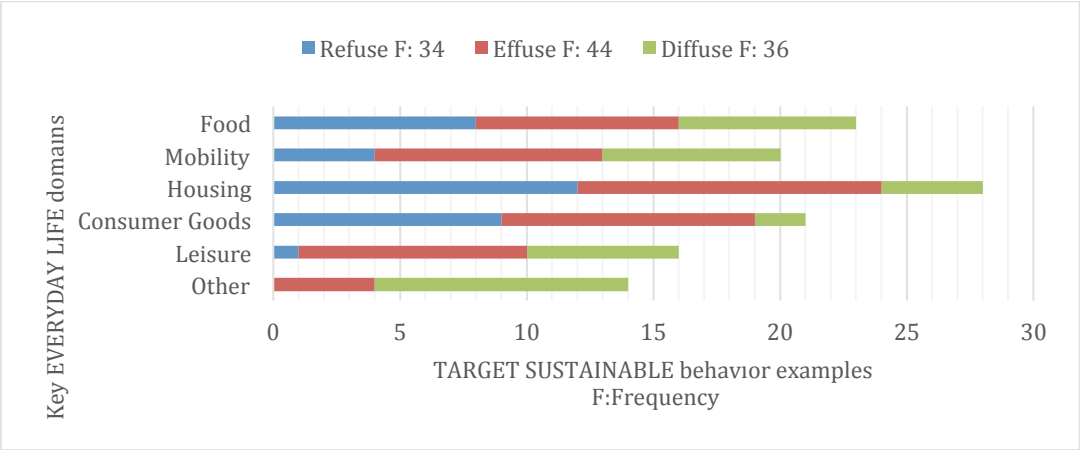

Figure 1 *The frequency of target behavior domains*

Firstly, the overview reveals that the largest number of target behaviors is devoted to behaviors in the housing domain, especially in the form of refuse and effuse. In other words, collaborative forms of behaviors are less suggested comparing to others. When it is examined in detail, behaviors are mostly related with energy consumption such as: "switch off devices", "reduce fridge door openings", "use energy efficient light bulbs" and so forth. It is also observed that some behaviors are stated such as "reduce energy consumption" without clarifying specific source, which might be considered as vague. The following frequently indicated domains are food, consumer goods and mobility. Secondly, the most suggested behaviors are: "reduce energy consumption", "avoid food waste", "choose local, fresh, in season and/or organic produce over exotic and out of season options", "use bike in the city", "energy or water efficient behavior" and "recycle". The majority of the frequently proposed behaviors are curtailing or ending a certain type of behavior or substituting a new for an old behavior. Thirdly, the most suggested behaviors are found in the form of "effuse" behavior which is mainly summarized as more efficient and innovative solutions for a particular behavior type such as conserving, reusing, recycling or do-it-yourself suggestions. This demonstrates that suggested target behaviors are proposed to promote more sustainable behavior. Yet, these contributing behaviors are also defined as sustainable behaviors. Behaviors such as fewer consuming goods or less purchasing clothes are more efficient than recycling or repairing these artifacts since waste is an unwanted output. However, both type of behaviors is considered as sustainable behaviors, which addresses the sense that any kind of step towards sustainability is welcomed. Finally, some behaviors that are defined as "political behaviors" (Monroe, 2003) or "civic actions" (Manning, 2009) such as voting, protesting, "ecosystem behaviors" (Monroe, 2003) such as putting up bird boxes, planting sea oats or behaviors which are specific to expertise or workplace such as reducing waste in production process are categorized as others. Nevertheless, behaviors are also related with energy consumption, waste management or avoiding destruction of environment which are similar topics in other domains of everyday life.

CONCLUSION

Identifying mostly asserted behaviors that were considered as sustainable was the main intention of this research. Based on the findings, one methodological step of the doctoral research was accomplished. Domains of everyday life and type of behavior framing demonstrated the majority of sustainable behavior examples in the field of

study. Benefiting from the results, we might be able to select the behavior(s) to promote by inclusion of fashionable wearables.

This research has explored and juxtaposed the understanding of sustainable behaviors through content analysis of the literature review. Various number of studies tend to frameworks and design studies seeking the answer of how to design, persuade, motivate, encourage, what kind of strategies, frameworks or guidelines others should follow. In this regard, it is observed as promoting sustainable behavior statements were used in many researches without clearly defining which type of behaviors would be considered as sustainable. While framing the behaviors that were proposed in the selected sources, we needed to interpret the sustainable behaviors from the feature of the product designs, or what case studies suggested in scenarios.

We conclude that the purposes of this study, one should take into account the established delimitations: articles restricted to particular databases, the keywords used in the search of publications, the framework used to formulate the sustainable behaviors in the lens of everyday life. As suggestion for future studies, we highlight the possibility of deepening the analysis, including use of experts in the field, focus groups to analyze the content.

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Varying Mindsets in Design Thinking

Why they change during the process and how to nudge them

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ABSTRACT

A Design Thinking project typically demands the application of a process with distinct stages and the execution of the challenge in interdisciplinary teams (Lewrick, Link, & Leifer, 2018, p. 38 and 144). The stages require various skills and mindsets that only can be mastered with experience and time (Brown, 2019, p. 3). This paper indicates that one of the main reasons for that is the fact that there is not one set of mindsets that should prevail through the whole process but that there are mindsets that need to change with the tasks to be done and that these changes are easier to manage for creative people. However, the interdisciplinary teams will always lead to team members that are new to Design Thinking (Liedtka, 2018, pp. 73–74). So this paper concludes with some sugestions for methods that can help to shift the mindsets of the untrained Design Thinkers.

Keywords: Creativity, Design Thinking, Mindsets, Influence, Psychology

INTRODUCTION

Since 2004 Design Thinking gets a constantly growing interest. Figure 1 shows the continually rising number of searches after the term "Design Thinking" worldwide. A search in news channels delivers enthusiastic headlines like "Design thinking: A superpower for the challenges of modern businesses " (Banerjee, 2019) or "Publishing needs more design thinking" (Fulwood, 2019). But there are also critics calling Design Thinking "absurd" (Vinsel, 2018) or even "Bullsh*t" (Jen, 2017). One prominent complaint is the fact, that Design Thinking teams include non-designers and often do not reach the aspired goals. The following text argues that Design Thinking – against common statements – does not need one set of mindsets, but changing mindsets according to the need of the given stage, and that non-designers need (more) guidance to reach these goals.

Figure 1: "Design Thinking" in Google Trends
https://trends.google.de/trends/explore?date=all&q=design%20thinking

DESIGN THINKING AND ITS CHANGING DEMANDS

Design Thinking is an approach to problem solving and innovation. "Design thinking offers a structured framework for understanding and pursuing innovation in ways that contribute to organic growth and add real value to your customers." (Naiman, 2019) Its origins can be already seen in Plato's thoughts to participatory design and later for instance in the works of Ockham, Hume, and Kant (Curedale, 2019, p. 16). "Like all great ideas, it has been an evolution, influenced by thousands of people." (Spencer, 2019) The theoretical fundament as a creativity method with a defined process "Problem Statement Thinking" can be determined in John E. Arnolds "Creative Engineering" in 1959 (Arnold, 2016; von Thienen, Clancey, Corazza, & Meinel, 2018).

The evolution of Design Thinking resolved in manifold models that can be lead back to Tim Browns Inspiration-Ideation-Implementation framework (Brown, 2008, pp. 88–89) and the Double Diamond of Design (Design Council, 2015). A characteristic feature is phases that demand divergent or convergent thinking alternate, typically split in two spaces: the problem space and the solution space (see Figure 2).

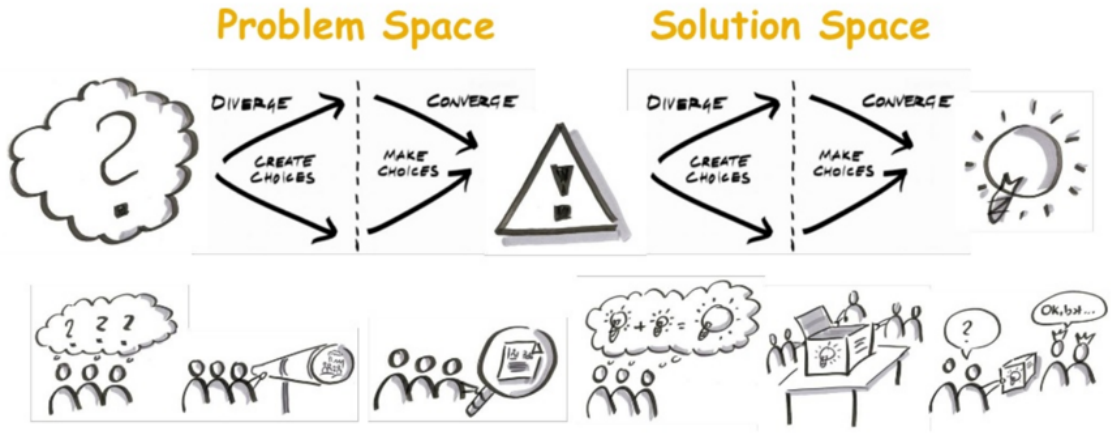

Figure 2: A visualisation of the Design Thinking process
(HILDENBRAND, 2012, P. 29)

Also, a typical for Design Thinking models is the demand for a specific mindset(Both & Baggereor, 2010, p. 3). A mindset is "a set of activated cognitive procedures" (Gollwitzer & Keller, 2016, p. 1). It is often more palpable coined as mental attitude, that influences our ways to think and to act (Meier & Kropp, 2010, p. 179). So, how we perceive information and how we react on it is highly affected by our mindsets (Thum, 2012). In a comprehensive literature research Schweitzer, Groeger and Sobel identified 11 mindsets from "Empathetic towards people's needs and context" to "Critically questioning" (2016, pp. 6–13). Figure 3 shows their iconographic visualisation of the whole set. Dosi, Rosati and Vignoli even identify 19 Design Thinking mindsets (2018).

1. *Empathetic towards people's needs and context*
2. *Collaboratively geared and embracing diversity*
3. *Inquisitive and open to new perspectives and learning*
4. *Mindful of process and thinking modes*
5. *Experiential intelligence*
6. *Taking action deliberately and overt*
7. *Consciously creative*
8. *Accepting of uncertainty and open to risk*
9. *Modelling behaviour*
10. *Desire and determination to make a difference*
11. *Critically questioning*

Figure 3: Design Thinking Mindsets
(Schweitzer et al., 2016, p. 6) layout by author

When we take a closer look at the process and the stages of Design Thinking, it gets evident, that these mindsets, despite their multitude, only build a basis, a common denominator for the whole process (Brown, 2019, pp. 32–34). But, each stage needs different ways to perceive, process and react to information. Tom Kelley identifies ten roles, with specific attitudes and abilities that enhance the effectiveness and efficiency of Design Thinking processes. He describes them as different personas, typically even as professional specialists (2016).

So, should a Design Thinking team just hire and fire additional people to support these tasks? Partially, this is sensible and recommended. With complex projects, it's even inevitable. But still, there must be a core team, hat is stable through the whole endeavour, and that needs to be active in all stages (Brown, 2019, p. 35) Design Thinking lives on its team with people with different capabilities and expertise, typically necessarily consisting of experienced designers and untrained non-designers (Lewrick, 2018, p. 36). Creative people show the flexibility of cognitive processes that leave others lacking (Beaty et al., 2018, p. 1090). The mastery Tim Brown describes as ideal (2019, p. 3) is very often not to reach with the line-up demanded by the challenge (Dam & Siang, 2018). Thus, the conflict arouses between a stable, interdisciplinary team and the desired cognitive abilities of the team members.

Here the facilitator comes at play. The facilitator is the team leader, the person who moderates the Design Thinking sessions, which keeps the process running and the creative level high (Curedale, 2019, pp. 155–156). "A leader who is experienced in maintaining the right mix of mindsets is essential" (Dam & Siang, 2018, para 5).

After explaining the changing mindsets, we will lay out some methods facilitators can use to lead the team members to the needed cognitive attitude.

THE CHANGING MINDSETS

As elaborated above, mindsets are activated cognitive procedures. The tasks that each stage of Design Thinking involves, demand for different thoughts processes and ways to interact with one's environment. To keep them separate and not to try to do them at once is one of the fundamental mindsets of Design Thinking: "Be Mindful of Process" (Both & Baggereor, 2010, p. 3). This is wise, as Edward de Bono points out: "The main cause of confusion is trying to do everything at once"(2008, p. 1).

Even if de Bono talks about thinking in general, his books "Six thinking hats" (2016) and "Six Frames: For Thinking About Information " (2008) fit very well to Design Thinking. He describes the six hats not as personas but as "modes of behaviour" (2016, p. 6), the frames are meant to enhance the sensitivity of the mind to specific aspects (2008, p. 4). Similarly, Tom Kelleys "Faces" are not personas but roles that a person can play according to the need at hand (Kelley, 2016, p. 13).

Gary Klein describes mindset as a belief (2016), a way we perceive and with that think of our surroundings. In his book "Seeing What Others Don't" he describes how different beliefs and the way to handle them change our possibilities to gain insights. He explains strategies to modify beliefs and how this changes the way we understand what we see (Klein, 2017, pp. 101–108). Figure 4 shows what can activate a change, how beliefs are altered, and how this changes our perception.

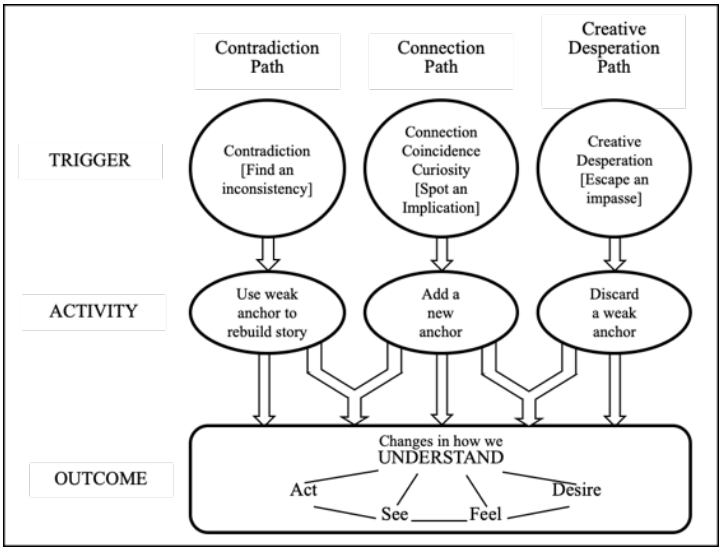

Figure 4: Triple Path Model of Insight
(Klein, 2017, p. 104) layout by author

Research of the authors in both literature in Design Thinking and psychology on creativity revealed a set of relevant cognitive procedures. The analysis resulted in five pairs of opposing thought and action processes that outline the needed mindsets in Design Thinking (see Table 1).

Table 1
Contradictive thought and action processes derived from creativity research

Collecting	⟷	**Analytical**
Observant	⟷	**Envisioning/Imagining**
Developing	⟷	**Judgmental/Selective**
Empathic	⟷	**Withdrawn / Introverted**
Spontaneous	⟷	**Reflective**

Structuring mindsets as opposing pairs is common in positive psychology to ease definition and comparison (e.g. Callahan, 2016; Dweck, 2019). Ongoing research (action research and quantitative surveys) is analysing the attributes and their importance for each stage (following the d.school model).

Paralell to the extensive literature study the researchers conducted a series of Design Thinking projects to examine the assumption of the changing mindsets by observation and qualitative research. So a triangulation with literature research, field study and surveys serves to prove the proposal (Flick, 2011). Finally the results will be discussed with Design Thinking experts to evaluate their practical value. The analysis if the data is still ongoing but first probes show promising outcomes.

METHODS TO AFFECT MINDSETS

One point that the research indicates is that Design Thinking process indispensably needs creative people (i.e. people trained and able in creativity) as they can follow the ever-changing demands of the tasks like others don't. As Mihaly Csikszentmihalyi states: "they [creative people] show tendencies of thought and action that in most people are segregated. They contain contradictory extremes; instead of being an 'individual,' each of them is a 'multitude'" (2013, p. 57).

But as Design Thinking teams necessarily are transdisciplinary, all team members need to be equal (Betancur, 2017, pp. 7–8) it is the task of the facilitator to help them all to find the right mindset to be efficient (Curedale, 2019, p. 160). Design Thinking pros are aware of this fact (if not right now in the given details) and strive to get the team productive. They use for example warm-ups: These are exercises comparable to those athletes or musicians use to prepare body and mind for the successive activity (Uebernickel, Brenner, Naef, Pukall, & Schindlholzer, 2015, p. 192).

Another example is the design spaces that ideally can give the team the chance to stand, sit or lounge because the bodily attitude affects the mental attitude (Gerstbach, 2016, pp. 162–163). A highly prominent and very often used method is the cloze "How might we...?". Duane Bray explains in Leah Fessler's text how every word affects the attitude of the team: "'How' asks employees to be descriptive, 'might' suggests there are good answers, but not a single correct answer, and 'we' evokes inclusivity and teamwork" (Fessler, 2017, para 4)

Against common belief, mindsets can be changed. “One of the most powerful aspects of mindsets is how quickly they can be shifted, and how powerful the consequences can be. Unlike skills that have to be practiced again and again, mindsets sometimes show dramatic shifts” (Klein, 2016, para 12).

Based on the definition that a mindset is a mental attitude, we can follow Maio, Haddock and, Verplanken that mindsets are influenced by cognition, affect, and behaviour (2018, p. 113). Some small examples:

- Cognition: Explanations and logical reasoning can affect mindsets. So, if the team members comprehend why a particular way of thinking is useful for the given task and if they get guidance how to reach it, they tend to concede to it (Vogel, 2016, p. 139). In practice, the facilitator can explain the importance of being collective in the observation phase and advice on how to amass information without losing it.
- Affect: Mindsets can be influenced by affection. If the team member has a positive emotion towards the shift, he or she might follow. Role models work with this effect. A person (or archetype) with the right enigmatic profile can trigger a new train of thoughts (Basford & Schaninger, 2016). In practice, to tell a

(compelling) story about T.A. Edison and his never faltering way to forge the light bulb can push the developing mindset for prototyping.

- Behaviour: Direct experience has a strong influencer on mindsets. If a person is exposed to a situation where he or she can easily get in touch with the demanded task a positive stance to the needed mindset is probable (Maio et al., 2018, pp. 168–169). Warm-up exercises that demand impromptu reaction of the team members can help to enhance their willingness to spontaneity, e.g. in the ideation phase.

These small examples should show the vast possibilities the facilitator or the planer of the Design Thinking session has to stimulate the mindsets of the team members. The assessment of the needed nudges is one of the essential abilities of a facilitator (Lewrick et al., 2018, p. 180). The leverages are ubiquitous but most important is the direct interaction with the team members, the balance of rapport and professionalism, the instructions given, the time management or the way to intervene in challenging situations (Curedale, 2019, pp. 155–158).

CONCLUSION

The still ongoing research indicates that there are mindsets that need to change as the tasks change during a Design Thinking process. This fact – and the identification of the mindsets – is relevant for Design Thinking facilitators as they need to be aware of the needs of the process and the status of their team members. It is also relevant to give them advice how they can influence these mindsets to strengthen their teams.

This article is far from comprehensive to the given subject, but only gives an impression of the scope of the endeavour. The nature of mindsets, their application to the Design Thinking process and the instruments that can be given to the teams to achieve these mindsets need more in-depth investigation and elaboration.

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The Perceived Value of Portuguese Design:

Identity elements of Portuguese Culture in Production

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ABSTRACT

This paper approaches some aspects, using relativistic information to characterize an artifact or product which, can be highlighted as relevant to help increase the perceived value of Portuguese Design through its qualitative elements of identity, which emerge from human creativity, by the combination and interaction of different arguments and weights of the belief systems to which the designer belongs.

Keywords: Portuguese Design, Value, Belief Systems, Identity Elements.

INTRODUCTION

Regardless of the sensory abilities of each individual, we all have a perception about the understanding of design and its identity elements. Today, we have a set of basic guidelines (Lidwell, 2010, p.11) for improving perceptibility remote to the present information using a language that provides compatibility with assistive sensory technologies and information so that the users can perceive them. For this, it will be necessary to categorize/ catalogue the different senses in the human being. In order to have a better perception of the identity elements of Portuguese Design, we need to clarify the concepts of Information, taken as synonyms of data as senses or arguments for understand the Design practice, thus being measurable, although dependent on the observer and will always be relativistic. In this scenario, it becomes essential to identify a differentiation and in the creation and production of objects in the context of Portuguese design.

IMPORTANCE OF SENSES IN DESIGN

Industrial design is an activity that groups different methodologies by combining distinct areas, such as the social sciences, the principles of art, engineering processes or management practices. Influencing the entire process, from planning to production, across diverse sectors of activity, such car design and aircraft design contributed to the studio's expertise in industrial design services with a strong technical component (ie design of means of transport) so that in the context of this research it has been important to focus on a fundamental aspect, the definition of the Formal Language of products as the main task of the industrial designer so that all the different methodologies materialize in solutions (De Castro, 2018, p.30).

André de Castro (2018, p.30) also states that in the different competencies of an industrial designer, it is important not only to create and construct the object itself, but a varied range of processes similar to those of the social sciences in the development of

market research and interviewing and observation of users; have the ability to communicate concepts and ideas through illustration; be able to materialize concepts thought of 3D models with software; turn to product engineering by designing the parts and building prototypes and managing people and resources.

For André de Castro (2018, p.33) there are three research segments that will help to clarify the objectives:

• Context: analyzes the context of the studio in two decades of activity, from an internal perspective (designers, methodologies, processes) and external (social, economic and technological changes and design history);

• Form Syntax: characterizes the formal elements developed by the studio designers and their organization through design principles;

• Form Semantics: Emphasizes the creation of symbols through product design and interpretation by clients/ partners.

We can adapt complex industrial products with a degree of complexity in a complex ecosystem that have a specific performance and function in achieving their value qualifications and can be achieved through different geometric definitions, production technologies and materials. In general, the form, function and technique interconnect in the development of a particular product and whenever one of these components changes, the rest is affected. Naturally designers approach these three basic elements in a holistic way, clustered in a complex ecosystem that includes social, cultural, economic, and technological and market differences (De Castro, 2018, p.33).

In any case, for Krishnesh (2003, p.180), a synthesis of facts and theories of the various fields like psychophysics, neurology, psychology, medicine, management, physics and others, makes it possible to identify more senses in the human nature. They are divided in to two different categories, the physiologic senses and the sensibility driven senses (Table 1).

Krishnesh (2003, p.180) also applies the scientific knowledge that the pre-frontal cortex and the temporal lobes are the two parts of the brain that are very important to design. These parts are instrumental in making innovative and creative decisions, visio-spatial skills, in communication, memory, etc. and these are the places where our higher, more human sensibilities lie. Sweet smells directly soothe our limbic system, our animal instincts.

Table 1: The Physiological Senses

The senses that have some physiological organs or mechanisms in the body.

Visual	Light and Time –in terms of circadian cycles based on melatonin secretion
Auditory	Sensors for Parasympathetic (PNS) and Sympathetic (SNS) activation
Olfactory	Hunger
Gustatory	Thirst
Tactile	Opiates and stimulants
Vestibular	Fatigue
Kinesthesis	Sense of personal history and identity
Chemesthesis	Elimination (all types)
VNO –vomernasal organ or Pheromonic	Satiety
Temperature	The Unifying or the psychological sense
Pain	
Haptic	
Space	

Table 2: The Sensibility Driven Senses

The senses that do not have any direct physiological organs but are based on the combinational sensing of one or more physiological senses along with the past perceptions and sensibilities as also on brain functions like memory.

Proximity (personal space)	Sense of economy
Rhythm and synchronicity	Sense of aesthetic appeal or beauty
Time	Value Perception
Intuition –as distinct from hunch (popularly known as the sixth sense)	Humor and wit
Reading Emotions and body language	Male/Female sensibility (including Body consciousness)
Immunity –especially of others	Sense of delight, serenity and harmony or otherwise (in persons, places and objects)

Acknowledging the importance of the senses in design, the human understanding justifies the consideration of these qualities and in general, however, there are additional, more specific, systems of beliefs for considering the arguments that characterize the culture in design, which emerge from human creativity, by the combination and interaction of different arguments and weights. In conclusion, we can affirm that systems of beliefs are relativist, varying from the observer.

ELEMENTS THAT CAN IDENTIFY PORTUGUESE DESIGN

A system with a great amount of data to obtain less information is said to have a highly disordered structure, and induces in the observer a huge ignorance. On the contrary with an orderly and well organized structure, with a set of data with few elements, one can obtain all the necessary information. In short, the degree of knowledge we can have over a determined system is maximized if its uncertainty is zero (Duarte, 2013, p.125). To do so, a method has been developed to calculate the information amount that events generate in the observer, tested in several domains, in studies related with the loss of cohesion from a society before events related to epidemics, or the effects caused in an army before loss in combat, or still with the detection of faults related to the tannery industry, or the determination of fibers distribution in paper industry.

Lidwell (2010, p.13) states 125 arguments in Design that he refers as “principles,” consist of laws, guidelines, human biases, and general design considerations. The principles were selected from a variety of design disciplines based on several factors, including utility, degree of misuse or misunderstanding, and strength of supporting evidence. From those principles, eight were selected that can be used to identify the Portuguese identity in design, they are as follows:

- Accessibility: the principle of accessibility asserts that designs should be usable by people of diverse abilities, without special adaptation or modification. Historically, accessibility in design focused on accommodating people with disabilities. As knowledge and experience of accessible design increased, it became increasingly clear that many required “accommodations” could be designed to benefit everyone;
- Closure: the principle of closure is one of a number of principles referred to as Gestalt principles of perception. It states that whenever possible, people tend to perceive a set of individual elements as a single, recognizable pattern, rather than multiple, individual elements. The tendency to perceive a single pattern is so strong that people will close gaps and fill in missing information to complete the pattern if necessary;

- Cognitive Dissonance: cognitive dissonance is the state of mental discomfort that occurs when a person's attitudes, thoughts, or beliefs (i.e., cognitions) conflict. If two cognitions agree with one another, there is consonance, and a state of comfort results. If two cognitions disagree with one another, there is dissonance, and a state of discomfort results;
- Consistency: according to the principle of consistency, systems are more usable and learnable when similar parts are expressed in similar ways. Consistency enables people to efficiently transfer knowledge to new contexts, learn new things quickly, and focus attention on the relevant aspects of a task;
- Convergence: natural or human-made systems that best approximate optimal strategies afforded by the environment tend to be successful, while systems exhibiting lesser approximations tend to become extinct. This process results in the convergence of form and function over time. The degree of convergence in an environment indicates its stability and receptivity to different kinds of innovation;
- Hierarchy of needs: the hierarchy of needs principle specifies that a design must serve the low-level needs (e.g., it must function), before the higher-level needs, such as creativity, can begin to be addressed. Good designs follow the hierarchy of needs principle, whereas poor designs may attempt to meet needs from the various levels without building on the lower levels of the hierarchy first;
- Priming: consider priming in all aspects of design. First impressions, contexts, and antecedent events are all opportunities to influence subsequent reactions and behaviors — this includes the way products are presented in packaging, the articles adjacent to advertisements in newspapers, and the experiences leading from the parking lot to the entryway of a retail store. Favor indirect primes over direct primes, as the former tends to be more persistent and leaves no trace;
- Structural forms: structures are assemblages of elements used to support a load or contain and protect things. In many cases, the structure supports only itself (i.e., the load is the weight of the materials), and in other cases the structure supports itself and additional loads (e.g., a crane). Whether creating a museum exhibit, large sculpture, 3-D billboard, or temporary shelter, a basic understanding of structure is essential to successful design.

We are thus before a probability: the measure of certainty of who we really are, is obtained by the combination of arguments we presently dispose, knowing that there is a weight for each argument. This set of arguments, plus each argument weight is, in turn, the system of beliefs (Melo-Pinto, 1998, p.77). Finally we can also state that before the same set of data, different Systems of Beliefs will also give different results.

EXEMPLES OF ELEMENTS IN PORTUGUESE DESIGN OF FURNITURE

For Ratner (2003, p.198) 'Tactile aesthetics' are an important field to understand elements that can characterize the Portuguese design of furniture, as for Rognoli (2003, p.132) focused on creating a project's tool that could bring a contribution to understand the culture of industrial design as a complex picture of different set of elements, like an action that will always be committed to its shared System of Belief, and as such it is

responsible for values, ideals, feelings and actions transmitted to those who are or were part of itself.

Today we know that the supposed commercial failure of some products is due not only to problems related to an operative-functional nature, but also because they didn't made sense to the aimed target. Hence we can state that this is a consequence of something that does not fit with the positivist perception of a certain user (Duarte, 2013, p.127).

But what is the real perception of value that the identity elements of Portuguese design transmit to us? What aspect or sense should we allow more or less importance in Portuguese design?

In case of Portuguese furniture has a solid association with the past and convention. The qualities obtained by the subject over ages enable us to build up a connection with the artificial universe, affinities for the item, both in tasteful appearance and in structure, shading or material, method of utilization, usefulness, or history item is proposed to 'check'. Accordingly, objects that contain pictures suggesting past encounters, can, immediately, inspire the consideration of its client by bringing out an aggregate memory of ceremonies, qualities and practices. The taste and the choices of the person are fundamentally adapted by their way of life, in the social and anthropological existence that helps their everyday life (Baptista, 2012, p.45).

Thus, in parallel with the French industry, the original Portuguese production appears (Guimarães & Sardoeira, 1924, p.28). We produce objects reputed for excellence, both in terms of raw materials adopted as the design of the design, technical and aesthetic solutions, and the perfect execution of the artist like the ones we can see in Figure 2 and then compare them with the ones from Figure 1. What do we have to help us identify our belief system in terms of the proposition we want to achieve?

Figure 1: Maison & Objet Paris Fair
Pictures of inside the Maison & Objet Paris *Fair*

Figure 2: Portuguese Furniture Producer in France
Pictures of Portuguese Furniture Company Duistt.

Portuguese culture not just went with the Portuguese recorded procedure by denoting its quality around the globe, yet in addition turned into a marvel of importance on a world scale. It was emphatically affected by a decent variety of people groups and traditions throughout the years that left their follows and a mixed social and material heritage unmistakable all through the Portuguese territory (Guimarães & Sardoeira, 1924, p.30).

The adaptability of Portuguese Design in a Furniture Fair in Sweden, where it's possible to see similarities between furniture pieces, but it is also possible to comprehend the differences in the shape, colors and size of the pieces, the principles of Structural Form and Consistency can be applied here, and it will need further testing to prove it. But can our system of beliefs validate similarities between two different forms of production and elements?

Figure 3: Stockholm Furniture Fair
Pictures of inside the Stockholm Furniture Fair

Figure 4: Portuguese Furniture Producer in Sweden
From left to right: Wewood, Marques & Silva, Lda., Bud.

The tradition of the Portuguese people has strengthened the relationship between culture and history by assimilating values that preserve the possible and desirable cultural identity. Thus, the strong aesthetic knowledge, the mastery of artistic execution, the absorption of styles and the use of materials marked the very specific way of reinterpreting and structuring various cultural influences. There are new technical processes that influence the structural and decorative set of Portuguese art and combine its artistic character with the Portuguese way of life (Baptista, 2012, p.40).

In this way, the use of artistic decoration or the use of noble wood originated elegance, organic and decorative quality to Portuguese furniture (Guimarães & Sardoeira, 1924, p.30).

CONCLUSION

Krishnesh (2003, p.181) makes reference that designers need to look into these aspects and design products that take care of these issues. They have to design with highly

sensitive senses and sensibilities. Only then can design be truly responsible and delightful and help improve the quality of life.

The quantity and complexity of accumulated knowledge led to increased specialization among designers, and breadth of knowledge was increasingly traded for depth of knowledge and as designers become more specialized. By acknowledging this factor, the true value in Portuguese design can be truly appreciated and contemplated knowing the bases in which it is created.

The system of beliefs is supported by the meanings in function of the arguments that are applied to them. It's a relativist point of view because it always depends of the observer, the designer, the school of design, or even the society in which the observer is inserted in. By applying Krishnesh's sensorial elements combined with Lidwell's principles, we believe that it's possible to identify the value in Portuguese design.

As main objective we will address different aspects that may characterize the different circumstances that contributed to the specificity of Portuguese design, whether related to geography and local historical heritage, culture and traditions, as well as the concepts of place, belonging, identity, memory and senses as a belief system of Portuguese design.

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The problematization in the design process

Case report proposed in workshop

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INTRODUCTION

This article aims at reporting strategies used in a workshop that sought to elucidate reflections about matters much discussed in the area of design today. The challenge was offered to a group of design students who participated in the activity performed in the 13th International Week of European University in Lisbon, 2019. Aiming to address the issues raised and to find a creative and pleasant format in the act of designing, the activity proposed theoretical introduction to the theme and followed guided by small actions based on tools of traditional methods merged, as well as periods of reflection about design topics for innovation and design for sustainability, being that the latter was one of the central issues of the event. The intention on end was for participants to find conceptual proposals in response to identified opportunities for them. The solutions were analyzed as closure of the meeting by class in order to show that, within a well-organized process, a multidisciplinary team manages to get the results of the most diverse contexts of project in the area of design. Still it was possible to perceive, within the purpose of the meeting, issues relating to the defining moment of the project, when it was requested that an opportunity to project should be identified and the result of this article is based on observations of this specific stage of design method proposed in the workshop. The focus is on the stage of problematization seeing that the activity was performed as a way of collecting data for the development of the doctorate thesis of the author. Practical activities, such as described in this paper, serve to support the observation in various contexts in the construction of this perspective of problematization in the design area.

LITERATURE REVIEW

In order to present an overview of the context addressed in the workshop there is a theoretical repertoire of each subject treated. The conceptual basis exposed in the meeting is used as a reference point, which helped to clarify and situate the group of academics in the context of design that was being proposed. It can be said that design is a project activity, which develops plans, sketches or models, after all what the designer does is essentially and above all the project; their actions are not limited to drawings and are not related only to the aesthetics of products (Matté, 2008). Design primarily seeks to solve problems through the design method, which is a specific way to seek innovative and satisfactory solutions (Forty, 2007). These solutions and problems worked on in design projects demand in their majority of needs of society (Redig, 2006), so the goal is to deliver results that fill gaps existing in the daily lives of the target audience of each

project. For being a project activity and the fact that the area is interdisciplinary it is necessary to absorb information from several other sources of knowledge for the correct development of each project (Cipiniuk and Portinari, 2006). A design project deals with several factors at the same time, and these are related to ergonomics, perception, anthropology, technology, economics and ecology, in order to design structures necessary for the life, well-being and culture of human beings (Redig, 1977). Thus, design is the "process of adapting the artificial environment to the physical and psychological needs of men in society", in other words, the design aims to make the environment as appropriate as possible to those who will use it (Löbach, 2000, P. 13).

Every design project has a stage of creativity, in which possible answers to the design problem are built. Creativity needs to be worked on and therefore numerous techniques are used to add value to the project, after all, creativity is a way to transmit new ideas and generate new concepts. It can also be said that it depends on productive and constructive attitudes that result in actions or achievements (Lowenfeld, 1974). It is believed that creativity represents deep and abstract feelings, allowing to express them through imagination, which is the thought directed to the freedom of ideas. Thus, one can consider that to be creative is to think outside certain standards, act according to the instinct and self-will, as the very widespread concept of 'thinking outside the box' in the search for solutions and alternatives in different contexts. The creativity in Design is the differential factor of the projects, with specific moment in practically all the methodologies proposed in the area, it allows the use of several strategies for designers to leave their comfort zone and develop differentiated proposals for solutions in their projects. Therefore, it is a way of acting and thinking without barriers or limits, which opens up countless possibilities for the generation of alternatives and is flexible in its various forms of use, being considered a relevant stage of the processes in the design area (Kneller, 1978).

Another constant objective in design projects is innovation, which is often confused with invention and originality because it seeks new strategies and results different from those that already exist. Innovative proposals always come from an association of already existing concepts and the ideas resulting from these associations are disseminated by responding in a new way to the needs that were already under consideration. It does not mean that there is no innovation, but the fact of presenting a new form of use, strategy, logic or organization in a context can already be considered something innovative, it can be through a product totally new in its characteristics or circumstances, or an improvement in something already existing, but that provides a new perception about the object in question. As soon as the innovative proposal is accepted by users one can also notice economic or social return. The innovation in the design occurs during the project and in order to propose improvements aiming at innovation it should be thought that it needs to be significant, its relevance occurs in the scope of characteristics or expected uses, thus relating to "technical specifications, components and materials, embedded software, ease of use or other functional characteristics" (Oslo Manual - OECD, 2005). In design, innovation is the objective of projects, so many strategies are carried out in the search for innovative results, which can generate economic evolution, add value to the object and adapt the market creating competitive differential in the sector. (Pinheiro, 2004; Design Council, 2011). Within the concept of design for innovation some other issues should be considered for the projects, such as the analysis and verification of trends in the scenario in question, the way in which the evolution of the product or

problem to be worked on occurred, benchmark study - which is the product that is best positioned in the sector at the time of the project, and the search for the forecast of scenarios and contexts, in order to verify how the innovative proposal could fit when made available in the market. In view of this, developing projects focused on design for innovation is to intermediate the wishes of the target audience with new technologies (Tezel, 2012).

Finally, the last relevant issue addressed in the workshop and that has project demand in design is sustainability whose concept is related to "sustain", i.e. that provides basis, support, anchor, which does not allow a fall. Given this, it is clear that in fact the term aims to "conserve, maintain, protect and nourish, feed, prosper, subsidize, live, always maintain the same height and always conserve well" (Boff, 2012). Consequently, it was put on the agenda the understanding of the "three pillars of sustainability" that by definition seek the balance between the scopes: economic, social and environmental. Considering the objective of the term, to balance these three concepts in a project or context it is necessary to encourage economic progress, intensifying social equity and minimizing the use of natural resources and tailings production (Lozano, 2012). In practice this principle should govern the way beings care for and exploit the available means, and their commitment to the next generations in order to allow them also to have resources necessary for life (Manzini and Vezzoli, 2008). According to De Moraes (2010) "the design is a protagonist within the trilogy environment, production and consumption", thus has responsibilities and power of design decision that directly affects the way projects are developed and the types of products that will be available to consumers. Then the designer should "connect the technologically possible with the ecologically necessary, giving rise to new proposals socially and culturally appreciable", which meets the three pillars of sustainability (Manzini and Vezzoli, 2008). In the current scenario, it is advocated that an effort be made to transition from a "consumer society" to a "use society", in other words, stop consuming and producing products and start thinking and promoting the development of services. After all, there is no point in minimizing the production of products or waste, the issue is to change the progress format of the system as a whole (Kazazian, 2009). Issues that should be considered in the development of design projects that focus on sustainability are related to the impacts generated, necessary resources and ecological footprint throughout the process, use and post use of the product. In addition, care should be taken to avoid misleading marketing in relation to the sustainability of the project solution when made available to the consumer, as well as checking that there is no specific product life time programming (scheduled obsolescence) and analysis of the entire life cycle in question.

Thus, it is important to emphasize that creativity provides innovation in projects and both can be used as partners in the pursuit of sustainable development, after all they are responsible for "giving the necessary impulse to the entrepreneur in order to imagine products or services that meet more the needs of customers (and the planet) using fewer resources" (Kazazian, 2009). In order for all this to be applied to a project, it is necessary to have initial strategic planning that defines how the process will be carried out. Thus, in design, project methods are used as paths to follow in the development of the process, after all the method is the way to reach an objective, a previous program of systematized operations that must be performed, lastly, the way to proceed before the opportunity. The method in design can be understood as a grouping of strategies and techniques that helps to determine the scope of the project (Bomfim, 1995). The design

process identifies and defines the order and type of interactions that will be carried out and necessary to reach the solution of the opportunity. The methods in the design are logically organized ways of going from the opportunity to the desired outcome of the project. According to a study carried out, it is essential that the designer is able to "know techniques of project methodology, including systematic work of identification of project problems, creativity, definition of objectives, data collection and analysis, generation evaluation and decision options", so the proposal described addresses each of these topics, even if it only analyzes the phase of problematization in the process (Abramovitz and Monteiro, 2005).

METHODOLOGY

The article can be considered a case study report, since it discusses a specific case in a real context and seeks to show 'how' some situation happens (Yin, 2001). In this sense, it seeks to analyze reality without the need to use specific techniques, but organizing data and preserving the social character of the object studied (Goode and Hatt, 1979). Thus, the study can be classified as descriptive approach that aims to explain characteristics, identify possible variables and discover the existence of associations between these factors (Gil, 2010). Aiming to detail the information about the situation analyzed, this report deals with the process of problematization in the design projects, which occurred in the first workshop held, of a series of five, that will be executed during the research and data collection of the author's doctoral thesis in academic environments. The objective is to observe in each activity the dynamics, facilities, difficulties and ways found by the academics to define their project opportunities in design aiming at the development of large, innovative and sustainable projects. The case of this first workshop was proposed to a group of academics who participated in the activity held at the 13th International Week of the European University, in Lisbon, 2019. Aiming to address the issues already mentioned and find a creative and pleasurable format in the act of projecting, the activity proposed theoretical introduction to the theme as presented in the referential and followed guided in project practices. The group of students who participated in the workshop was made of 32 academics from the design course of IADE - Creative University.

The relate - case

After this theoretical introduction which happened in the format of discussion and questions with the class, the workshop started its practical stage with small actions based on tools of mixed traditional methods, as well as periods of reflection on topics of design for innovation and design for sustainability, the latter being one of the central subjects of the event. For the performance of the activities proposed, the class was randomly divided into eight groups of four students and the tasks were timed by the workshop lecturer. Each group built a briefing based on its initial discussion of possible project issues in the theoretical context presented and the briefings were exchanged between the groups in order that none developed its own project idea. At the end, the participants were asked to find conceptual proposals in response to the opportunities identified. The solutions were analyzed as a conclusion of the meeting by the class in order to show that, within a well organized process, a multidisciplinary team can achieve results from the most diverse project contexts in the design area. It was still possible to perceive, within the objective of the meeting, questions regarding the moment of definition of the project, when it was requested that a project opportunity be identified and the result of

this article is based on the observations of this specific stage of the design method proposed in the workshop. The activities developed in the workshop are presented in the following chart:

PROBLEMATIZATION 50 MINUTES	CREATIVITY 35 MINUTES	DEFINITION 35 MINUTES
• Group discussion • 5W2H • Context Analysis • Target Public Analysis • Scenarios • Personas • Briefing • Counter Briefing	• Mental Map • Brainstorming • Moodboard • Project Concept • The 30 circles • Random alternatives • Drawing against time • 635	• Decision matrix • Voting • Choose • Differential • Presentation • Final refletion

Chart 1: Workshop Method - Activities

The way in which the activity was conducted meant that the problematization stage was the most worked on, but the method proposed for carrying out the tasks in that stage meant that the academics did not realize that they had devoted so much time to this phase. This can be considered a positive point, since it is clear that there are strategies that can be used in the classroom and that make the academics better develop the research and analysis necessary for the projects, realising the importance of these tasks, but without relating them to a phase normally considered less interesting in the project design. This can encourage them to carry out a more coherent stage of problematization in a more dynamic format through the use of tools related to project analysis. The focus is on the problematization stage since the activity was performed as a form of data collection for the development of the author's doctoral thesis. This is because after following project disciplines for a few years in the graduation course in design, it was noticed an inconsistency in the relevance and seriousness spent by the academics at this time of project. Thus, as doctoral delivery the goal is to propose a strategy that assists undergraduate academics in this very important phase of the design process. And practical activities, such as the ones reported in this article, serve to support the observation in various contexts in the construction of this perspective of problematization in the area of design in which it is being studied.

INTERPRETATIONS

Focusing on the stage of problematization of the workshop, which as one can see took most of the time and attention at the meeting, the project opportunities defined by the eight group are presented below: Group 1: Cleaning the sink after shaving; Group 2: Forgetting the keys to the house; Group 3: Group 5: How to find the car in an underground car park; Group 6: Discomfort in public transport; Group 7: Food waste in restaurants; Group 8: Lack of parking spaces in Lisbon. It can be seen that there is no standard for the opportunities selected among those identified by the groups. Each group listed about 3 or 4 project opportunities when they started the work, but the first options, the written ones, were related to solutions and not to the problems themselves. Thus, it is clear that there is a difficulty on the part of academics to identify and outline a design problem. Basically what the groups were able to explain were ways they thought about to solve the situation, but practically none of them had the ability to define the problem in one sentence. The assistance at this stage had to be directed with each group individually, to instigate through questions and have them visualize the opportunities

they were reflecting upon. All the groups made proposals related to personal issues that they observe in their daily lives, which may explain the reasons that led them to start defining the problem already thinking of a solution. It was noticed that from the moment they knew that it would be another group who would seek a solution to the problem they were defining, it became more evident their unpreparedness in making a precise cut that defined the opportunity. However, it became clear that the seriousness in having to pass on the information was imperative for the groups to be able to establish in a more coherent way what they would like to carry on as a project.

Only one group thought about problems directly related to the topics presented at the beginning of the workshop, all the others searched for situations in their daily lives, only group 7 dealt with a topic that enabled design projects aimed at sustainability and innovation. This shows that the designer, at least as an academic, is unprepared to deal with the stage of problematization of projects, within the scope of defining the opportunities. The project is not carried out because the designer wants something but because there is a need to solve some issue. In addition, it can be observed that if the workshop was not being guided by the methodology detailed above, the academics constantly demonstrated the willingness to skip steps and few were the records made by the groups until the time they did not know that they would deliver all the material they were developing. The use of the pre-established method made all the groups deliver a result, but it is noticed that whenever possible the groups did not finish the proposed activities or skipped steps, getting attached to the first idea of solution they had.

During the final discussion, some questions were put to the large group participating in the workshop, they were: i) In relation to the theme - application of initial concepts (sustainability and innovation) during the development of the project did you think to apply or did this get lost in the way? Even though the questions were so urgent, why do we sometimes only produce more and more without thinking about other possibilities?; ii) The process - what did we have to do? What would they do differently now if they started again? What is the most important step (personal opinion)?; and iii) About the outcome - what did you get was what you expected when you thought about the opportunity? If they had developed their own briefing, would they have thought of a similar outcome? Would they have abandoned the 'idea'?

After almost three hours of workshop a few participated in the final reflections; it is also believed that when these were put into discussion, many may have noticed inconsistencies or lack of relationships that they could have made throughout the proposed activity. In relation to the theme, those who spoke commented that they knew the importance of the themes and that only at the moment of thinking about the opportunity of the project they realized that they could have searched in another way other than thinking about their daily lives. However, everyone claimed that in the development of the project they tried to keep the issues in focus to apply in the solution.

Regarding the questioning about the process they did not say that they would do differently and some claimed that they would not know how to define the steps to be taken. Those who expressed an opinion on the importance of the steps drew attention to the analyses, saying that if they were not carried out well they would not be able to develop the project, and that they had difficulties in understanding the project request, that it was not possible to capture the need in the way it was described and that only after more

conversations with the group that had made the briefing they managed to understand the objective of the requested project. And finally, all the groups were asked about the result and generally responded that they liked the solutions delivered. Some would have solved their own briefings in the same way and others had not thought of anything similar to what they had received, but all agreed that the solutions they received met the demand proposed in the briefing.

CONCLUSION

After the realization of the proposed activity, some important points can be noticed in the design process organized for the workshop. It is necessary to raise awareness and give greater emphasis to the stage of problematization in the academic teaching of the area. It is not based only on the reported activity, but years of classroom experience of the three authors of this article. It is noticeable the urgency to highlight the initial phase of the project; the moment of identifying the problem and formulating it is not only that of choice or establishment of the problem itself, but also involves understanding of it. In other words, the entire part of research and analysis performed in the design process is at the stage in question.

The academics show interest in the phase of generating alternatives and the eagerness to act upon it, but even realizing at the end of the projects that they should have invested more time and dedication to their initial stage they always seek the practical part of the project first. Many times, when the group of academics has no profile or interest in modeling and detailing for example, this same mistake is perceived in the final stage of projects, so all the effort is concentrated only in the stage of creativity. The designer is not only responsible for the creative process of the project, but must follow all stages of it. In addition, it is clear that, as already disseminated by numerous authors in the area, a project scope, which means, a previous organization that defines the method to be followed, is essential for a positive progress in design projects, but for this it is also necessary clarity and understanding of the need for each step and tool used. And the awareness of the seriousness with which one should work a method is also something that needs reflection in the academic world of design, since carrying out a project following a method seriously does not mean that it is not flexible, so this in no way fixes the work of the designer, on the contrary, serves as a basis and gives credibility to the process and the professional.

A workshop report is not enough for conclusions about the design project method, it only describes a specific situation and indicates the strategy used for the observation and collection of some data for further analysis. As mentioned, this report was from the first of five that are being conducted in the same format and proposal. With the description of its organization and analysis of each activity it is possible to compare them after they have all been performed, as well as other important factors: participants, context, location... With all these data that can be compared and with the replicated workshop it will be possible to obtain more assertive conclusions about the design process and the stage of problematization in the academic world.

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Imagery Analysis in the Cultural Sector:

A study of brand visual trends mapped in repertoire dance companies

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ABSTRACT

The present article aims to present the application of a possible method for mapping visual trends in the context of dance group brands. This text is an integral part of the Doctoral thesis on Design. The study presented in this article presents only a part of the analysis proposed in the research through a comparative study (case studies) on the visual behavior of the imagery component of three repertoire dance companies from different countries: CNB - Companhia Nacional de Bailado (Portugal), the New York City Ballet and the SPDC - São Paulo Dance Company. The main objective of this article is to test a process that can be able to synthesize and analyze the images of dance brands, through a mix model developed for the examination, systematization. The proposed model allow to compare the collected images in order to clarify tendencies of the photographic style used by companies of great expression in their contexts. In support of this analysis is a literature review on the subjects under discussion that aims to establish bridges between the theoretical and pragmatic process. As a result, it was possible to establish some similarities between the brand language approaches of the different repertoire dance companies analyzed in this study.

Keywords: Brand Language; Visual identity; Imagery; Dance

INTRODUCTION

Joly, Lancien, Le Mée, & Vanoye (2011, p. 214), affirm that imagery is the term that designates the set of images from the same origin or inspiration.

Thus, the present article aims to present a set of images of the same inspiration, that is, images that make up the visual identity of dance marks. Through the composition of visual mosaics that seek to identify the visual trends found in the images of the dance companies included in this study.

For this, a comparative analysis is proposed between three repertoire dance companies in different geographic and cultural contexts: CNB - Companhia Nacional de Bailado, SPCD - São Paulo Companhia de Dança and New York City Ballet.

Vilas Boas (2010, p. 63) reports on the inevitability of visualization, which obliges us to not only interact in a predominantly visual way with everything around us, but also our tendency to consume images wherever we are.

The images are part of the brand identity, which according to Oliveira (2015, p.47), is established by the presence of four basic elements: name, typography (s), symbol, color (s), along with the graphic as they also describe Olins (2008) and Mollerup (2017). But Oliveira (2015) emphasizes that imagery, form (s), sound/voice and movement are also part of this system that complements the essence of brands.

In the present study we intend to focus only on the aspects about the imaging and the use of a method that can help this type of analysis. When searching for the existence of trends in the images, seeking to perceive differences and patterns between the images in a pragmatized way, in which parallelism allows for comparison, as well as in the model developed by Rosado (2015, p.8), which through careful observation and systematized, the author (2015) states that it is possible to identify and perceive a set of specific characteristics, as Tufte (2006, p. 137), reiterates that if the intellectual task is to make comparisons, as in almost all data analyzes , so "show comparisons" is the design principle.

However, it is intended that an excess of logic does not interfere too much with interpretation because, as Vilas Boas (2010, p.11) points out, the obsession of interpretation may lead to the intellect overlapping with something that predominantly refers to affectivity , running the risk of thus muddying our sensibility.

OBJECTIVES

The objective of this article is to test the first phase of a model that is under development. The first phase is based on searching, identifying, systematizing and analyzing the imagery of the dance brands analyzed in a short period of time (2 months).

At the end of this study we intend just to understand the global tendency of the imagery of the dance companies examined in this comparative case study.

METHODOLOGY

In order to carry out this study it was necessary to first develop the literature review, which according to Creswell (2014, p.27 and 28), aims to share the results of other studies that are closely related to what is being done, making possible the elaboration of the theoretical framework as well as the initial survey for the structuring of the proposed model.

As Tufte (1997 [2010], pp. 70-83) points out, the visual comparison of information, which emerges the notion of parallelism, connecting the visual elements by similarity and synchronization and thus revealing patterns and deviations.

For the accomplishment of this article, we opted to test an image analysis model that is being developed, in which aspects related to visual composition will be analyzed through a qualitative analysis on the elements that make up the imagery of dance brands.

Joly, Lancien, Le Mée, & Vanoye (2011: 214), affirm that imagery is the term that designates the set of images of the same origin or inspiration.

For this article an analysis was developed from a significant set of images based on a methodology created for the purpose that aims to identify components of the images

that reveal patterns of representation and that carry visual identity for a particular brand. The method is based on the observation, collection and systematization of images of repertoire dance companies during the same period of time, Rosado (2015, p.7).

Through the qualitative analysis of the elements that make up brand imagery, one seeks to map values that are relevant to the composition of the brand image of dance companies.

Thus, during the process of observation and analysis of the imagery, the other components that make up the image are isolated, such as graphic mark, typographic characters, or any other characteristic of visual identity that could identify them as being part of the image of a particular company.

Only through careful and systematic observation can we identify the attributes of the imagery that companies have in common as well as make it possible to identify images with visual representation within this (imagery) context.

The second phase of the analysis is when we isolate the images with greater representation of the whole, so that it is possible to analyze aspects such as context, support, frame, framing, angle of view, composition, shapes, colors and illumination and texture, Joly (2015 , p.105-118).

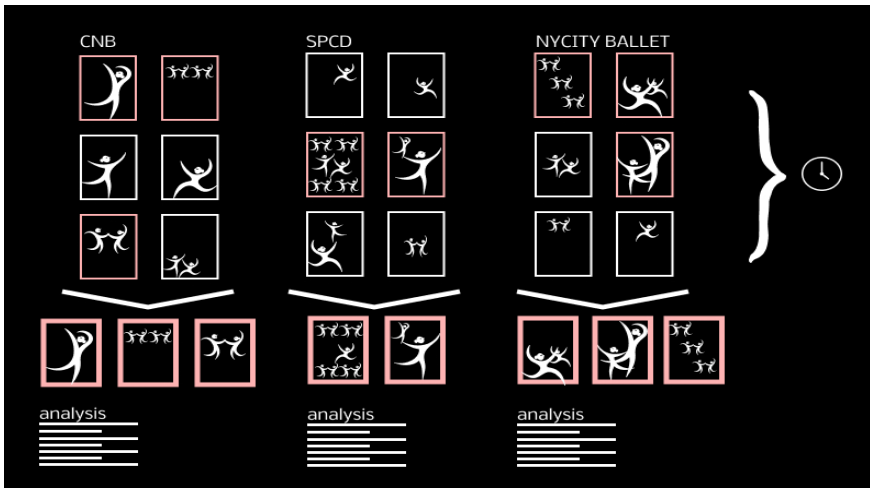

Figure 1:
A scheme of the comparative analytic mix model that is under development.

Through the comparative case studies model, it will be possible to compare dance companies in different geographic contexts over the same period of time, allowing for reflection on aspects that influenced the companies' imagery in a given period.
In this way, the model developed seeks to merge different types of analysis, such as the traditional example of analysis presented by Joly (2015, p.120), Gervereau (2017, pp. 58-60), Rosado (2015, p.206-265), which propose the reading of the different elements that compose the image as well as models of analysis that allow the analysis through comparative models of image systematization such as Tufte (1997 [2010], pp. 70-83) and Oliveira (2015, p.356-359).
Afterwards, it goes back to the concepts of brand and we will have a blending of analyzes in which, the qualitative analyzes are crossed along with the characterization elements of the brands.

LITERATURE REVIEW

Branding

Raposo (2008, p.21), reiterates that branding is the project to create a brand (company, product or service) in a market, positioning it to establish an emotional connection with your audience passing him to assign a certain value.

Wheeler (2009), who characterizes the branding process by listing the steps that make up the branding process, crystallizes the concept of branding by defining it as an effective branding strategy that provides an idea unifying center around which all behaviors, actions and communication are aligned. It works on products and services and should promote effectiveness over time.

Olins (2010, p.30), affirms that the main identifier of almost all brands is the logo. However, the author also affirms that there are 4 vectors that reinforce the idea oftangibility of the brand, which we can mention: product, environment, communication and behavior. This being perhaps the clearest way to understand how the brand becomes tangible is to look at it through the four vectors that it manifests.

Therefore, the composition of the brand language should provide a central unifying idea in which all brand-related behaviors and actions must be aligned in order to contribute to the establishment of an immediate connection with the public.

Brand Language

Lupton (2013, page 132) states that a brand language is more than a logo. It is a system of design elements, such as color, shape, image, texture, typography, patterns and materials, created to communicate the values of a specific company or public.Oliveira (2015, p.209), also agrees that visual language is the set of elements of the visual system, combined in a fusion that must convey the visual discourse of a particular brand. Thus, all these elements and values carry us into the universe of a brand that goes far beyond just a graphic brand, as Lloyd Northover (1993) quoted Oliveira (2015, p.10), "it takes a lot more than a clever logotype to create a powerful corporate brand".

The imagery is manifested as one of the relevant areas for the representation of the brand language of the dance brands presented in this study since, as Goliot-Leté, Joly, Lancien, Le Mée, & Vanoye (2011, p. the term that designates the set of images of the same origin or inspiration. Thus, this study consists of a set of images of the same inspiration and the same theme as part of a system of elements that make up the language of the marks and which in turn transmit the atmosphere (look & feel) of the dance marks.

Visual Culture

Villas-Boas (2010, p.38) refers to Alexandre de Melo, which characterizes the process of cultural globalization as "as a notable trend of evolution in progress and not [...] a final situation, and closed" (1998, p.38).

In this sense, the uniformity caused by cultural globalization can be perceived through the tendencies in the culture of globalization. In the analysis proposed, it was possible to perceive the uniformity of the images that follow the same photographic style, even though they are in different geographical contexts (Mirzoeff, 2003, p.23), that the hyper-stimulus of modern visual culture, nineteenth century to the present day, has been devoted to trying to saturate the visual field. However this process constantly fails because every time we learn to see and connect more quickly the culture globalization al

to produce more diversities hyper-regulates the visual field of the viewer but fails as one learns to see and decode this same saturation of images more and more rapidly.

Voyeurism is an important component of today's visual culture, particularly through photography, for its "faithful" representation of reality, Vilas-Boas (2010, p.60) reports. The same author (2010, p.61), cites the authors Sturken & Cartwright (p. 72, 73), in which they affirm that psychoanalytic theory best explains our pleasure in seeing images, linking our desires to ours visual world: "we can have intense relationships with images precisely because of the power they have as much to give us pleasure as to enable us to articulate our desires through observation".

In this sense, Crow (2006, p.35), also tells us about the pleasure of reading images contained in advertising, which the author (2006) states that it was impossible to apply the principle of removing the layers of the image to reveal a hidden meaning. The viewer simply felt pleasure in them rather than decoding them. The photographic reading is linked to pleasure by the observation of the image, especially the images that are intended to represent an artistic side, in which a bridge can be established with the examples presented in this study.

It is only possible to decode the images and therefore enjoy the pleasure of admiring them because we can read the images, as Barthes (1977, p. 46), states that the variation in the readings is not anarchic, it depends on the different types of knowledge are the the same: practical, national, cultural, aesthetic - invested in the image and these can be classified, that is, converted into a typology.

WJT Mitchell cited by Mirzoeff (2003, pp.24-25), also reports on the composition of the elements that compose the condition of spectator, in affirming that the understanding of the elements that form part of the condition of spectator (the gaze, the fixed gaze, observation, surveillance, and visual pleasure) can be as profound a problem as the various forms of reading (the act of decoding, interpretation, etc.). Gervereau (2007, 41), questions the composition of the images by stating that "observing an image, other than with a simple intention of fleeting consumption, is asking questions."

Thus, the contribution of the analyzes provided by the dance images instigate the spectator's curiosity through the image. The consequence of the readings coming from the viewer may be diverse, but if the image has the capacity to seduce the viewer by moving the viewer to the theater and watch the spectacle widens the spectrum of notoriety and investment in an adequate imagery can prove to be fundamental in the brand image.

CASE STUDIES

We also used the comparative case study model because, as Creswell (2014) states, it can be both single-case and multiple-case studies that some areas (and authors) treat as a comparative case study method.

The criterion for the choice of dance companies is based primarily on the fact that they are repertoire dance companies, that is, they are dance companies that present different types of spectacle - classical, contemporary, modern dance, among others. As well as the fact that they are dance companies of notorious local and world knowledge.

CNB - Companhia Nacional de Bailado, presented its first show in 1977 at the Rivoli Theater in the city of Porto. Having as its second inauguration when in 1998 in occasion

of the Expo'98 the company gains own space in the Parque das Nações, the Theater Luís de Camões. It is a national dance company that reinforces the presence of Portuguese authors, such as Olga Roriz, Vasco Wellenkamp, but has in its repertoire works by renowned international choreographers such as William Forsythe, Nacho Duato, Ohad Naharin and others.

SPCD - São Paulo Dance Company was created in 2008 and carries out montages that include works of the XIX, XX and XXI centuries, from great classics, modern dance shows and contemporary works created by Brazilian and international choreographers. Since its founding, the company has acrolled 24 national and international awards and it is a company of great national circulation that has assumed an important role in the recording, memory and education and diffusion of Brazilian dance through various educational and social programs of the company.

The New York City Ballet, idealized by Lincoln Kirstein and the choreographer George Balanchine in 1933, has in its repertoire more than 150 works, most of them by Balanchine and choreographer Jerome Robbins. It is one of the largest dance companies in the United States and is widely recognized for its contributions to world dance.

In terms of graphic design, the three companies also have great relevance. The Estúdio João Campos at Lisbon Portugal, is the current responsible for the identity of Companhia Nacional de Bailado, and received in July 2018 important prizes in the work developed in the Company's logo as well as in the process of rebranding of the CNB brand. The corporate identity of the SPCD was developed by the architect, graphic designer, professor, PhD Vicente Gil, at the company's founding event in 1998. Its objectives were to characterize the dance movement and its variations throughout the company's logo. And the Pentagram designer worldly known graphic designer, Paula Scher was hired in 2008 to develop the new identity of the New York City Ballet, which purpose was to link the legacy of the legendary dance company to the new contemporary and dramatic aesthetic, through the font (DIN), used for the company logo, which refers to a stacked layers just like the buildings of one of the importante American metropolis. Therefore, it is considered in this particular study companies of great importance for the culture as well as for the design.

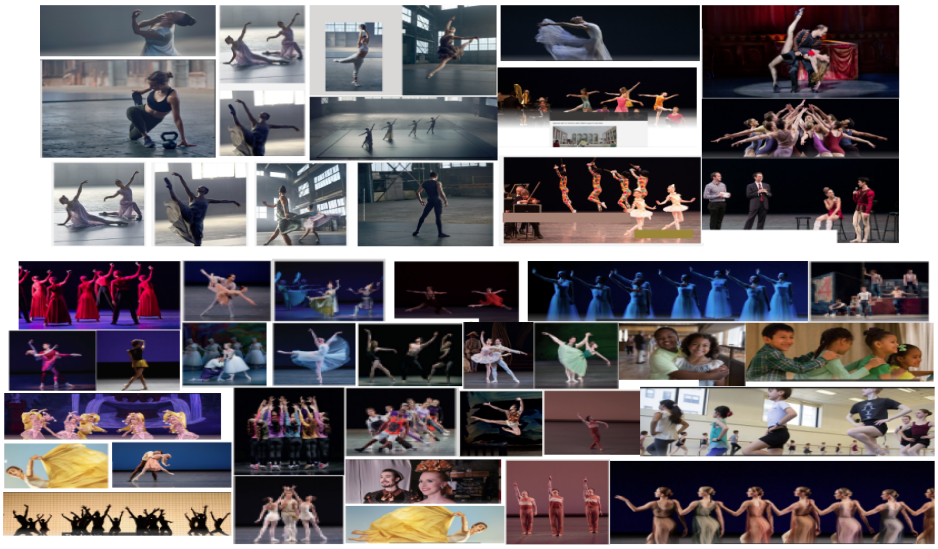

Figure 2 and 3:
Visual systematization of the images taken on the New York City Ballet website.

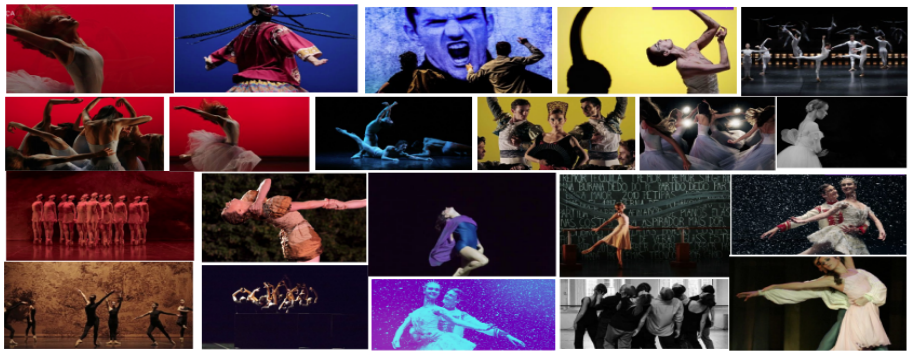

Figure 4:
Visual systematization of the images taken on the CNB website

Figure 5:
Visual systematization of the images taken on the SPCD website

CONCLUSION

Through this first visual systemazation it was possible to perceive a predominant style of photographic image before the other components that compose the universe of the brands of dance (Figures 2, 3, 4 and 5).
Through the analysis of the photograpies we can also highlight the presence of the dancers that is perceive through the centralization of the performer in scene.
And through the photographic record, it becomes possible to crystallize the art in scene, fixed in the time and space through the presence of the performatic body in motion in the three-dimensional space where dance takes place.
Another aspect that we can point out is about the space where the three-dimensional universe presented on the dance scene mostly where the spectacle takes place, we can realize that through the presence of the scenery, costumes, props and so on.
It was also possible to emphasized that through the analyzed images it was possible to perceive the representation of spectacles of different typologies (classic & contemporary), just through the observation and detailed analysis of the components that compose the photographic images. It was observed aspects such as the presence of costumes typical of classical dance shows as well as the representation of the movements presented by the dancers on the scene, if these movements are characteristic of those types of spectacle.
When reviewing the objectives and the methodologies proposed for this paper, we were able to test the analytic process that we are developing in order to search, identify, systematize and analyze the imagery.
Those analysis described below were based only by the applying of the first phase of the proposed model which is based on the qualitative analysis of the elements that make up brand imagery through careful and systematic observation we were able to identify the attributes of the imagery that companies have in common as well as make it possible to identify images with visual representation within this (imagery) context.

The process of analysis of those images that have a strong representation within the imagery is part of the second part of the analysis which still under development.
As the next steps we can list here, the intention to test the application of the complete model and perform all the analysis proposed in the model.
It is necessary to emphasize that this is an improvement model and that this study is part of a process within a thesis under development as mentioned above.

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Can a diverse and well-disseminated approach to speculative and critical design engage effectively with the complex systems and crises the Anthropocene Era?

A Reflective Study of Practice-based design research

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ABSTRACT

Speculative and Critical Design (SCD) is a design approach that attempts to challenge hegemonic attitudes about society by criticising current paradigms of thought and speculating about possible futures that breach the impasse of the perpetually reconstructed present. However, it has itself come under criticism that (1) it struggles to have much impact beyond its institutional habitats of the academy, the classroom and the gallery, and (2) more existentially, that it has tended to be practiced in a way that includes the very hegemonic viewpoints it claims to challenge in place of the more marginal voices it should, by definition, be listening to. This paper proposes a reflective study of speculative and critical design practice as a form of Research Through Design (RTD) to obtain a better understanding of how the practice of SCD can transcend this critique, building on previous work that has shown a use for this design approach in public engagement with science and in government policy making.

Keywords: Speculative and Critical Design, Reflective practice, Research through design, Anthropocene, transdisciplinarity.

INTRODUCTION

This paper takes as its central proposition that speculative and critical design (SCD) is a paradigmatic design approach well suited to engaging with complex systems and crises, if practiced in a way that is well disseminated and engages with diverse voices and communities.

It suggests a way to explore this proposition is through a reflective analysis of a practice-based speculative and critical design project that aims to engage diverse and conflicting communities of practice to orient constructively towards complex systems and crises.

This paper draws on the relational dynamics that have been proposed by Bruno Latour and Isabelle Stengers (Simons, 2017) to operate in this Anthropocene age dominated by techno-scientific society, whereby human and non-human things have agency to act

within a network, and the voice of non-human things, of nature, is capable to be heard, allowing for a politics of all things – a cosmopolitics.

Literature Review: An introduction

In this section, is presented a review of some of the literature which is foundational to this research project. Some initial considerations of the practices of speculative and critical design as a form of research through design, aimed at challenging prevailing paradigms of the present and the possible future, will be made. It will highlight some of the key features of speculative design as a form of speculative research, as well as some of the limitations and criticisms of the practice that provide the starting point of this project. These are that speculative and critical design can struggle to find relevance and exposure beyond its instititutional habitats—whether academic, pedagogic or gallery-based—and that it is often practiced in a way that expresses a rejection of normative thinking while simultaneously reinforces dominant paradigms and has a powerful hegemonic gaze.

These foundational assumptions frame the context for the research proposition that a speculative and critical design practice that includes diverse voices and is disseminated widely is well suited to engage with complex systems and crises.

The literature review then gives a consideration of the literature that informs the practice-based research that is a central proposition of this research proposal. There is a dialogue between some of the framing concerns and the subject of the research practice. The practice is not intended to sit outside of the body of the analytical framework, but to be integral to the concerns and impulses that guide it. These concerns are the ability of SCD to be impactful (Jakobsone, 2017; Prado de O. Martins, 2014); the dynamics around representation of hegemonic and marginal communities and identities (Jakobsone, 2017; Prado de O. Martins, 2014); the dynamics of complex techno-scientific-social networks and the problem spaces that they engender (Lanier, 2011; Simons, 2017); and the communities of identity that are mobilised into conflicting positions within these problem spaces (Latour, 2004); which is to say that it is a question of the politics of identity. Therefore, the speculative and critical core of the project may need to consider an engagement with identity as a political position within socio-technical networks.

Speculative and critical design

Speculative and critical design (SCD) is a form of research through design that concerns itself with the world as it could or should be; sometimes considered as separate disciplines, they are characterised by speculation about possible futures and alternative presents as a way of interrogating present issues critically. Such an approach may be a necessary condition for the meaningful evolution of the practice of design (Ferreira, 2003; 2008). SCD is defined as a challenge to the assumption whereby "design has been primarily regarded as a problem-solving practice [and has been] seen as a service activity that primarily addresses client's needs" (Mitrović & Šuran, 2016) (See also (Papanek, 1973).

In their introduction to the book Speculative Research (Savransky, Wilkie, & Rosegarten, 2017), the authors discuss the concept of the impasse of the present, whereby an awareness of the fact that the future may be quite different to the present—something that emerged after the French Revolution—has resulted in a paradigm where

futures are conceived and planned for through the lens of risk management, thus perpetually extending the paradigm present moment. Speculative research, in design and elsewhere, is a way of imagining alternative futures that breach this impasse.

The practices of speculative and critical design have a strong orientation to temporality and material artefacts, engaged with in an imaginative way (Auger, 2012; Dunne & Raby, 2014; Sterling, 2010).

Futures are often invoked as utopias and dystopias, raising questions of the universality of utopian beliefs: if something is someone's utopia, is it the dystopia of someone else? Frederic Jameson has suggested that "dystopia is in reality utopia if examined more closely" Gadanho, Laia, & Ventura, 2016, p?). In the present ideologically charged political environment, a critical engagement with utopian thinking becomes more important.

The anthology Contested Futures presents some key arguments regarding the role of futures and their intersection with design. Mike Michael has written about the sociology of expectations, and the way that futures (and pasts) only exist rhetorically. Any future scenario that is invoked exists as a rhetorical device, a way to persuade others of the value and necessity or otherwise of the future that is being invoked (Michael, 2000). In another article, Mads Borup and his co-writers explore the way that designing artefacts is a way of materialising that future in the present, making it more real and more 'present', and acting as a much stronger rhetorical tool for that future. (Borup, Brown, Konrad, & Lente, 2006).

Jakobsone also touches on this issue as she discusses one of the key ways in which speculative and critical design can be useful: normative or affirmative design tends to take place unconsciously within a particular ideological paradigm, and acts to strengthen that ideological framework by creating its physical manifestations in the world. (Jakobsone, 2017). A good example of this is anti-social architecture, the use of design to make prevent people from lingering and sleeping on streets and street furniture, an ideological practice that reclaims public space as a private resource. SCD is a design practice that can challenge and raise awareness of these ideological assumptions by materialising and disseminating other futures.

This touches on the notion of the materiality of time, the way that past and future exist through their materiality. In conversation with one of the authors, Andrew Gardner, an archaeologist at University College London explained that "artefacts are pretty important to the way human consciousness interacts with the world, and particularly we have a strong sense of the temporality of artefacts. They're an important benchmark I suppose for change, and continuity, and aside from the aging of our own bodies, they're the things that keep us located in time, that allow us to imagine both past and future times, and we have to do that in order to be able to operate in a daily basis." (Gardner, 2016).

This highlights the power of speculative and critical *design* over other forms of speculation, such as speculative fiction: designed artefacts can provide a bridge from the everyday to the imagined. Speculative writer and theorist Bruce Sterling (2010) has written about the use of 'diegetic' prototypes in design fiction, diegetic being term taken from cinema to refer to props that are fake but are designed to be real within the narrative of the film. He suggests that the diegetic prototypes developed in speculative design projects act to invoke and make real the potential futures and alternatives

presents, allowing those who engage with them to imagine the possible 'real' that they represent.

James Auger has written about the importance of imagination and creativity in building effective speculative artefacts, with the need to strike a balance between deliberate strangeness, intended to prime the audience to weirdness and to a world outside of the norm (like George Orwell's clock striking thirteen), and familiarity to ground the experience in the everyday. It's fundamentally a process of making the everyday strange, in order to achieve anything from an emotional reaction, to a change of perspective, to open up a space for dialogue (Auger, 2012).

Liene Jakobsone explores the argument, however, that SCD often isn't practiced in a useful way (Jakobsone, 2017). The focus tends to be narrow, dealing with white male first-world preoccupations, and while it aims to change the world, it often is poorly disseminated beyond the academic and gallery environments. The latter is being challenged by the use of the approach in public engagement and policy development settings—such as the Material Beliefs project (Beaver, Kerridge, & Pennington, 2009) that engaged the public with cutting-edge scientific research, or the UK Government's policy development project into the future of ageing populations (Voss, Revell, & Pickard, 2015); the former stands as a fair critique. In particular, Luiza Prado de O. Martins, a Brazilian speculative and critical designer based in Berlin, has argued that while SCD has aspirations to be critical of hegemonic mainstream attitudes, it often occludes the important social justice issues of "gender, race, class and ability" (Prado de O. Martins, 2014).

These then are key motivations for this research exercise: to explore a tangible usefulness for SCD as a practice that (1) transcends its institutional situations, and (2) is well suited to interacting with issues of identity in the Anthropocene Era –typically thought of as the era in which humans are the dominant influence on the planet (though Bruno Latour has a more particular definition of the term, as explained below) (Simons, 2017).

We live in an era when the complexity of socio-technical systems, or at least our perception of their complexity, threatens to overwhelm our ability to fully perceive them. Bruno Latour has characterised the way that we relate to these systems in his Actor-Network Theory (ANT), where he suggests that we exist in a complex network of actors, both human and non-human, with semantic (meaning) and material qualities (Latour, 2007). Within this network, actors have agency to act and to influence the agency and actions of the other actors; techno-scientific developments play a reciprocal role in shaping and being shaped by the network. Further, Latour and Isabelle Stengers have conceptualised these relations in a way Stengers has described as cosmopolitical: an encompassing politics where all things, human and non-human have a voice, and techno-science acts as the mediator by which the voice of things can be heard. In this sense, Latour reconceives the Anthropocene as the era in which we need to recognize the voice of things, of nature, as valid (Simons, 2017).

This suggests that the perceived boundary between the natural and the artificial loses its relevance, and that the artificial is subject to the same complex evolutionary dynamics as the natural world. This implies a space for hybridization, whereby the attributes of actors within the network can be shared, mutate and evolve. Donna Haraway describes this dynamic in her Cyborg Manifesto, where she suggests that "late twentieth-century

machines have made thoroughly ambiguous the difference between natural and artificial, mind and body, self-developing and externally designed, and many other distinctions that used to apply to organisms and machines."(Haraway, 1981, p.?).

To Pinxten, (Pinxten, 2018), this is related to a form of cosmopolitics that suggests humans need to find a way to acknowledge difference yet find common ground for co-existence. In the Stengers/Latour sense of cosmopolitics, it implies that all THINGS need to come to this accommodation. The suggestion is made of a tension between traditional western conceptions of personhood as a form of being, where the contexts and structures of a society shape humans into complete persons—a fixing to archetypes—and a post-post modern sense of personhood as a process, a dialogue with the world that is always in flux. This position is characteristic of post-structuralist and queer-theoretical conceptions of self and identity, whereby Noreen Giffney of Ulster University has suggested that 'identities become not so much categories to be occupied, protected or rejected, but spaces to be navigated, revisited, revised and elided on a moment-to-moment basis' (Barker & Scheele, 2016).

Faced with complex and ill-defined challenges (known as wicked problems), such as climate change, environmental damage and political extremism, it feels vital to engage with these dynamics of identity. Latour has written about the importance of giving voice to objects to make sense of complex, ill-defined systems, in what he has termed a parliament of things (Simons, 2017), and the fact that conflicts of identity cannot presuppose a pre-existing common ground, but that this must be created purposefully, by acknowledging the cosmopolitical necessity to mediate the relationships between actors in the network (Latour, 2004). Therefore, it is not only necessary to include the voices of marginalized people and groups of people, but of all marginalised things, of nature itself.

As described above, SCD has the ability to engage across disciplines and communities of practice, to transcend current paradigms of being, and to invoke in a material way alternative and critical future scenarios. The authors contend that such a practice can act to de-mystify or make less opaque the complex dynamics of socio-technical systems and, as such, can engage meaningfully in the complex systems and crises that characterise this Anthropocene Era.

Research methodology

This section begins with a review of some of the literature relevant to making reflective accounts of practice-based research through design, which has been established as the framework that will be used to approach the research questions, followed by a discussion of the choice of methodological approach.

This paper proposes a form of research through design, which is a reflective practice that involves using design activities as a way of generating knowledge, through creating artefacts and reflecting on the process, as described in some detail by Godin and Zahedi in their literature review of research through design (Godin & Zahedi, 2014). I will take methodological cues from the qualitative research methods of action research and grounded theory to ensure the academic rigour of the process, as well as applying conventional and experimental design techniques to generate material artefacts in a design studio setting as part of the research output.

The expected findings should take the form of a reflective analysis of a design process, alongside the artefacts that are the outputs of the research, where it will be assessed the impact of design activities as a way of obtaining meaningful engagements with some of the issues that will be addressed. It is expected that these outputs and reflections to be rich, surprising and multi-faceted.

The question of engagement through speculative and critical design was explored by Tobie Kerridge (Kerridge, 2015) in his PhD Thesis based on the Material Beliefs project (Beaver et al., 2009). Material Beliefs was carried out by the Interaction Research Studio at Goldsmiths aimed at exploring public engagement with science through a speculative and critical design approach, with funding provided by the UK's Engineering and Physical Sciences Research Council.

> "The project brought together a network of designers, engineers, scientists, and social scientists to explore potential implications of emerging biomedical and cybernetic technologies. The ambition was to produce prototypes, exhibitions and debates that would move scientific research out of laboratories into public spaces" (Beaver et al., 2009, p.3).

Tobie Kerridge used this project to explore the synergy between speculative and critical design and upstream engagement with science and technology—upstream engagement being engagement with the public at an early stage in scientific research, potentially helping to guide and shape the research itself. The overall conclusion that he reached was to "contend that this mixing provides an opportunity to foster a reflexive and empirical account of speculative practice, to engage in analysis of the organisations and settings that support a speculative approach, and to provide a critique of upstream engagement" (Kerridge, 2015, p.4).

He also provides an exemplar of the academic validity of reflective design practice, referencing a foundational work by Schön on reflective design practice (Kerridge, 2015).

The methodological approaches to both the Material Design project, and Kerridge's analysis of it, can provide a structure for this proposed research project.

As presented by the Interaction Research Studio at Goldsmiths, University of London, Material Beliefs progressed through four key design and engagement stages, which alternate between exploratory opening up of the design space, and focusing through activities of engagement:

1) **Scoping the Project**, where interviews with scientific researchers, workshops and project branding took place to try to create a scope and a frame for the project

2) **Engaging People**, where initial engagements were carried out with the public in relation to the themes of the research alongside student design projects

3) **Developing Designs**, where highly resolved speculative design concepts and prototypes were developed

4) **Provoking Debate**, where engagement events, exhibitions and publications were used to disseminate the design outcomes and generate public engagement and discussion.

Planning the research activities

As a methodological framework, this paper proposes a research approach that will adapt the structure of the Material Beliefs project and Kerridge's mode of analysis thereof; It

combines the scoping and engagement phases into a research framing phase, and add a final phase of reflective analysis, as follows:

Stage 1: Framing the research problem

A socio-technical attitude can be taken to the framing of the project, in terms of an engagement with complex systems and problems, and a problem space will need to be identified. Some possibilities of problem spaces that encompass the Anthropocene concerns of the boundary between the artificial and the natural, as well as foregrounding diverse and conflicting voices are the global climate crisis, and the crisis of ecosystem collapse and loss of biodiversity.

Regardless of the problem space that is settled on, there will necessarily need to be an engagement within a broad and diverse practice space, which should include biological and physical techno-scientific orientations towards the problem as well as more social, cultural and artistic orientations, such as performance and politics.

These initial engagements will take the form of framing interviews, workshops, ethnographic studies, design probes, design experiments, and design film-making. It is intended that the output of this first stage will be a rich and diverse body of research data, which will be expressed in documentation and a design film that combines elements of documentary and design fiction to act as both to frame the project and to act as a provocative lure for engagement.

Stage 2: Generative design experiments and innovation

This phase should involve the development of design responses to the project frame. These responses will range from collaborations with practitioners, student project challenges, and the development of design fictions and prototypes.

Stage 3: Creating dialogue

While this proposed research project should be characterised throughout by a process of engagement, this third phase will be one that focuses most specifically on engagement, both with practitioners and publics. It will involve sharing the ideas developed within the project, generating debate, and opening up avenues for people to engage in dialogue regarding the way their identities are constructed around complex problems. Like Material Beliefs, this stage should involve engagement events, exhibitions, and publications.

Stage 4: Reflective analysis of practice

The final stage should be a reflective analysis of the project, applying reflective qualitative methodological approaches taken from action research and grounded theory.

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Coworking Design Learning in the *Underground/Middleground/Upperground*

A Conceptual Framework

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ABSTRACT

We intend to explore a conceptual framework based on three lines of thinking/ work from Patrick Cohendet (Underground/ Middleground/ Upperground), Ray Oldenburg (The Great Good Place), and Fred Garnett (heutagogy or self-determined learning). To demonstrate the relevance and feasibility of such a concept we review the key factors and definitions of these authors and their work. Additionally, a brief comparison between a conceptual framework and a theoretical framework is presented. Moreover, this paper aims to help map our research work within the context of the Doctoral Programme in Design at IADE / Universidade Europeia, which triangulates Coworking, Design Learning, and Heutagogy. Ultimately, the aim is to generate new knowledge for a Coworking Design Learning model to be presented in our final doctoral document.

Keywords: Design Learning, Underground-Middleground-Upperground, Coworking, Conceptual Framework.

INTRODUCTION

Being a designer, a Coworking space founder and operator, a Design teacher, and a Ph.D. on Design student, I and my supervisors found ourselves right in the middle of an interesting situation. At the beginning of this Doctoral programme, we decided that it would be challenging and useful to research and investigate the bridging of possibilities between Coworking spaces, as new "work&learn" spaces, and the myriad of new models for Design learning.

Surprisingly, the first searches and reading for our investigation showed evidence of a lack of relevant literature connecting both fields, i.e Design Education/Learning, and the Coworking global movement. Moreover, given the wide spread of Design methodologies, and the adoption of Design Thinking into so many fields and industries, it is truly surprising that the number of books on Design Teaching is so small (Davis, 2017). Equally scarce is the literature on the Coworking movement, mainly due to its informal genesis, although the last years have seen an exponential increase in more relevant literature from researchers and scholars from interdisciplinary fields. A good starting point is the Coworking Library (https://coworkinglibrary.com/) ('Coworking Library', n.d.).

Perhaps the most challenging problem we have been facing since our initial research work was choosing either an existing theoretical structure for our thesis or designing a new conceptual one. It is important to point out that this is a common problem among doctoral students, and that this paper aims to reinforce the difference between theoretical and conceptual frameworks.

Ultimately, we decided to approach three concepts related to our first exploratory studies. Firstly, we looked to better understand how the Design Education field is mapped nowadays, tentatively identifying its connection with new learning approaches, and the broader social contexts of our times. To illustrate this, Cohendet's trilogy *Underground*, *Middleground*, and *Upperground* (Cohendet, Grandadam, & Simon, 2010) seemed to fit our purpose. Additionally, two other concepts grabbed our attention. *From Access to Content to Context* is a free and independent line of thinking from Fred Garnett's *The Heutagogy Archives* (Garnett, n.d.) investigating new learning processes [and new learners]. Finally, we needed to find an angle from which to fit the Coworking movement within this research investigation, and for that purpose, The Great Good Place (Oldenburg, 1999) is an unsurpassed classic on the *third place*, a term coined by the author back in 1989. Oldenburg identifies three core factors in the *third place*: open and free access to all; users as [social] levelers; and free conversation.

COWORKING DESIGN LEARNING. A CONCEPTUAL FRAMEWORK

What is a Conceptual Framework?

A Conceptual Framework is used as a lens to observe and understand a particular phenomenon – within a given research project – from the point of view of other researchers (Maxwell, 2012). Moreover, such a lens provides a map to the researcher's studies and its inter-connections in line with the research project.

Theoretical vs Conceptual Framework

Although not absolutely consensual, many authors agree on making a distinction between theoretical and conceptual frameworks.

Wikipedia is not an usual reference when it comes to academic work and design research but we venture to transcript here the first lines of 'Conceptual framework' article as it specifically addresses our need of an overall picture:

> A conceptual framework is an analytical tool with several variations and contexts. It can be applied in different categories of work where an overall picture is needed. It is used to make conceptual distinctions and organize ideas. Strong conceptual frameworks capture something real and do this in a way that is easy to remember and apply ('Conceptual framework', 2019).

Maxwell notes that a conceptual framework differs from a theoretical framework. In fact, while a conceptual framework maps the researcher's intentions and knowledge on a given problematic, a theoretical framework embodies other researcher's theories aiming to explain particular phenomena (Maxwell, 2012).

Therefore, a conceptual framework consists of an interconnected range of concepts within a less formal structure as opposed to more formal existing theory which in our case we found less applicable. Moreover, because conceptual frameworks often result in

empirical observation and intuition, we found it more in line with our current research work. Nevertheless, we expect to deduce theories from such a conceptual framework.

The general purpose of this conceptual framework is to organize and clarify the three concepts presented here, finding the relevant relationships among them. We aim to build a context for interpreting further study findings and observations. Finally, we are looking for theory development that is at all levels relevant to Design practice.

Coworking as "The Great Good Place"

According to Oldenburg, a *third place* is nor the private domestic space (home) neither the institutional place (formal institutions) but instead the community space, shared and used by all as an escape from home and work (Oldenburg, 1999). Nonetheless, the author notes that the *third place* is not merely what remains from those two other spaces. In fact, it is the *neutral ground* kind of spaces where individuals have free and open access; a non-hierarchical mode (individuals act as *levelers*); a home away from home with free conversation. Coupled with this common and neutral ground are two other key factors Ray Oldenburg found mandatory to establish a vibrant and lively *third place*, i.e. regulars (people keep returning to the place) and a playful mood.

Nonetheless, Oldenburg doesn't include Work at the *third place* although it is now absolute evidence that Coworking, as conceived at the beginning of the 21st century, is exactly the merging of those two dimensions – work and the community place, the *third place*. Significantly, Oldenburg's seminal book was written the same year as the advent of the World Wide Web (1989) before Work got dematerialized after access to the Internet, devices' portability, wifi, hi-speed bandwidth, etc. In short, work has become something we can do whenever and wherever we want, although we won't address here the societal problems this change of paradigm will cause to the way we live in the near future.

In reality, Coworking is much more than just sharing a workplace with others. It is now understood as a global and complex social phenomenon (Waters-Lynch, Potts, Butcher, Dodson, & Hurley, 2016) including work, learning, and other human activities. Furthermore, Coworking spaces are taking over, changing, and challenging the way we work; the way creative workers interact; and how space and place relate to these new ways of working (Brown, 2017).

Heutagogy – From Access to Content to Context

Fred Garnett was a member of London's team at Erasmus+ Project *The Origin of Spaces* (http://originofspaces.com/) with the goal of producing an online toolbox *to share existing know-how and explore new practices related to coworking ecosystems*. ('Origin of Spaces - Innovative practices for creative clusters', n.d.). Other teams included the cities of Lisboa (Portugal), Bilbao (Spain), Pula (Croatia, and Bordeaux (France). In Lisboa, the team gathered LX Factory and Coworklisboa (founded in 2010).

Garnett's work deals with Heutagogy (or self-determined learning), and self-determined learning places in a context-based future post web 2.0 pedagogic model (Garnett, n.d.). Heutagogy can be described as self-directed learning as opposed to andragogy which is student-centered learning (Halupa, 2015). The heutagogical model of learning is primarily based on the learner (Hase, S., & Kenyon, C., 2000). This author suggests heutagogy learning models would benefit *a far more creative approach to learning, no matter what the context.*

Underground / Middleground / Upperground

Underground / Middleground / Upperground is a theoretical framework originally proposed in 2010 by Patrick Cohendet (Cohendet, Grandadam, & Simon, 2010). This author suggests an *Anatomy of the City* based in three levels or layers contributing to a creative feed of knowledge between those three levels. This section describes Cohendet's system, exclusively based on his original article.

The *Underground* is the level of the individuals, including the actual creative workers, remote workers, digital nomads, and independent professionals. In contrast, the *Upperground*, on top of these three layers, comprises the level of all the formal institutions, companies, services, etc. Finally, the *Middleground* connects the two previous levels, aiming to identify communities.

At the *Underground* level lives everyone and everything that is not based on formal relationships or organisations. These actors have a strong connection with art and culture, nourishing their identity and lifestyle. In contrast, this level and its players feed up the corporate and formal world of the *Upperground*, establishing new trends in art, urban culture, sports, fashion, gaming, etc. As a result, the *Middleground* is a mediation field, in between the levels above and below, that connects the formal and the informal world. Accordingly, Coworking spaces belong naturally to the *Middleground* as mediating spaces between formal and informal dimensions like Work, Leisure, and Learning.

Coworking Design Learning Conceptual Framework

Based on a merging between the three presented concepts from Cohendet, Garnett, and Oldenburg, we present an exploratory and ongoing conceptual framework towards a Coworking Design Learning model based on a context-based heutagogical approach. The main purpose of such a framework is to map our research work. Our quest is to pursue and make available new knowledge for new Design Learning strategies grounded on how coworking spaces nurture their communities, and how those spaces are in fact learning spaces based on self-determined modes of acquiring knowledge.

These are times of transdisciplinarity where a learner gathers knowledge from all sorts of sources, breaking any formal barrier between work, learning, home, community (Middleton, 2018). In spite of this context, Design at Higher Education is still struggling to keep pace with the profound and diffuse changes brought by these new learners. Andrew Middleton calls these new learners the *nomadic learners*. This author recalls the lack of strategies from the University to address these new learners' demands and to propose non-formal spaces to learn.

In 2015, Ezio Manzini proposed a new Design definition which we believe integrates that emerging notion of the necessity of collaboration at all levels in the Design field. Manzini refers to "all the involved actors". This sentence now includes all areas of knowledge, defining new roles for "the design experts", probably as catalysts of the mentioned "open-ended co-design processes":

> Design is a culture and a practice concerning how things ought to be in order to attain desired functions and meanings. It takes place within open-ended co-design processes in which all the involved actors participate in different ways. It is based on a human capability that everyone can cultivate and which for some – the design experts – becomes a profession. The role of design experts is to trigger

> and support these open-ended co-design processes, using their design knowledge to conceive and enhance clear-cut, focused design initiatives (Manzini, 2015, p.53).

The proposed framework embodies the foundational three layers from Cohendet adding the conceptual work from Garnett and Ray Oldenburg at the core level of this system – the *Underground*. We aim to describe in detail each layer towards a better understanding of the entire system.

As can be seen in fig. 01, this framework is based on the trilogy *Upperground/ Middleground/ Underground* originally proposed by Patrick Cohendet. It also includes Garnett and Oldenburg concepts at the *Underground*. Although the *third place*, as presented by Oldenburg, would logically fit into the *Middleground*, we believe it is today a transition between the *Underground* and the *Middleground*, i.e some *third places* never migrate to the *Middleground*, keeping their original self-determined nature, while others embrace the mediation with the formal world above.

At the present time, Design Education is still a matter of the formal world of the *Upperground*. More and more experiences and models are being tested worldwide but, one way or another, the majority of these experiments end up at the formal level of the learning institutions. As a result, what sometimes start at the *Underground*, coming from the individuals' creative class, is then absorbed by the formal institutions without the mediation offered by the *Middleground*. Coworking spaces are *Middleground* by nature; places of mediation between individuals; between work and learning; between formal and informal; self-determined to its core.

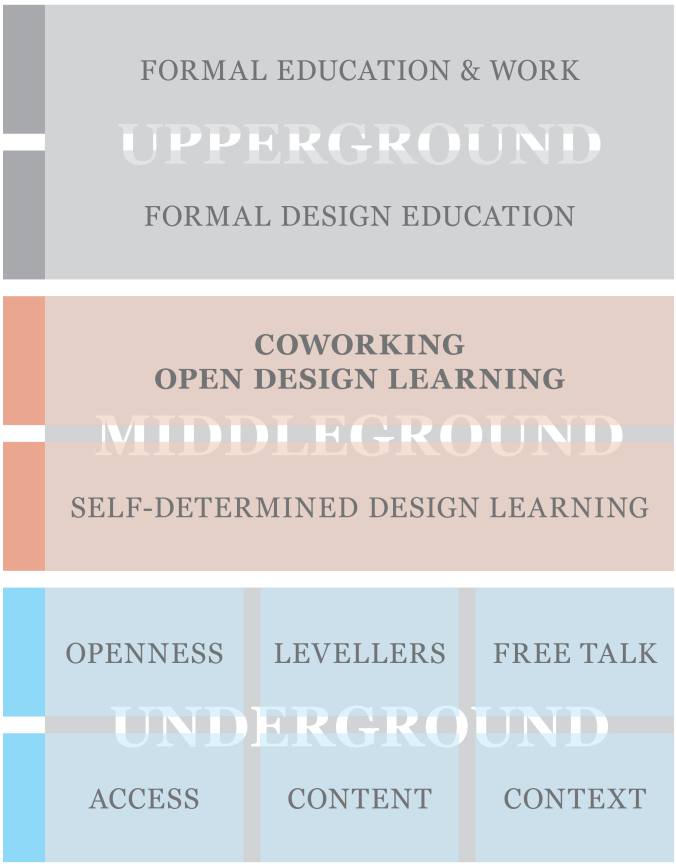

Figure 01. Coworking Design Learning Conceptual Framework
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CONCLUSION

Coworking spaces – as a new evidence of merged spaces between work and learning – are in the *Middleground* field proposed by our exploratory framework based on Cohendet's concept while Higher Education Schools in Design still operate in the *Upperground*, disconnected from the new trends coming from the base of this framework, the *Underground*, its actors, and players. Our studies and research points to shifting in Design Learning Spaces from the formal world to a more informal one, better connected to the creative class nowadays nourishing the two levels above. To summarise, we expect to validate this conceptual framework to support our research body of work.

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Designing in the invisible world:

Virtual Reality and Industrial Design Education

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ABSTRACT

This paper proposes an investigation onto the physiological and/or cognitive effects that VR, as a technology-enabled learning platform, may have on industrial design students when used as a medium for content creation, with the goal of identifying optimal experience thresholds. This will be accomplished through the adoption of a mixed methodology, with a user-centered design (UCD) focus, designed to evaluate both the value of the technology as a tool for abstract expression and, from task-based exercises in virtual environments (VEs), identify optimal experience thresholds through analysis of the physiological and/or cognitive load variability among different user's. Perception of value will be sought by means of primary sourced qualitative data, while physiological and cognitive quantitative data will derive from experiments. Once all data is collected, both strands of information will be combined to design, prototype and evaluate an optimal VR experience with the objective of assessing its validity, and consequently establish a set of guidelines that may be used to develop a future instructional framework.

Keywords: higher education, industrial design, technology, virtual reality

INTRODUCTION

Our entire experience of reality is simply a combination of sensory information and our brains sense-making mechanisms. Taste, touch, smell, sight, and hearing are the most obvious but we possess more e.g. sense of balance, spatial awareness, and others. All these sensory inputs combined, plus our brain processing ability, ensure that we rich receive a continuous flow of information from whichever environment we're inserted in.

In psychology and education, learning styles are a popular concept. These can be defined as our preferred methods for perceiving and processing information (Kolb, 1984). The intent is to understand the mechanisms through which we learn best so that teaching can become more effective. Many different models exist, but only one common belief — that every individual is different in the way he learns in, and that a singular approach to teaching e.g. lecture, does not work for every student, or even most students (Hawk and Shah, 2007). The key to accommodate distinct learning preferences among heterogeneous groups is to bring a variety of educational methods and tools into study programmes.

Technology's impact in the modern day classroom has facilitated teaching and learning by bringing new tools and methods that assist in the process. Among these, and with growing popularity in recent years, is virtual reality (VR). Although known better through its associated visual experience, it is really the user interaction within different immersion levels achieved through multimodal combinations e.g. visual, auditive, and other that defines it better. Features such as these are bringing change to the way we learn, interact, and communicate with each other. Pushing the boundaries of traditional classroom teaching through VR is bringing experiences into it that were impossible before, and providing a medium that is able to singularly accommodate a wider range of learning styles.

Interaction, Immersion, and Imagination

Advances in technology brought about the television in 1927 and screens slowly started to be part of daily life. The first personal computer as mass-market consumer device came in 1977 and, with it the ease to design and build information more efficiently e.g. vector-based computer graphics, and also visualise it more promptly. Screens effortlessly integrated social and professional aspects of daily life — through television, computers, smartphones, etc. making us both spectators and content creators, looking from the outside in.

VR is changing human-computer interaction (HCI). In 2014 Skillman and Hackett developed the Tilt Brush, a room-scale three dimensional (3D) painting VR application, later acquired by Google. The tool allows users to draw from imagination on a two dimensional (2D) plane but also shift its orientation to fill out a space, or to define a 3D object. Through user-interaction compromised of gestures and body motion tracking, the application enabled the development of 3D work in real-time that could be filmed, photographed, or exported as a 3D object. In such a scenario, VR offers interactive means that help boost creativity by enabling experimentation in a world that is unconstrained by physics or logic e.g. design a chair with fire. This establishes a gateway for interactions with our own imagination where abstract ideas can be easily realised, and mental models demonstrated (Winn et al., 1997). Moreover, it also affords multi-user collaborative work, creating further opportunities for interaction, communication, or collaboration, unconstrained by physical location.

The technology is distinguishable from other forms HCI in two ways. First, through a feeling of user immersion within the experience, and secondly through user interaction with virtual elements. These two are complementary and greatly impact the overall user experience. Immersion is related to the multimodal nature of the perceptual senses (Rebelo, Duarte, Noriega, and Soares, 2011) in fidelity to their equivalent real-world sensory modalities — a perception of being physically present in a non-physical world (Mestre, 2005) i.e. the user loses awareness of the fact that he/she is in a simulated world and experiences it with all of their senses. The interactive aspect of the experience reinforces this perception. The system detects spatial positioning, gestures and action, and reacts in real-time accordingly. The user becomes involved rather than being a passive spectator.

The level of immersion in VR varies, and is also related to equipment choice. There are three main categories, commonly ranked according to the sense of immersion: fully immersive (head-mounted display system), semi-immersive (projection-system), and non-immersive (desktop-system) (Costello, 1997). These are classified according to how much

of the real world is still perceived throughout the experience — the lower the level, the higher the immersion and the greater the degree of presence achieved (Rebelo et al, 2011) i.e. the user genuinely believes he is experiencing another world, which historically is the core of a VR experience (Mestre, 2005). Nowadays, VR can satisfy vision and hearing, and while there are some significant developments with touch, much work is still needed in regards to smell and taste.

Although improvements in recent years, there are still numerous downsides to VR. The largest threat to widespread adoption has been experiencing discomfort as a side effect. Common symptoms of VR sickness, caused by visually induced motion, include nausea, headache, pallor, among others. The effects are notoriously difficult to research and understand due to a multitude of factors — variation among people, adaptation over repeated use, difficulty of measuring symptoms, rapidly changing technology, and content-dependent sensitivity (LaValle, 2019). Discomfort may also derive from factors external to the experience e.g. user lifestyle, immersion type, or user unique physiology.

Virtual reality and education

Early experimentation in education focused on the natural sciences such as biology, anatomy, geology, or astronomy. Here, learning opportunities were enriched through interaction with dimensional objects, animals and environments. The technology offered an ideal multimodal medium to approach, study, and remember new knowledge for all those who favour visual, auditory or kinaesthetic learning (Leite, Svinicki and Shi, 2010), leading to an increase in subject involvement and motivation, while accommodating individual differences in terms of learning style (Chen, Toh and Ismail, 2005). In general, the widely use in the fields of education and training are due to its potentials in stimulating interactivity (Roussou, 2004) and fostering motivation (Garris, Ahlers and Driskell, 2002; Ott and Tavella, 2009).

VR affordances can be used to support groups of heterogenous learners by increasing student engagement, enabling constructivist learning opportunities, providing authentic experiences that impact student identity, creativity and the ability to visualise difficult models (Hu-Au and Lee, 2017). Furthermore, the technology enables adult training in safe controlled environments, when combined with game like features, through the direct feeling of objects or events that are physically out of reach (Freina and Ott, 2015). The entire experience however should be designed to build on existing knowledge, based on a constructivism approach, and not just replicate face-to-face, didactic experiences of learning (Hu-Au and Lee, 2017). The key is to add value to the learning process by bringing experiences into it that were not possible before.

STUDY RATIONALE AND DEVELOPMENT

While the benefits of virtual reality in education are numerous, the right strategy for integration will vary from school to school, classroom to classroom, and a clear pathway to integrating it into existing curriculums is still very much needed (Brodheim, 2017). Educators and students will need to learn the technical side of VR and how to navigate the transitional relationship between virtual and real life. With users gradually being attracted to the subject matter, research and exploration into multimodal learning will be a key factor, but unlikely the only one. New pedagogical strategies will be needed, rather than

iterations of traditional ones (Chen, 2006; Gandolfi, 2018) — these however, should likely come second.

As previously stated, discomfort and health related triggers are still a major issue affecting VR widespread. If immersive type learning is indeed looming on the educational horizon, priority should be placed on a comprehensive evaluation of student needs and responses to this new medium. In this sense, research onto physiological and/or cognitive responses associated with VR need to provide the guidelines in which instructional frameworks can develop. Among other possible advantages, this type of research should bring further clarity onto the particulars of experience such as, — engagement level, usability impediments or output constrains/limitations, opportunities for further development, or threats facing integration. Understanding some of these will allow to make better decisions on how to design new learning models that are not only a valuable tool for teaching and learning, but are also modelled according to concrete data.

Objectives

The aim of this research proposal is hence twofold. Firstly, to contribute to design education by qualitatively identifying VR value when applied to an existing curriculum in industrial design. Secondly, through both quantitative and qualitative means (e.g. participants' perceptions, as well as physiological and/or cognitive responses to a VR task-based exercise), understand the thresholds that define the experience as suitable to most. The main objective is to investigate and comprehend how the user-experience should be modelled and integrated, as to provide an optimal experience output.

Applied to an industrial design educational context, the main research question is, — what is the perceived value of immersive 3D sketching, as a medium to explore quick concepts, in comparison to more rooted methods such as 2D sketching, and what are the thresholds that define an optimal immersive VR task-based experience?

Following research questions:

- In which way do initial perceived sense of VR value changes as a result of continual periods of immersion, and how does it affect the overall experience?
- Do immersive VR 3D sketching tools promote significant higher levels of task engagement in comparison to traditional Non-VR 2D sketching.
- Are there limitations to which a task-based exercise in VR should be constrained to, and what guidelines could be imposed on it to warrant an optimal experience?
- Are there significant differences in experience thresholds between individual and group work in VR task-based exercises?

To achieve the main objective, the following specific objectives were established:

General perception of the phenomenon derived from a VR experience: a preliminary phenomenology study is expected to provide further clarity as to understand subjective views, lived experiences and personal perspectives towards past, present, and future applications of the technology and possible use in an educational context.

Identify where value lies within design education: a tool is considered useful if it brings added value to a process, while affording a new medium for creative outputs, combined with easy to use equipment and positive user-experience.

Design, collect: characterise and analyse participants' physiological and/or cognitive responses to given task through a series of experiments designed to test pre-defined independent variables. Map data sets, identify possible links among participant responses.

Prototype, test, and iterate: based on the identified thresholds, prototype an optimal VR experience. Gather data through a new cycle of experiments, and compare data sets for significant changes in participant's physiological and/or cognitive responses. Adjust based on results and conduct new experiment cycles.

Propose guidelines for the future development: through data insights, propose an ideal case scenario for the application of the technology within an industrial design curriculum, together with a set of guidelines that support the development of an instructional framework.

Evaluation: critically assess the overall experience, viability, user acceptance, and the impact of the solution in the context of the intervention.

Methodology

A mixed methodology will be used to accomplish the objectives proposed. A literature review will inform an initial stage, followed by interviews, questionnaires, and experiments. The methodology will employ a UCD approach to gain a deep understanding of users, tasks, and environment. It is divided into five stages, they are as follow.

1. Knowledge review, and analysis of reference situations

Objective: to review and reflect on existing knowledge

The review of existing knowledge will be used to identify key terms and concepts, to narrow the topic, and search parameters, which will be used to search information in multiple databases, find academic articles, and other related or complementary resources. Prior applications in educational contexts, and ongoing developments with similar aims to this research proposal, may be considered. These may provide further insight onto additional development stages or research paths. Overall, the base for this investigation will encompass a broad overview of the development in recent years, past successful applications, and overall benefits or shortcomings of the technology. All of these will constitute the base for the literature review.

2. Phenomenology study; explore the relationship and experiential value, between user and technology

Objective: a) to develop a deeper understanding of the phenomenon derived from user experience, and gain insight into individual or shared experiences, b) bring further clarity onto subjective views, lived experiences and personal perspectives towards past, present, and future applications of the technology in an educational context

This part of the study aims to develop a deeper understanding of the phenomenon derived from an individual experience and interaction in VEs. Qualitative data will be collected through structured, or semi-structured, personal open-ended interviews with the intent of having actual words of the participants in the study, and allow different perspectives (Creswell, 2013). Objectively, this stage will report on the status of the relationship, and experiential value, between user and technology as a tool for learning.

3. Identify characterisable physiological and/or cognitive response markers

Objective: through a designed user-experience, test pre-determined independent variables, and collect real-time quantitative data on the different affecting factors.

Data used will be based on primary research. In the first part of the data collection period, two groups will be formed. Each will be populated with randomly assigned participants to minimise the possibility of threats to internal validity, and gain control over extraneous variables (Creswell, 2013). One group will be the control group and the other the experimental group. Each will be assigned to different conditions of the experimental variable: VR+2D Sketching, and Non-VR+2D sketching. Only individuals in the experimental group will have access to the VR component. This experiment is intended to evaluate the different outputs between both groups, compare, and map the participant's physiological and/or cognitive responses. Past this first period, a second experiment will occur, also requiring a control group and one experimental group. In this one, both groups will incur on a VR based experiment (no 2D sketching), but the experimental group will experience a change of independent variables. To reduce the threats of testing instrumentation, only a post-test questionnaire will be applied to participants in the experimental group. Both VR experiments will require the use of an HTC Vive HMD and the Google Tilt Brush application.

Quantitative data from physiological and/or cognitive responses will be collected through specialised equipment. For the cognitive response the research study will utilise the Emotiv EPOC+ electroencephalogram (EEG) headset to collect electrical signals generated from brain activity. The power, frequency, and location of these signals will provide information about cognitive processes occurring in the brain. There are different electrical frequency bands that affect in different activities, allowing to identify cognitive responses. This study will look mainly for engagement, and extraneous cognitive loading.

In regards to physiological responses, heart-rate (HR), and galvanic skin response (GSR), may be collected with a wearable E4 Wristband REV2. These allow to measure presence, via participant arousal, i.e., capturing changes in heart rate and skin conductivity. Data may be analysed in conjunction with a post-test based on adaptation of the Slater, Usoh and Steed (1994) questionnaire on level of presence in immersive virtual environments. HR and GSR also allow to identify anxiety. Lastly, head motion may also be tracked, as to estimate fatigue or postural instability without causing any distraction (LaVelle, 2019).

Data will be collected in real time and autonomously to mitigate any bias presented by participants when articulating emotions and experiences. This stage will be deterministic in accessing individual impact. Upon concluding the first cycle of experiments, iterations will be made to test a range of independent variables. The result of each cycle will be statistically analysed to prove or disprove the broad general points of this study, enable decision making, objective observations and, at a final stage, provide insightful metrics that determine the ideal parameters, or guidelines, in how virtual immersion ought to be set up and used as to provide an optimal experience to future users.

4. Prototype based on data analytics

Objective: a) develop an initial prototype based on the merger of both data strands b) test its validity through a new cycle of experiments c) iterate and optimise

The qualitative data gathered throughout this study will be analysed utilising a deductive approach, involving a predetermined structure. The research questions will be used as a

guide for grouping and analysing the data. A visual representation of non-numerical data may also act as a form of qualitative analysis e.g. flow charts, diagrams. Due to the expected large amount of quantitative data, data mining will be applied to reveal trends, patterns, and relationships, which otherwise may remain undetected. Online tools such as Orange (range.biolab.si) allow a relatively easy construction of workflows and visualisations, and both are capable of analysing large amounts of data.

A prototype model will derive from the combined knowledge of both data strands, which will endure a new cycle of experiments. Data retrieved from these will be compared previous sets for further insights. Further model iterations may ensue for optimisation.

5. Guidelines for instructional framework; evaluation, and conclusion

Objective: propose a set of guidelines for a future instructional framework development, based on identified thresholds; assess its validity in context.

Through data validation, an ideal case scenario for the application within an industrial design curriculum may be proposed, together with a set of guidelines for future development of an instructional framework.

CONCLUSION

VR is bringing new methods and tools to education that foster student engagement and are also more responsive to their needs, while additionally enabling new platforms for content creation. The exploratory medium it affords could serve well in an industrial design study programme by expanding the means through which, creative output and conceptual/abstract thinking is made tangible. The technology may indeed have a promising future in industrial design but not one without challenges as the right path towards integration is still unclear, and likely to vary according to context. Moreover, integration will be extremely dependent on the user's physiological variability, as well as the affecting extraneous cognitive load that the experience may incur on the user. Utilising the methodology described earlier, this study was designed to better understand these by aiming to identify the thresholds in which an optimal VR experience occurs so that an informed integration into the study programme may be proposed, and consequently validated through data analysis.

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Design Teaching in Engineering

A Transdisciplinary Approach

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ABSTRACT

This research aims to analyse how the design as a specific subject has been introduced in engineering courses in Brazil, observing its interface in the training of future engineers, considering the dimensions related to the technical-scientific competences, the possible or existing multi, inter and transdisciplinary knowledge and how the design can collaborate in this scenario. This study presents an overview of design teaching in the ten best evaluated undergraduate Mechanical Engineering courses in Brazil (covering five public and five private institutions, according to the RUF 2018 - Ranking Universitário Folha), based on their respective curricula and pedagogical project.

Keywords: higher education, engineering, design, transdisciplinarity

INTRODUCTION

The intense changes the world has witnessed in the last decades, heading by the expansion of capitalism and the cultural and economic globalization in the 21st century are reflected in education as an object of study, concern, focus, strategy and discussion in all the nations of the globe. In higher education, specifically in undergraduate courses in engineering, this reality is not different and engineering education deserves our attention, and its contribution to development must be fully acknowledged (UNESCO, 2010). Engineering education occupy a central place in the discussions involving the formulation and implementation of strategies for industrial development. They are part of the range of challenges that countries must face to sustain productivity gains and to strengthen their competitive positions, providing a more dynamic knowledge-based world economy capable of lasting economic growth. The need for change in higher education and the promotion of interdisciplinarity, stimulates entrepreneurship, emphasize the cultural and social involvement of universities in the construction of a superior educational system, propelled by a strategic government investment in engineering education as an incubator for the technology-based entrepreneurial talent (Brasil, 2019; Confederação Nacional da Indústria [CNI], 2018; Graham, 2018; Magalhães, 2014). Answering the question "'What is the future direction for the engineering education sector?" one of the trends recently appointed is a move towards socially-relevant and outward-facing engineering curricula that emphasize student

choice, multidisciplinary learning and societal impact, coupled with a breadth of student experience outside the classroom, outside traditional engineering disciplines and across the world (Graham, 2018).

Dym (2005) highlights the need for change in engineering courses that could benefit from the application of the precepts of design theory and systems analysis. The design principles could help shape the objectives for engineering training and identify functions that enable them to achieve these goals by providing metrics so that achieving these goals can be evaluated. The "renaissance" engineer of the 21st century must be an identifier, evaluator and problem-maker, as well as a solver, working with people from other scientific, artistic or technical areas and from different cultures; should combine technical knowledge and skills with leadership, entrepreneurship, and management and relationship skills; must know the technical, political and commercial context of the product of his/her work, being concerned with the economic, social and environmental sustainability; must behave ethically and develop global citizenship skills (Magalhães, 2014).

In Brazil, the unsatisfactory quality of education is one of the barriers to economic and social development and solve this problem is essential for the increase of work productivity and, consequently, the competitiveness (CNI, 2018). In view of the central place occupied by engineering in the generation of knowledge, technologies and innovations, it is strategic to consider these new trends and emphasize the improvement of the quality of the courses offered in the country, in order to increase productivity and expanding the possibilities of economic growth, both today and in the future (Brasil, 2019). The country graduates fewer engineers than it needs. In addition to increasing the number of these professionals, it is necessary to improve the curricula to develop a multidisciplinary vision and a training conducive to innovation (CNI, 2018). The new National Curriculum Guidelines of the Undergraduate Engineering Course, which have been recently updated and approved by the Ministry of Education (MEC), define on the profile of the egress and competencies expected that the engineer must act both as a "designer" of innovative solutions and as an entrepreneur, throughout the life cycle of the product and the enterprise. It also clarifies that the establishment of a competency curriculum presupposes the substitution of the logic of the previous assimilation of the contents – for further incorporation and use - by the concomitant occurrence of this with the development of skills and attitudes from specific knowledge (Brasil, 2019).

DESIGN TRANSDISCIPLINARITY

Understanding how knowledge passes between, through and beyond the disciplines that are part of the universe of each area can collaborate to a greater understanding of the reality that everyone seeks. The concept of transdisciplinarity is originally based on Nicolescu's theory (1999), which states that by relating several disciplines one can take a multi, inter or transdisciplinary approach. A multidisciplinary approach occurs when it concerns the study of an object of one and the same discipline, carried out by several disciplines at the same time (for example, the history of Brazil that can be studied under the angle of design, engineering or architecture). The interdisciplinary approach refers to a certain knowledge that transits between different disciplines (for example, the mathematical calculus that can be transferred and applied in a project of a building or a machine or a product). The transdisciplinary approach, according to the author, involves what is at the same time between disciplines, through different disciplines and

beyond all discipline. Its purpose is the understanding of the current world, for which one of the imperatives is the unity of knowledge. This new form of thinking based on *trans* requires a knowledge and behavior that crosses and exceeds the way disciplines are organized so far and that it places as central elements the human being and the environment that surrounds it above all else.

Interdisciplinarity is a way of thinking. Piaget argued that interdisciplinarity would be a way to get to transdisciplinarity, a stage that would not be in the interaction and reciprocity between the sciences but would reach an internship where there would be no more boundaries between the disciplines. The design is, by nature, interdisciplinary, because it is a propitious area for working together with other areas of knowledge. It is now up to the insertion of the design as an agent in the process of relations between disciplines that, according to the World Design Organization (WDO, 2019) is a strategic problem-solving process that drives innovation, builds the business success and leads to better quality of life through innovative products, systems, services and experiences (Fontoura 2011). Historically, this scenario follows the trend initially pointed out by Buchanan (1992) where the design, conceived in the 20th century, has undergone a revolutionary transformation, from a commercial activity to a segmented profession and a field of technical research, integrating knowledge and combining theory with practice to find new productive purposes.

Design is then considered not only as a tool to create new products, but as a factor of innovation in the productive chain of companies to confront the effects of globalization. The design shows its participation in the innovation chain when it changes its spectrum of performance; comes out of a strictly projectual condition, where it is responsible for assigning function and form to the object, for a broader participation, where it becomes part of the entire process of development of products and services, being used as a differentiator factor (DDI-CBA, 2008). By its holistic and integrative character, Design has been more valued and coined with the term “Design Thinking (DT)”. The DT begins with skills that designers have learned over several decades in the quest to establish the correspondence between human needs and the technical resources available considering the practical constraints of the business. By integrating the desirable from a human standpoint to technology and economically viable, designs have been able to create the products we enjoy today. The Design thinking represents the next step, which is to put these tools in the hands of people who may never have thought of themselves as designers and apply them to a much broader variety of problems (Brown, 2009).

Design thinking is therefore a tool used to help companies innovate and grow, as well as develop new products and services. It is a way to incorporate innovation into the culture of enterprises, considering the real needs and desires of people along with what is technically feasible and financially viable. According to the methodology of design thinking there are three factors that must be considered and balanced in an innovation program: technical factors (practicability or feasibility), business factors (economic viability) and human factors (desirability). The technical and business factors are already known in the companies and taught in schools. It is believed, therefore, that the concern with human factors, because they are approached in this way more recently, is not more important than concern with others, but can provide new opportunities for innovation. This human-centered approach constitutes, in this case, the essence of the innovation process, according to the vision of design thinking (Kelley & Kelley, 2014).

DESIGN AND ENGINEERING

The subject 'Engineering Design Thinking' is a topic of interest for STEM (Science, Technology, Engineering and Mathematics) practitioners and researchers because it is a complex cognitive process that includes convergent-divergent thinking, a perspective of systems, ambiguity and collaboration. The Design is often complex, involving multiple levels of component interaction within a system that can be nested or connected to other systems. Systemic thinking is an essential facet of engineering design cognition (Dym et al., 2005 apud Lammi and Becker, 2013).

One of the signs that demonstrates the need for integration between areas of science and technology, such as engineering, with human areas such as design and arts is the emergence of movements such as STEAM (Science, Technology, Engineering, Arts and Design and Math). A movement led by researcher John Maeda, defended by the Rhode Island School of Design, and widely adopted by institutions, corporations and individuals whose objectives are to transform the research policy to put Art and Design in the center of STEM teaching, encouraging its integration into education and influencing employers to hire artists and designers to boost innovation. Similar Movement is the STHEM Brazil, a consortium affiliated with IDIA (Development of Academic Innovation) that proposes to work with universities, institutions, governmental organizations and the private sector to implement the initiative for teaching and advanced learning in science, technology, humanities, engineering and mathematics. It is perceived with these movements attempts and tendencies to integrate the disciplines of humanities in traditionally exact and technical systems.

In the discussion about engineering knowledge, Figueiredo (2008) presents four main dimensions: basic sciences, social sciences, design and practical achievement. In this way, it is possible to think the engineer as a professional that combines, in variables proportions, the qualities of scientist, sociologist, designer and "maker." These dimensions further approximate the knowledge of engineering and Design. Reinforcing this approach, Ericson (2009) identifies three key points justifying the use of the methodology of the Design Thinking in engineering education: integrated approaches are not heavily implemented, "soft" capacity training provides a change in thinking and the need for a social competence to use the Design Thinking. Engineering, for its essence, is fundamentally technical for problem solving and can easily host this paradigm shift when talking about innovation.

Design ability is a multi-faceted cognitive skill, possessed in some degree by everyone. There is enough evidence to make a reasonable claim that there are 'designerly' ways of knowing, thinking and acting. Viewing designing as a 'form of intelligence' is productive; it helps to identify and clarify features of the nature of design ability, and it offers a framework for understanding and developing the nurture of design ability (Cross, 2006). The design field already struggled, historically, to develop methods and proved that neither artistic or scientific thinking alone were sufficient to address complex social wicked problems, which are the type of problems often addressed in transdisciplinary collaborations (Mejía et al., 2018).

The design insertion format in engineering courses can be done in different ways: as a programmatic content addressed within a discipline, as a regular compulsory subject, as an elective or optional subject, as an extension course, as a specialization or minor and, even, as a content linked to an integrated project. An approach to introduce design

subject in engineering courses at undergraduate level must consider two important aspects: the appropriate position within the curriculum structure of the engineering programme *when* the subject is taught and *how* the subject of design is taught to the students of engineering. *When* means that it could be introduced in the beginning of the course, at the freshman year, making design a core subject at the very early stages of study, being introduced too early to be effective or in the end of the course, at the senior year, as an elective or as a follow up to what students learn in the freshman year, maybe too late to bring some real effect. *How* is about the method and means that it can be taught also upon usability, sustainability and design for manufacture (built on the framework of studio-based learning), not only with a principal focus based on the aesthetic (Sathikh, 2018).

SCENARIO OF ENGINEERING EDUCATION IN BRAZIL

Between 2001 and 2018, there was a total growth of 692% in the number of engineering courses in Brazil. According to the E-MEC system, there were 6,106 Engineering courses registered in 2018, operating in 1,176 distinct institutions, including private and public education. There was also a great growth of qualifications or areas of coverage of the engineering courses: nowadays, there are 60, considering the first denomination of the courses (civil, electrical, mechanics, etc.) and more than 250 when is considered the second denomination or emphasis (civil construction, electrical power, automobile mechanics, etc.) (Brasil, 2019).

The number of entrances and graduates in engineering courses nationwide has increased significantly in recent years. However, in 2017 about 270,000 students entered the engineering courses and just 140,000 graduated, almost half (51.48%) of the number of entrances in the same year. In an estimate of representative evasion, for each 1,000 candidates in Engineering selection processes, 175 entered and only 95 concluded their courses, suggesting a kind of “funnel” in the formation of engineers in Brazil (CNI, 2018). The reasons why many students quit the engineering course range from the lack of prior knowledge about the profession, to the discouragement caused by abstraction and deficiency of practical application of the disciplines of the first series and the successive fail in the fundamental disciplines (Cardoso & Scheer, 2003 apud Freitas, 2018).

This study presents an overview of design teaching in the ten best evaluated undergraduate Mechanical Engineering courses in Brazil (covering five public and five private institutions), according to the RUF 2018 (Ranking Universitário Folha), based on their respective curricula and course pedagogical project. The RUF is an annual evaluation of higher education in Brazil made by Folha de São Paulo since 2012. In the course ranking it is possible to find the evaluation of each of 40 undergraduate courses with more entrances according to the last census of higher education available from two indicators: teaching and market. The survey was carried out through the search of disciplines that contained the word "design" in their nomenclatures.

According to the collected data presented in Table 1, it can be observed that, in general, design as a subject is being inserted in mechanical engineering courses yet in a very shy way: only 4 among the 11 courses surveyed offer a design discipline in their regular program. Among the 13 disciplines found, most of them (70%) is being offered as elective or optional, taken usually at the end of the course, in the last (5th) period. Other important observation is about the addressed content, where most of them are

about project and product/service development. Although most courses offer a wide range of potential complementary disciplines (such as marketing, economics, law, innovation, etc.) the design as a subject is not yet seen as an important content to be inserted into the engineering programs.

Table 1: Design disciplines inserted in mechanical engineering courses in Brazil *(Adapted by the authors, 2019)*

PUBLIC	**POLI-USP: Polytechnic School, University of São Paulo (São Paulo/SP) #1 RUF**	
	Applied Design Project I (Interdepartmental Disciplines of the Polytechnic School)	optional, 150h, semiannual, 6 credits
	Applied design Project II (Interdepartmental Disciplines of the Polytechnic School)	optional, 150h, semiannual, 6 credits
	UNICAMP: Faculty of Mechanical Engineering, Campinas State University (Campinas/SP) #2 RUF	
	IPhone Application Development and Design (Integrated courses program)	online, external course
	UFMG: Federal University of Minas Gerais (Belo Horizonte/MG) #3 RUF	
	----nothing was found----	
	UFSC: Federal University of Santa Catarina #4 RUF	
	----nothing was found----	
	UFRJ: Federal University of Rio de #5 RUF	
	----nothing was found----	
PRIVATE	**FEI: University Center of the Educational Foundation Inaciana Pe Sabóia de Medeiros (São Bernardo do Campo/SP) #10 RUF**	
	----nothing was found----	
	PUC-RIO: Pontifical Catholic University of Rio de Janeiro (Rio de Janeiro/RJ) #14 RUF	
	----nothing was found----	
	MACKENZIE: Mackenzie Presbyterian University (São Paulo/SP) #15 RUF	
	----nothing was found----	
	CEUN-IMT: University Center of Mauá Institute of Technology (São Caetano do Sul/SP, Brazil) #18 RUF	
	Design Thinking (Minor of Design and Innovation)	elective, 80h, semiannual
	Strategic Design and Innovation (Minor of Design and Innovation)	elective, 40h, semiannual
	Interior Design (PAE - Projects and Special Activities)	elective, 40h, semiannual
	Development of Accessory and Application of Surface Design (PAE - Projects and Special Activities)	elective, 40h, semiannual
	UNIP: Paulista University (São Paulo/SP) #25 RUF	
	----nothing was found----	
	INSPER: Institute of Education and Research (São Paulo/SP) #140 (RUF)	
	Software Design	1st period, 80h, semiannual
	Nature of Design	1st period, 80h, semiannual
	Application Co-Design	2nd period, 80h, semiannual
	Design for Manufacturing	3rd period, 80h, semiannual
	Product-Service System Design	elective, 80h, semiannual
	Design Thinking	elective, 80h, semiannual

FINAL CONSIDERATIONS

In this scenario design can arise and, through its tools and methodologies, show new paths inspired not only in new technologies, but also in human needs, adding new values that are perceived. Design education represents both serious challenges and glorious opportunities (Dym, 2005). The design is still being a complementation to the formation of the engineer and not yet a basic requirement; it's a start but it still has a long way to go. Design can then be considered as an interdisciplinary content factor that, when applied in project practice, can contribute to the development of innovative products, enrich the training of the engineer and be a relevant agent in the innovation of higher education.

This research is underway and intends to address several aspects of the relationship between teaching, design and engineering, searching for answers to questions such as: How can the design be integrated into engineering courses as a form of innovation in higher education? How are design thinking and maker culture-based design methodologies applied in the process of developing innovative products in engineering courses? How can the design influence the engineer's training in a transdisciplinary way?

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Mapping cross-sensory interactions between Spain and Portugal

The results of a Synaesthetic Design Workshop

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ABSTRACT

Synaesthesia is the result of automatic processes of human perception that combine sensations proceeding from different sensory modalities. Along this paper we are going to present the results of a Synaesthetic Design Workshop, made with design students of IADE, Universidade Europeia (Lisbon, Portugal) and University of Extremadura (Mérida, Spain) with the purpose of identify different classes of cross-sensory interactions. Results suggest probable interactions between modalities with no obvious differences between genders from both the universities.

Keywords: Synaesthesia, Synaesthetic Design, Cross-sensory Interactions, Perception, Design

INTRODUCTION

In 1964, Stan Lee (1922-2018) and the cartoonist Bill Everett (1917-1973) published the first issue of Daredevil for Marvel Comics: it is the story of Matt Murdock, a law student went blind after an accident with a truck full of radioactive materials. However, the loss of the sight and the contact with radioactive waste provoked a strong improvement of the other senses beyond human natural abilities. From that day Matt uses these new abilities to fight the crime in New York City. The same author, in *"Stan Lee's Super-humans"* (a documentary television series about people in real-life with extraordinary physical or mental abilities) presents the story of a real Daredevil; Ben Underwood (1992-2009) was an American teenager that went blind since the age of three after a cancer of retina. Ben is famous for being an incredible echo-locator: at the age of five he developed the ability to detect objects in the space by making frequent clicks with his tongue and perceiving their echoes. Echo-localization is one example of how human senses work simultaneously to compensate the absence of information (in this case visual), to build the most detailed version of the surround reality. As human beings, we use the information coming from the different modalities (senses). Nevertheless only in a few cases our perception is related to one single modality: we are multi-medial most of the times! (Park & Alderman, 2018). These arguments have been well explained in an article published by Giovanni Anceschi and Dina Riccò in 2000:

> Even when we deal with mono-medial stimuli (such as a sound), what is triggered is not only the sensory system that is directly stimulated (i.e. the auditory system), but also other modalities, thought not directly stimulated, in a process of completion of the information. (p.2)

Phenomena of cross-sensory interaction are particularly evident in people affected by a partial/total loss of a sensory modality. Nonetheless, as we can experience in our everyday life, it happens very often to use a sense to compensate another when the specific modality is "blocked": *"there's a vision of touch or a vision of hearing. The hand watches, the eye touches. The hand watches, but not like the eyes, and the eye touches but not like the hand"* (Rognoli & Levi, 2005). As an example when is too dark, we put our hands in front of us to touch possible obstacles, or when there's too much noise around, we try to read the movements of the speaker's lips. When it is possible to observe a transfer of competence between the different modalities we are talking about «sensory substitution». This phenomenon represents only one typology inside the greater set of Synaesthesia, specifically the "acquired synaesthesia". The word «synaesthesia» (from the Greek *syn*, "together", and *aisthēsis*, "sensation", literarily "perceiving together") is often defined by some rhetorical expression as a *"cold light"* or a *"cold sound"*. Those are linguistic Synaesthesias and are representations of natural and automatic mechanisms of human perception able to combine elementary sensations of different modalities with our past (personal experience) and with the imaginative abilities of our mind. Synesthesia is the union of the senses (Cytowic, 2002) and is the general name for a great set of over 80 related cognitive processes (Córdoba, Riccò & Day, 2012). Apart from the people that suffered the loss of a sensory modality, genuine synaesthetic perceptions are common in a small group of population able to experience these phenomena since the childhood. These people are called Syanesthetes and represent around 1/23rd (4,16%) of the general population across the relatively wide range of synaesthesias tested (Simner & Carmichael, 2015). The term "genuine synaesthesia" defines that synaesthesia such as *l'audition colorée,* namely a condition in which the hearing of a sound produces the visualization of a colour. Famous artist such as poets Charles Baudelaire (1821-1867) and Arthur Rimbaud (1854-1891), painters such as Paul Klee (1879-1940), Vassily Kandinsky (1866-1944) or musicians as Alexander Scriabin (1872-1915) and Arnold Schönberg (1874-1951) are amongst known famous synaesthetes. Other synesthetic effect can be provoked - "induced synaesthesia" - with the use of some kind of substances (drug-induced synesthesia) or with the exposition to sensory stimuli opportunely designed. However, phenomena of cross-sensory are nothing exceptional: they are at basis of the functional model of human perception. As observed by Maurice Merleau-Ponty in *"Phénoménologie de la perception":*

> Nor are these even exceptional phenomena. Synesthetic perception is the rule, and we are unaware of it only because scientific knowledge shifts the centre of gravity of experience, so that we have unlearned how to see, hear, and generally speaking, feel, in order to deduce, from our bodily organization and the world as the physicist conceives it, what we are to see, hear and feel." (Merleau-Ponty, 1945)

Based on this context, we questioned how are those aspects related to the work of designers? Usually, designers invest great efforts in solving problems and create something aesthetically appealing. Nonetheless, when the users are in front of a new object, they can perceive it with all their senses. As pointed by Munari (1996), even if at first look the object is found to be okay, if is unpleasant to the touch, if it is too heavy or

too light, if it is cold or if it doesn't have formal relations with human anatomy, it will be discarded for a similar object, with same characteristic, but pleasant to all the senses. Nowadays, experiences in fields as sound design, tactile design and material experience are gaining great importance. Poly-sensorialism is one of the most important drivers in the change of epistemology that is today opening new sensorial approaches in design as well as in material science (Del Curto, Fiorani, & Passaro, 2010). Nevertheless, a grammar of synaesthesia in the design development does not exist: the coordination of all the different modalities doesn't occur or, when exists, takes place only in later phases of the design development. These methodological issues were object of study in a field of research called Synaesthetic Design by Anceschi and Riccò (2000).

> The aim of the synesthetic design is to coordinate all sensation stimulated by an artefact in a manner that results in a pleasant, harmonious overall appearance while coinciding with the particular function(s) desired. This goal can be achieved basing the design choices on the systematic connections between different modalities. (Haverkamp, 2013. p.14)

The Synaesthetic design research is a multidisciplinary research, embracing fields as Communication (Anceschi & Riccò,2000), Automotive (Haverkamp,2013), Multimedia Design (Park & Alderman, 2018) and Material Science (Rognoli & Levi, 2005). This paper reflects an on going Ph.D. research at IADE, Universidade Europeia, and the methodologies of synesthetic design are being applied aiming to humanize healthcare environments.

WORKSHOP

A workshop untitled – "Synaesthesia a way to design across the senses to promote well-being" was run in two universities (Faculty of Industrial Design Engineering and Product Development, University of Extremadura, Mérida, Spain, the 11th of March 2019, and IADE - Faculty of Design, Technology and Communication of Universidade Europeia, Lisbon, Portugal, the 26th of March 2019) with the main objective to identify phenomena of cross-sensory interaction between senses of different modalities. The fact that 13,95% of the Spanish population experiences some kind of synaesthesia (Melero, Peña-Melián, & Ríos-Lago, 2015) backed the choice of a Spanish university for this study. Eventual difference between the two groups, if found, could suggest some differences regarding the occurrence of cross-sensory interactions between the two countries. The gathered data is expected to be useful for the creation of a design model based on synesthetic connections.

Participants

A Total of 54 Design students of the bachelor's degree participated: 44,4% were IADE Universidade Europeia students and 55,6% were students from University of Extremadura and EASDM (Escuela de Arte Superior de Diseño de Mérida), 70,4% were females and were 29,6% males. Their age ranged from 17 to 38 (IADE Mean age = 20,00; SD = 2,39 – UEX Mean age = 22,23; SD = 3,38). After a preliminary analysis of the data collected, 10 participants (5 from each university) were excluded from the sample due to evidences of a clear misunderstanding of the task. As an example were excluded those forms that reported in the description of the stimulus a confusion between some sensory systems (e.g. vestibular and visceral). As a result, 29 students from Universidade Europeia and 35 from Universidade da Extremadura composed the sample.

Method

After a theoretical introduction on the topic of sensation and perception, a complete taxonomy of senses, consisting of 32 sensations, grouped in 8 sensory systems (Riccò, 1999) was provided. The same information was displayed on 8 totems placed on the workspace. Afterwards, the mechanisms of synesthetic perceptions were explained and practical examples given. Then, eight different stimuli (one for any sensory system) were placed over a set of tables arranged in a circle. The stimuli provided were: an ASMR record of a woman breathing (auditory stimulus); Mentho-lyptus candies (gustatory stimulus); Ethylic alcohol spilled on cotton balls (olfactory stimulus); a physical exercise: leg push-ups or side rises (proprioceptive stimulus); cotton balls impregnated with water (tactile stimulus); 10 twirls on themselves (vestibular stimulus); a painful clothespin on the nose (visceral stimulus); three bulbs emitting a cold light: 6.500 k, 806 lm (visual stimulus). With the selection of the stimuli we tried to replicate some stimuli that are frequent in healthcare facilities: i.e. incessant lights, smell of chemical agents, unpleasant textures (Nanda, 2017). Participants needed to try any stimulus for 1 minute in order to memorize the perception. Afterwards they were invited to refer the stimulus to the other sensory systems and provide an optional description. At the end of the workshop, the participants' answers were used to create a map of the interactions. For this purpose, participants were divided in 8 groups (one group for sensory system), and the connections were made visible with wool threads. This mapping intended to provide a visualization of how human perception combines all the information proceeding from the different modalities (fig.1). The workshop lasted 3 hours.

RESULTS

Table .1

Percentage of interactions per stimulus

	Auditory stimulus	Gustatory stimulus	Olfactory stimulus	Proprioceptive stimulus	Tactile stimulus	Vestibular stimulus	Visceral stimulus	Visual stimulus
Auditory interactions (%)	0	6,37	6,37	10,01	18,2	8,19	16,38	17,29
Gustatory interactions (%)	19,89	0	40,95	5,85	33,93	3,51	15,21	17,55
Olfactory interactions (%)	3,21	24,61	0	6,42	31,03	9,63	18,19	21,4
Proprioceptive interactions (%)	8,1	2,7	4,5	0	22,5	16,2	17,1	9,9
Tactile interactions (%)	8,36	6,84	6,84	3,04	0	3,8	8,36	20,52
Vestibular interactions (%)	12,74	2,73	0	22,75	3,64	0	13,65	27,3
Visceral interactions (%)	3,12	2,34	8,58	11,7	20,28	3,12	0	11,7
Visual interactions (%)	11,64	2,91	4,85	14,55	22,31	15,52	22,31	0

The data gathered (see table .1) suggest the existence of a cross-sensory interaction between most of the different modalities, for each one of stimuli provided. The interactions that are more obvious are:

- Proprioceptive, tactile, visceral and visual information in response to the auditory stimulus (fig.1). The record of a woman breathing caused opposite reaction: a sensation of relax (often associated to lose of strength), as well as sensation of rejection (visceral discomfort). Furthermore several people visualized different kind of images as, for example, the visualization of the sea. A Tactile sensation was often associated with the feeling of the wind on the skin.
- Olfactory and tactile information in response to the gustatory stimulus (fig.2). These are common associations, used everyday to discriminate the tastes and the consistence of food.

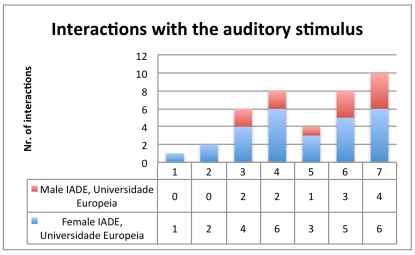
- Olfactory, tactile and visceral information in response to the olfactory stimulus (fig.3). Several participants reported an augmented salivation after being exposed to the smell ethylic alcohol. In the case of tactile information, it is mostly referred to the cotton balls where the ethylic alcohol was spilled. In several cases, the smell of alcohol was also referred to a sensation of pain (visceral).
- Vestibular and visceral information in response to the proprioceptive stimulus (fig.4). Some participants experienced a loss of balance (vestibular) and muscular or articular pain (visceral).
- Visual information in response to tactile stimulus (fig.5). Most of the cases refer the colour of the cotton balls.
- Proprioceptive and visual information in response to the vestibular stimulus (fig. 6). These are common interactions used in daily motor activity. The interactions reported are: loss of sight after twirls and a sensation of movement (proprioceptive). In some cases, symptoms of nausea were reported (visceral information).
- Tactile, proprioceptive and olfactory information in response to the visceral stimulus (fig.7). In this case, the tactile information regarded the sensation of pressure (tactile) and strength (proprioceptive) of the clothespin applied on the nose. The olfactory information provided was the absence of smell, due to the nostrils occlusion.
- Auditory, proprioceptive, tactile, vestibular and visceral information in response to the visual stimulus (fig.8). It is interesting to observe how the visual stimuli (three bulbs emitting a light of 6.500 k and 806 lm) were referred in a great variety of sensory systems. Proprioceptive, vestibular and visceral information referred a sensation of strength (proprioceptive), a sensation of pain (visceral) and a loss of balance (vestibular). In this case the light was considered too aggressive.

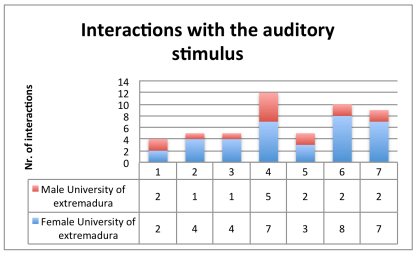
Table 2.
Percentage of interactions according to gender and groups (in average).

		Gender		**IADE**		**UEX**	
Stimulus	**Total**	Female	Male	Female	Male	Female	Male
Gustatory	162	69,1%	30,9%	64,4%	35,6%	71,8%	28,5%
Olfactory	145	71,7%	28,3%	69,1%	30,9%	73,3%	26,7%
Visual	142	74,6%	25,4%	76,8%	23,3%	73,3%	26,7%
Vestibular	137	75,9%	24,1%	80,4%	19,6%	72,8%	27,2%
Auditory	136	70,6%	29,4%	71,2%	28,8%	70,1%	29,9%
Proprioceptive	133	67,7%	32,3%	67,7%	32,3%	67,9%	32,1%
Tactile	129	72,1%	27,9%	64,0%	36,0%	77,2%	22,8%
Visceral	126	72,2%	27,8%	71,4%	28,6%	72,7%	27,3%

When comparing the recurrence for any interaction by gender, a higher number of interactions are found for females in response to the following stimulus: auditory (+0,2%), olfactory (+1,3%), tactile, vestibular (+5,5%), visceral (+1,8%) and visual stimuli (+4,2%). On the other hand, a higher recurrence of masculine interactions if

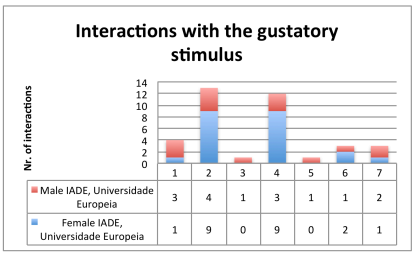
found within the proprioceptive stimulus (+2,7%). When comparing genders by university of origin, the results are as follows. In the case of IADE, Universidade Europeia, a higher number of interactions are found for females in response to the following stimulus: auditory (+0,4%), vestibular (9,6%), visceral (+0,6%) and visual stimulus (6%); while masculine interaction presents more recurrence in gustatory (+6,4%), olfactory (+1,7%), proprioceptive (3,1%) and tactile (+2,9%). In the case of UEX, a higher number of interactions are found for females in response to the following stimulus: auditory (+0,1%), gustatory (+1,8%), olfactory (+3,3%), tactile (+7,2%), vestibular (+2,8%), visceral (+2,7%), and visual (+3,3%) stimuli. Prevalence of masculine interaction regarded the proprioceptive stimulus (+2,1%).

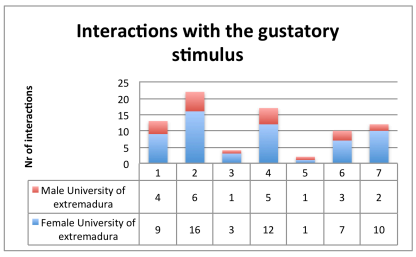




#	system involved
1	gustatory system
2	olfactory system
3	proprioceptive system
4	tactile system
5	vestibular system
6	visceral system
7	visual system

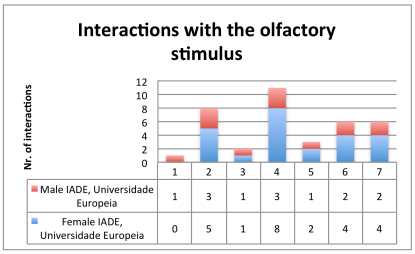
Fig. 1
Auditory stimulus: number of interaction per gender (IADE | UEX)

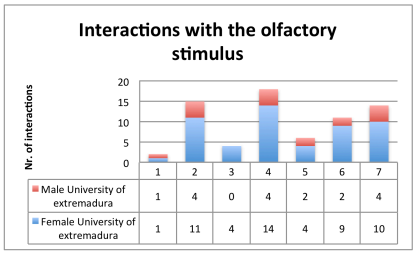




#	system involved
1	auditory system
2	olfactory system
3	proprioceptive system
4	tactile system
5	vestibular system
6	visceral system
7	visual system

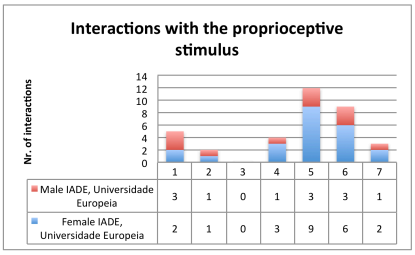
Fig. 2
Gustatory stimulus: number of interaction per gender (IADE | UEX)

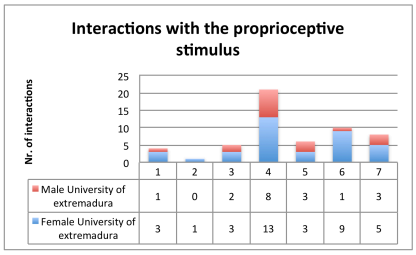




#	system involved
1	auditory system
2	gustatory system
3	proprioceptive system
4	tactile system
5	vestibular system
6	visceral system
7	visual system

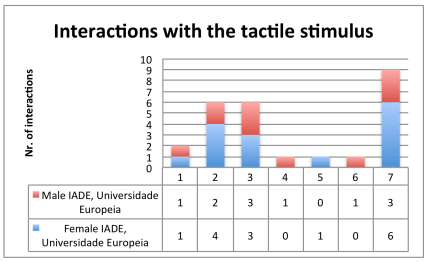
Fig. 3
Olfactory stimulus: number of interaction per gender (IADE | UEX)

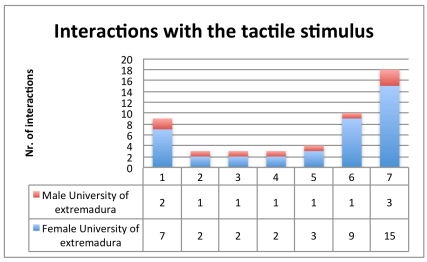




#	system involved
1	auditory system
2	gustatory system
3	olfactory system
4	tactile system
5	vestibular system
6	visceral system
7	visual system

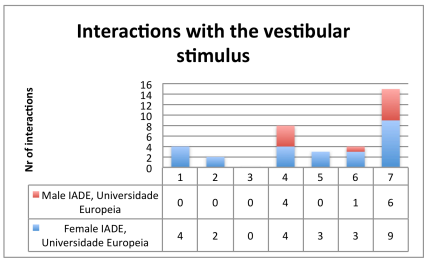
Fig. 4
Proprioceptive stimulus: number of interaction per gender (IADE | UEX)

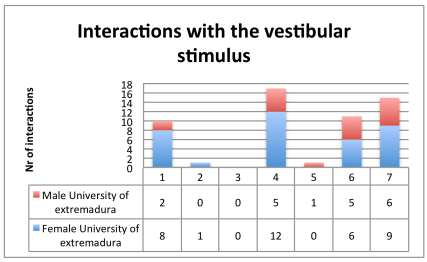




#	system involved
1	auditory system
2	gustatory system
3	olfactory system
4	proprioceptive system
5	vestibular system
6	visceral system
7	visual system

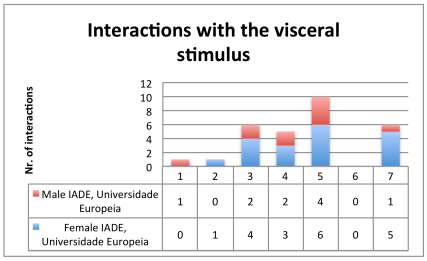
Fig. 5
Tactile stimulus: number of interaction per gender (IADE | UEX)

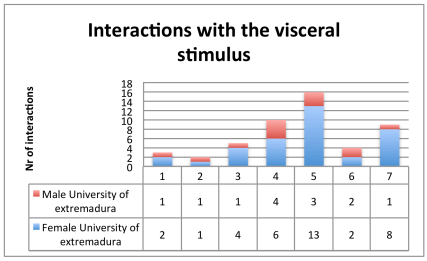




#	system involved
1	auditory system
2	gustatory system
3	olfactory system
4	proprioceptive system
5	tactile system
6	visceral system
7	visual system

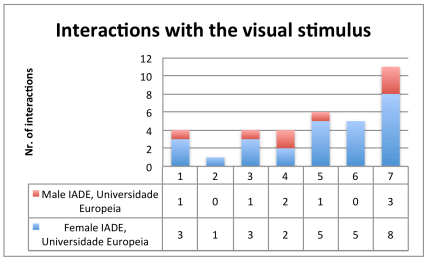
Fig. 6
Vestibular stimulus: number of interaction per gender (IADE | UEX)

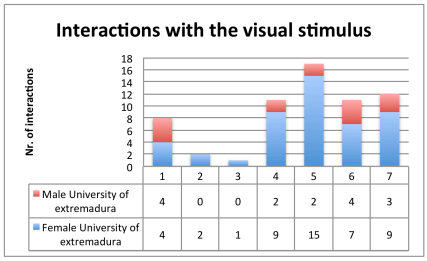




#	system involved
1	auditory system
2	gustatory system
3	olfactory system
4	proprioceptive system
5	tactile system
6	vestibular system
7	visual system

Fig. 7
Visceral stimulus: number of interaction per gender (IADE | UEX)





#	system involved
1	auditory system
2	gustatory system
3	olfactory system
4	proprioceptive system
5	tactile system
6	vestibular system
7	visceral system

Fig. 8
Visual stimulus: number of interaction per gender (IADE | UEX)

CONCLUSIONS

The results of the workshop show higher number of interactions between those modalities that are usually privileged by designers (visual, tactile, auditory, olfactory) and those one that, in contrary, are often neglected by designers (gustatory, proprioceptive, vestibular, visceral). The data between universities do not suggests a relevant differences between the two groups. The comparison of results gathered by gender (both when considering the all sample or when analysing data by university) seems to show a small prevalence of cross-sensory interactions in female responses for vestibular, visceral and visual stimuli and a small prevalence of masculine responses

regarding the proprioceptive interactions. The choice of workshop format to collect data limited our capacity to get a homogenous sample in terms of gender. Due to the reduced number of male participants, we decided to not conduct inferential statistics. Future replications of the same experience will give us the possibility to enlargement the sample and test data for significant differences between genders. The mapping of this information is seen as a way to collect the required number of cross-sensory combinations to be strategically included in a synaesthetic model for design development.

ACKNOWLEDGEMENTS

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Designing Innovative Clothing for Health and Wellbeing:

Using a Biomimetic Approach and Heat Releasing Electronic Nanocomposite Materials to Fibromyalgia Patients

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ABSTRACT

This paper aims to present the research design map of an innovative garment, as an applied research output, that through interdisciplinary studies for health and wellbeing is focused on helping fibromyalgia patients and also summarizes preliminary researching phase of doctoral thesis study. In the next part of study, methods can be developed or modified according to the information obtained. Fibromyalgia symptom is characterized by widespread muscle-skeleton system pain and it has clinical symptoms such as fatigue, sleep disorder and irritable colon syndrome (Özçetin, 2014). Fibromyalgia patients need to heat to sensitive parts of their body for reduce their pain. In this context, it is aimed to create a sustainable design product supported in a biomimetic approach, looking for the reduction of the pain or other fibromyalgia symptoms due to a collaborative exercise of a multidisciplinary team composed by doctors, engineers and designers. The use of textile surfaces finished with electronic nanocomposite materials is also a good technological hypothesis for desired feature. Because heat releasing electronic nanocomposite materials can be applicable to a fabric easily and can be used for a garment. Also the temperature can be adjusted to required temperature (Erol, 2013). According to the results of preliminary collected data, the designing of the heat releasing sustainable clothing could be well considered for fibromyalgia patients.

Keywords: co-design, biomimetic approach, medical clothing, fibromyalgia patient's wellbeing, social innovation, sustainability

INTRODUCTION

The innovations of medical technology, especially on medical textiles and medical clothing area, are on the agenda. Gupta's (2011) classification separates medical clothing from medical textiles and named them as medical-functional clothing within injury protective, therapeutic and rehabilitative and bio-sensing titles. According to Gupta's classification, this study promotes therapeutic and rehabilitative clothing to help fibromyalgia's patients' chronic pains. The hypothesis of this study is determined as "Designing a Heat Releasing Garment Through a biomimetic approach will help the patients with fibromyalgia".

After the problem is determined, the chosen conceptual and methodological framework supports the design of innovative solutions for patients' wellbeing and social sustainable practices. As presented by multiple authors, the 'Design for Well-Being' concept focuses on solving problems and helping people along many different dimensions like physical, mental, emotional or spiritual ones (Souter-Brown, 2015; Cowie et al., 2004; Harrington, 2013).

To understand fibromyalgia, a literature research is made and interviews are applied with patients and a doctor. Fibromyalgia is a common syndrome characterized by widespread pain (Bazzichi et al., 2011; Ulus et al., 2013; Altunbilek et al. 2017). As a result of interviews with patients it was clear that they should heat their body to reduce their pain by using heat pads or hot water bags. Patients linked their heating problems also to the cost of heat pad (energy) and the difficulty of using hot water bags in daily life. For solving the problem and helping to reduce their pain, it has been focused on method and design approach. This perception led to the idea and interest of a research design project that would create an innovative product, through a biomimetic approach, for fibromyalgia patients. For the solution of the problem, samples are researched from the nature and open-end interview form is applied with a biologist. The human body is itself is an automatic thermo-regulated organism (Tao, 2001). But the desired feature in design is an extra temperature for sensitive parts of body. Long legged wader birds have been imitated from the nature by using biomimetic approach. To design a garment has partial heating characteristic like long legged wader birds, material research is done. Textile surfaces are insulating. The textiles, which are supported by electronic nano composite materials, become conductive. It means no needed to use cables or wires for heat releasing. Interviews are made with engineers and electronic nano composite materials are chosen for obtain heat releasing fabric and designing a heat releasing garment.

METHOD

Considering the tender points of patients with fibromyalgia, a clothing design will be created to release heat according to these points. The garment to be designed is in the non-pharmacological treatment method classification. It was thought that the design would help the pain attacks of fibromyalgia patients when used with pharmacological methods during the treatment period. Future studies to be continued and developed for functional and aesthetical properties of the garment. It is planned that the medical garment will be designed as an stylish garment which can be used in daily life owing to its aesthetic features. The design will be supported as a result of the surveys to be conducted before and after the use and the interviews with the experts. This study is the preliminary phase of an applied research. In order to define the problem and determine the methods to be used in the solution of the problem, a literature study was conducted

and open-ended interview forms were applied to the experts in the field. In the following parts of the paper, the methods applied in the idea process of innovative product design are summarized.

THE RESEARCH PROCESS DESIGN: Sensing the problem

To spark the intended research, questions as 'Why fibromyalgia syndrome is selected for this study? How can we help fibromyalgia patients? What are our design approaches and tools for problem solving? Which materials could be chosen for production of an innovative product considering the patients' wellbeing? How should be planned the design processes for the creation of an innovative, meaningful and fitted product?' were posed. Based on those, some research activities and methods were considered, as shown below.

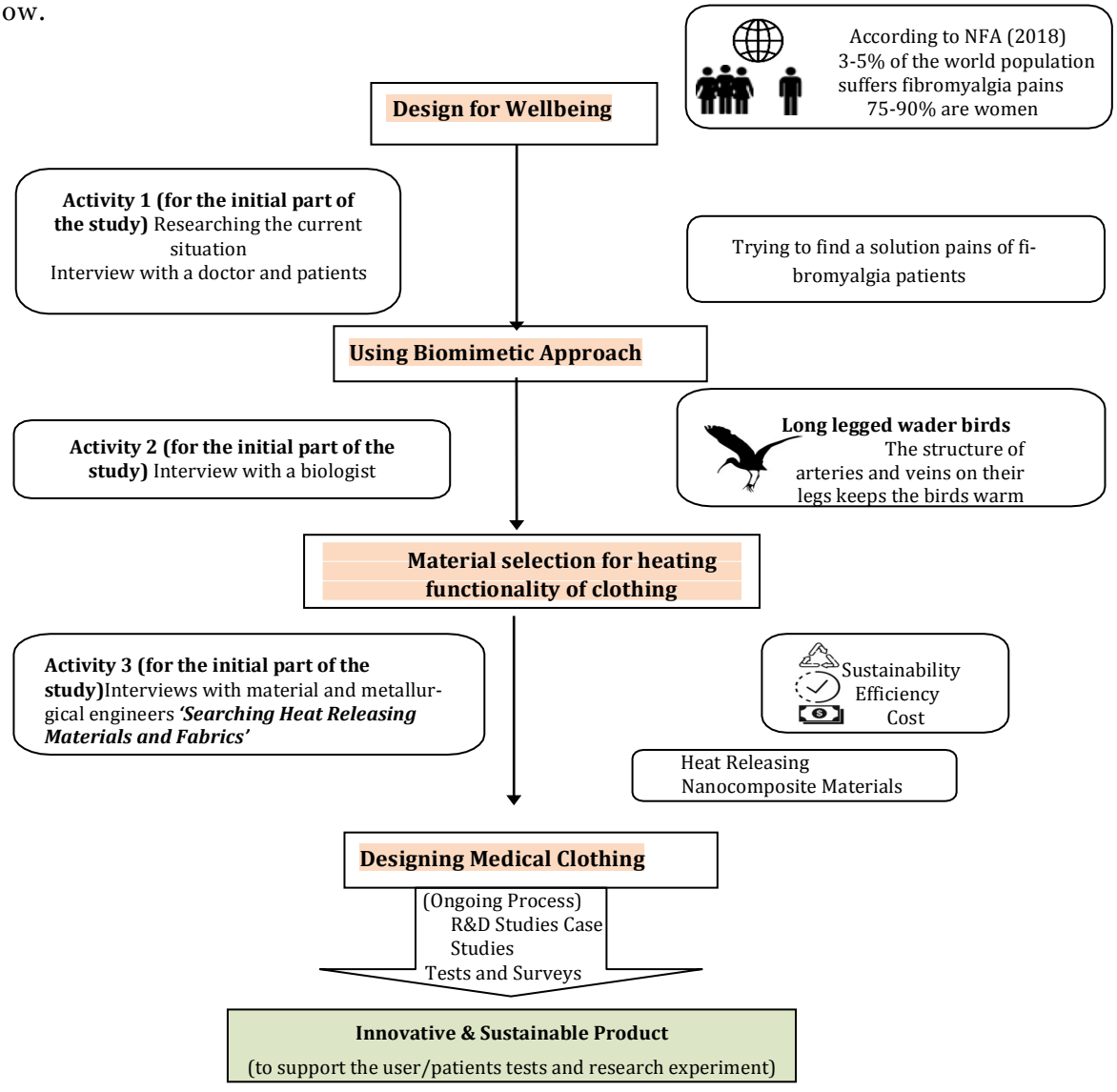

Figure 1.
Initial Design Processes

Activity 1 - What is Fibromyalgia?

In this part of the study, for understanding fibromyalgia patient's pains, literature review was done as well as an open end interview form applied to a doctor.

Chronic pain is one of the most frequent complaints in medical practice. The International Association for the Study of Pain (IASP) estimates that chronic pain afflicts about 20 % (10-55 %) of the adult population, world-wide (Queiroz, 2013). According to NFA (National Fibromyalgia Association), fibromyalgia is one of the most common chronic pain conditions. The disorder affects an estimated 10 million people in the U.S. and an estimated 3-6% of the world population. (NFA, 2018).Neumann and Buskila, (2013) reported the prevalence of fibromyalgia (FM) in in the general population was reported to range from 0.5% to 5% and up to 15.7% in the clinic. Branco et al.al. (2010), investigated prevalence of Fibromyalgia by a survey, was performed in 5 European countries (Portugal, Spain, France, Germany and Italy) to estimate the prevalence of fibromyalgia in general population among rheumatology outpatients according to estimate the prevalence of fibromyalgia in general population among rheumatology outpatients according to LFESSQ (London Fibromyalgia Epidemiological Study Screening Questionnaire).

This survey has composed of 6 question and positive screens were defined in 2 different ways. The London Fibromyalgia Epidemiology Study Screening Questionnaire is showed in Table 1 below. Having the pain criteria alone is defined as LFESSQ-4, having both the pain and fatigue criteria is defined LFESSQ-6. According to LFESSQ-4 results, the highest rate was found in Portugal and the lowest rate was found in Italy. Finally, the LFESSQ-6 results showed the highest rate at Germany and Portugal, and the lowest rate in Italy.

Pain criteria in the past 3 months: 1. Have you had pain in muscles, bones, or joints, lasting at least 1week? 2. Have you had pain in your shoulders, arms, or hands? On which side? Right, left, or both? 3. Have you had pain in your legs or feet? On which side? Right, left, or both? 4. Have you had pain in your neck, chest or back? Meeting the pain criteria requires "yes" responses to all 4 pain items, and either (1) both a right- and left side positive response, or (2) a both sides positive response. Fatigue criteria 5. Over the past 3 months, do you often felt tired or fatigued? 6. Does tiredness or fatigue significantly limit your activities? Screening positive for chronic, debilitating fatigue requires a "yes" response to both fatigue items.

Table 1.
The London Fibromyalgia Epidemiology Study Screening Questionnaire (Branco et al., 2010).

Aside from chronic pain and fatigue, several patients manifest non-specific symptoms such as sleep disturbances, mood disorders, and neurocognitive impairment (Giacommelli, 2013).Fibromyalgia treatment methods are grouped basically as pharmacological treatment methods and non-pharmacological treatment methods (Sindel et al.,2012; Sarzi-Puttini, et al., 2008). Many studies show that treatment methods using single modality do not provide full efficacy in patients with fibromyalgia and that the most effective method in clinical practice is to apply pharmacological and non pharmacological treatments methods together (Sindel et al. 2012). Applying heat is considered a non pharmacological method. This understanding supports the goal and underlines the social relevance of designing a heat releasing cloth that will help with the treatment together with the pharmacological methods.

For a better perception of the problem limits, an open-end interview form was created and applied at 21.03.2019 to Prof.Dr. RENGİN GÜZEL who works at Cukurova University Faculty of Medicine/ Department of Physical Medicine and Rehabilitation in Turkey. The most important parts of the interview are summarized and can be seen in figure 2.

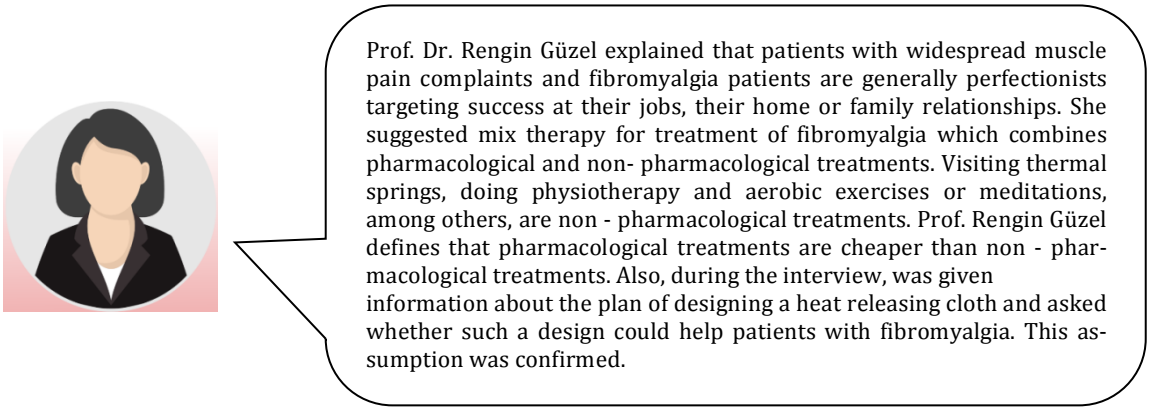

Figure 2.
Summary of Prof. Dr. Rengin Güzel Interview

In this exploratory line of action, some interviews were applied to 3 patients to understand what they need or use to heat their body and to reduce their pain. The patients stated that they usually used heat pad or hot water bag. As already stated, patient's noticed, as some important causes to their heating problems, the cost of heat pad and difficulty of using hot water bags in a common base. According to the findings, the garment design should be tight to tender points.

Activity 2 - Design Process Approaches

Sustainability, biomimetic approach and wellbeing are intersecting concepts at many points. Souter-Brown (2015) advocates that without ecological health there is no human health and wellbeing. Dieffenbacher (2013) indicates "Biomimetic also tells us that every solution we seek has already been designed by nature, thus if we find ways to reconnect with it, we will find well being".

This study aims helping fibromyalgia patients by using a biomimetic (inspiring nature) approach. The selection of the materials and knowledge access to achieve sustainability and to create new or improved products/services/solutions can be find in nature (Pan and Blavis, 2014; Dieffenbacher, 2013; Das et al., 2017). The term 'biomimetic' was coined by Otto Schmitt in the 1950s and it has come to have a wider meaning beyond the medical and robotic focus of Steele's bionics. Janine Benyus (2002) lists three types of biological entity on which technology might be modeled: natural methods of (chemical) manufacture; mechanisms and structures found in nature; and organizational principles in the social behavior of animals (Steadman, 2008). To reinforce the idea and pertinence of using this approach to frame the research design, an open-end interview was applied to Prof.Dr. Hatice Korkmaz Güven from Cukurova University Faculty of Arts and Sciences Department of Biology at 28.03.2019.

Figure 3 presents a summary of the interview.

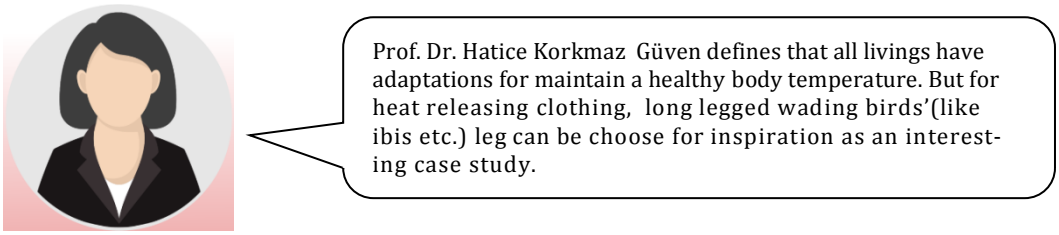

Figure 3.
Summary of Prof. Dr. Hatice Korkmaz Güven Interview

Initially, the findings about fibromyalgia were shared with Hatice Korkmaz Güven and the desired design mentioned. She suggests to mimicry long legged wader birds. Long legged wading birds maintain their body temperature via the vascular structures in the legs. Something called counter current heat exchange also helps birds reduce heat loss (Lawlor and Archer, 1998). This mimicry revealed the idea that heating could be made according to tender points on the medical clothing.

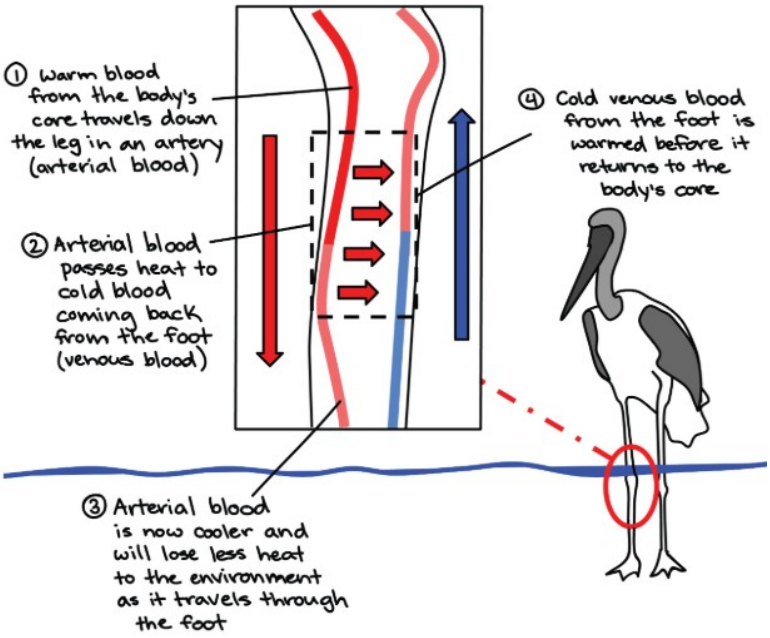

Figure 4.
How do ' long legged wader birds' maintain body temp temperature? (Khanacadmy, 2017)

Activity 3 – Material Selection

In this part of study was important to obtain heat releasing solutions information. Initially, the case studies on heat release products were examined. There are heat releasing jacket designs by using heating panels which are sold on the internet. Also heats releasing patented products were examined. Most of them provision the heat, by putting electronic devices, heating pads or air tubes on the clothing. The design 'Wirelessly-Chargeable Heating Pad' of Ming- Hsiang Yeh (2011) can be given as an example. Using a portable heating panel, a dress, a glove or a blanket may release heat. In this study, it was desired to obtain conductive textile surfaces unlike the placement of

electronic devices. Because, it is desired to design a garment that has comfort features. Generally for thermal regulating of fabrics phase changed materials are used. But phase change materials protect the body from sudden changes and they do not release extra heating (NASA, 2017).

For thee needed properties of design, biomimetic approach, sustainability, wellbeing and fibromyalgia was explained to engineers. An open-end interview was conducted to Dr. Mustafa Erol and Dr. Metin Yurddaşkal from Dokuz Eylül University in Turkey, Faculty of Engineering Metallurgical and Materials Engineering at 29.03.2019. Taking into account sustainability, efficiency and cost, electronic nanocomposite materials were suggested as interesting materials with good performance for the design.

Summarized interview answers are shown at next Figure5.

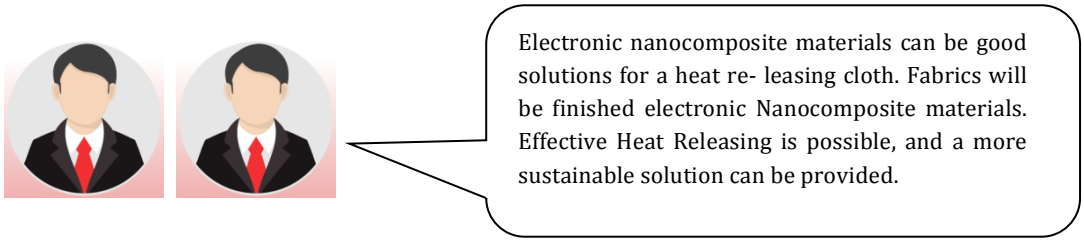

Figure 5.
Summary of Dr. Mustafa Erol and Dr. Metin Yurddaşkal Interviews

CONCLUSION

This paper aims to explain of a medical garment design process. To helping reduce the pain of fibromyalgia patients, information collection, material and method determination practices are presented in a garment design process.

Fibromyalgia patients suffer pain. With this perception, it is intended to do a applied research process envisioning the reduction of the body pain of fibromyalgia patients through the design of an innovative cloth. For getting it, as well as a patients and others users wellbeing, a multidisciplinary study will be conducted with expert from different but complementary fields. According to preliminary interview results, the biomimetic approach proposal, some innovative materials and important information was underlined, supporting some initial ideas and helping in this challenge framing.

ACKNOWLEDGEMENTS/NOTES

This study is the initial part of research design process. And in the ongoing working process, the foundations of the design will be formed according to the findings. Also, interviews will be applied to patients.

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The Relation between UCD principles and evaluation methods in digital product Design development process

Digital Products for Healthcare

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ABSTRACT

Since designers have gained a more significant role at the digital product development process, their daily practice is showing there is an urgent need to provide ROI structured evidence. By demonstrating more accurately, how different design skills and methodologies can significantly reduce feature re-work, avoid usability errors and increase product user engagement, when consistently and systematically applied along the development process. This paper aims to discuss the cross-relation between User-Centered Design framework, namely, its four phases and the software development process methodologies, focusing on Agile approach, having, as use case, the healthcare digital products. How can the UCD framework be a positive added-value to the development process and constitute a methodology baseline structure mapping user-research methods and evaluation methods along the software development process. This new framework will help designers and multidisciplinary teams to identify usability metrics accordingly to the project stage, help to support project design decisions and contribute to bring added-value both to the IT supplier's team and client's end-users, by delivering coherent, robust, usable and efficient products.

Keywords: digital product design, software development, UCD, ISO, healthcare

INTRODUCTION

Since the 70's, when J. Christopher Jones identified in his book "Design Methods: seeds of human future" that, due to the crescent problem complexity, designers had to re-adjust themselves into new ways to approach design project (Jones, 1992). A decade after, designers started to work in multidisciplinary teams at the IT industry where, design problems occured at the human vs machine level. It was the beginning of a new era, where designers needed to design holistic experiences that would cross both the tangible/analogical products with intangible/digital products. Defining product-service ecosystems to frame products and define experiences.

This paper's scope is about the intangible/digital products, its development process and, the positive contribute that matching the development process phases and UCD design framework can bring. The intersection between development process methodologies and design thinking (Baxter, Courage, & Caine, 2015) approaches, have been increasing for the past decade, giving rise

to the methodologies like Agile UX, Lean UX and Design Ops ('Agile and User-Centered Design', 2014).

These approaches are based on iterative touchpoints of the multidisciplinary team through the process called sprints, based on effort estimation of groups of functional requirements. Through this dynamic process, both IT suppliers and clients can easily get real time evolution of the project by providing small systematic deliveries.

This study is about non-closed scope products for healthcare (Chokshi & Mann, 2018), namely for hospital context of use, with a patient-oriented focus. This kind of products bring several challenges to teams. The projects for this functional area are based on digital transformation or, work on interoperability with multiple pre-existent products of the hospital ecosystem. Legal mandatory updates, which lead to new requirements and constant modifications, clinical techniques and knowledge evolution, as well as, different specialities practice, imprint a constant product evolution. The criticality and severity of users' tasks and the multi-level functionality usage makes, the development and evolutionary maintenance of this products, an open process. This events causes several difficulties such as coherence (navigational and visual), scaling, creating updated documentation and delivering useful, efficient and interoperable workflows. Those characteristics would provide meaningful data at the right context in order to provide, to the users, an efficient decision support tool.

The designers' role on this process has been increasingly growing, since software industry understood that building and delivering digital products is not only about building artefacts but, also, to provide holistic and immersive experiences (Hoober, 2014). To achieve these goals, design thinking has been entering into cultural organizations DNA in order to promote inside teams, the right environment to promote creative routines. This would result in better products to be delivered to the clients.

DIGITAL PRODUCT DEVELOPMENT METHODOLOGIES AND UCD PRINCIPLES

Software development methodologies such as Waterfall or Scrum approaches (the Agile methodology was the one used to elaborate this study due to the widespread and variety of IT functional industry applications) are developer-task-oriented. This means that the whole process is focused on, elaborating documentation (user stories, requirements, epics, tasks and issues) that supports the developers work. The Product roadmap encloses all the main features that the product/project would have. Product roadmap documentation is maintained all through the project by the Product Owner, which is the products' gatekeeper.

The documentation is previously elaborated by Business Analysis team, with Designers' team contribution, that support both navigational and visually the requirements. As mentioned before, the subject of this paper (non-closed scope product project) brings additional challenges to this workflow. Teams are not working from scratch but, working based on pre-existences (projects triggered by technology or feature evolution). This means that team members are already considered functional specialists and documentation production can be accelerated, as well as the Designers teamwork.

Base on project constraints, delivery schedullings, team availability, external factors to the project and project margins, at the beginning of the project, is defined the MVP version (Minimum Viable Product). This version is constituted by a group of requirements that will be time-framed into sprints (time periods in which the development team should estimate, develop, test and deliver the requirements), e.g., Agile teams work in 4-week sprints. The criteria to include requirements

to a sprint are subjected firstly to the development' team capability and, also to meet the client's needs to keep on the continuous iterative delivery.

Applying the user-centered framework (Gladkiy, 2018) to digital product development, brings to the team new perspectives that helps, namely, to project managers and developers, a better understanding of user needs, feelling the users' difficulties when approaching tasks and better prioritizing features in the MVP. Also establish a hierarchical relation in between them. UCD gatekeepers at the project tend to be UX Designers (with barely exceptions, designers are the ones responsible to maintain the users' problems at the center of the process) because their work is triggered by the user and the impact of a certain task at the user's day timeline. Designers' job is to find out what is the better path/workflow to construct and deliver the best response to it.

Both UCD and Agile approaches are based on iterative touchpoints, making both design and development sprints a dynamic and systematic workflow. Although there is proved added value in bringing design thinking frameworks into development process, constraints, like time, budget and technology dictates that UX issues and requirements are left into second plane. Design and Designers still need to prove the relevance and critical impact of their work by defining strategies to provide hierarchies metrics (Albert & Tullis, 2013, p.63-98). This strategy would prove that bringing designers to all the development stages would prevent re-work, increased costs, increase users' early acceptance to change, help to manage change (this is especially critical in non-closed scope products with heavy interaction legacy), manage expectations and bring users into the process, easining live critical implementations (by generating empathy since the beginning of the process) (Da Silva, Martin, Maurer, & Silveira, 2011).

ISO 9241 part 210 in Development Methodologies

Acknowledging the return of investment of having creative resources in IT companies is very difficult due to the qualitative nature of the outputs' deliverables provided to the projects. Starting by concepts/user stories/prototypes and continuing with project hand-off. There are metrics like user engagement, relation between training and proficiency levels, use of behavior patterns, etc. Measuring user experience and cognitive ignitions to interfaces, would be one tool to develop KPI's. This would provide companies' decision makers enough information to hire more creative profiles or, even more important, empower UX inside the company.

As mentioned above, software development methodologies are predominantly oriented to be developer-task oriented. Although some frameworks like UCD can be applied, the disfunction between the development sprint rhythm and design sprint ('DesignOps Handbook ', 2019) persists. The only way to secure and empower project decisions anchored in UX is to apply methods that would bring metrics that project managers, product owners and, most important, clients could understand. The aim of this paper is to present a framework that matches UCD principles and ISO 9241 Ergonomics of Human-System Interaction - Part 210: Human-centred design for interactive systems('ISO 9241-210:2010(en), Ergonomics of human-system interaction — Part 210: Human-centred design for interactive systems', 2010).

This general standard, that has replaced ISO 13407:1999, was a technical revision taking into account the growing complexity of problems that companies and professionals are dealing with. It provides a revision incorporating the approach based on the UCD framework but renamed to Human-Centered Design Activities, (as you can see at Figure 1):

a) Understanding and specifying the context of use;
b) Specifying the user requirements;
c) Producing design solutions;

d) Evaluating the Design.

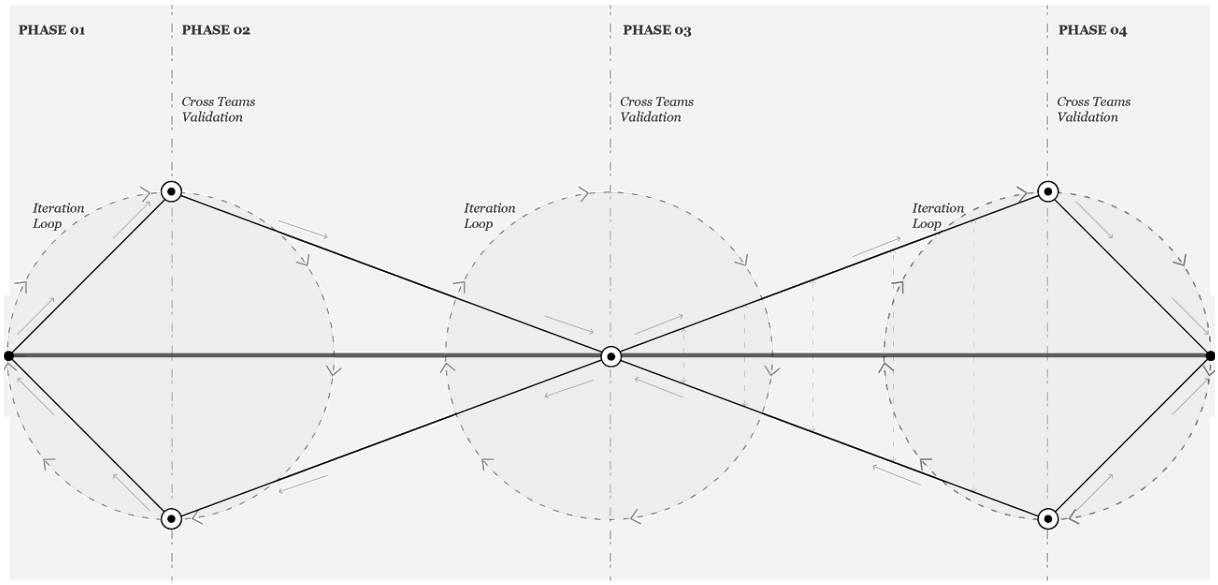
This standard intends to provide a framework that doesn't represent any specific design process. It should be applied in complement to other methodologies at any stage of the project development. The conformance of the system/product to this part of the of ISO 9241 is based on the satisfaction of all requirements, identification of applicable recommendations, explanation why particular recommendations are not applicable and stating whether or not the applicable recommendations have been followed.

The ISO 9241 Ergonomics of Human-System Interaction - Part 210: Human-centred design for interactive systems provides an "umbrella" approach that would frame all process phases. For healthcare context, IEC TR 62366 - 2:2016 Medical devices - Part 2: Guidance on the application of usability engineering to medical devices, provides the list of methods that are suited for the context of healthcare (IEC TR 62366, 2016).

Applying these standards through the development process and, correspondent methods associated to each activity would provide, firstly, to the UX designers and the multidisciplinary project team more data that would help to mark the developments, As well as, to bring insights to a decision support tool to (re)define priorities in sprint, take user-interaction decisions and (re)direct development team efforts into features that are meaningful and game changers to the end-user.

Proposed Approach for Non-Closed Scope Digital Products for Healthcare

Based on the User-Centered Design and ISO 9241 part 210 - Human-centred design for interactive systems frameworks, Agile development methodology and healthcare digital products development, this paper proposes a 4 phase approach to the sprint. This framework intends to match both the Design Team and Developer team sprints, promoting the interdependency of work between them, anchored at the application, at each stage, of a selection of evaluation methods retrieved from IEC TR 62366 - 2:2016 Medical devices - Part 2: Guidance on the application of usability engineering to medical devices. Figure 1 shows the visual representation of a sprint, a time-framed inside the development process.



UCD Principles vs ISO 9241-210 Human-Centred Activities and Methods

PHASE 01	PHASE 02	PHASE 03	PHASE 04
UCD Principles			
1. *Analysis*	**2.** *Requirements Definition*	**3.** *Design*	**4.** *Test*
ISO Activities			
1. *Understanding and Specifying the context of use*	**2.** *Specifying User/UX Requirements*	**3.** *Producing Design Solutions*	**4.** *Evaluating Design*
Methods			
. Cognitive Walkthrough . Day-in-the-life analyisis . Function Analysis . Observation . Task Analyisis	. Day-in-the-life analyisis . Function Analysis . Observation . Task Analyisis	. Cognitive Walkthrough . Advisory Panel Reviews . Expert Reviews . Heuristic Analysis . Standard Reviews . Task Analyisis	. Advisory Panel Reviews . Expert Reviews . Observation . One-on-one Interviews . Simulation

Figure 1

Proposed framework: cross approach UCD and ISO evaluation methods

CONCLUSION

The challenges brought by the increasing complexity of human interactions led into new needs, concerning the relation between the multidisciplinary teams that develop software for healthcare context. The aim of this paper was to present an approach proposal based on User-centered Design framework, ISO 9241 and IEC TR 62366 standards and Agile methodology that would bring more meaningful data to the development process that would contribute to the UX Designers empowerment and build more usable, efficient and robust products to the end-users.

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Usability and User Experience Evaluation of Learning Management Systems

An Exploratory Study to start the transformEDUcation

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ABSTRACT

This paper presents an Exploratory Study (EE) based on a bibliographic review. Publications were analyzed with the purpose of identifying criteria and guidelines used in Heuristic Evaluation (HE) studies and User Experience (UX) in Learning Management Systems (LMSs). The analysis was done selecting and inspecting scientific papers. This paper presents the process used to recognize the field of evaluation of LMSs to support the development of a doctoral research project in Design. Eighteen papers analyzed to identify the most frequently used techniques to evaluate usability and UX criteria in LMSs. It was possible to characterize the State-of-The-Art (SoTA) of the search field and generate insights for the design of the research project.

Keywords: Usability Evaluation, User Experience Evaluation, Learning Management Systems, Human-Computer Interaction, Exploratory Study

INTRODUCTION

LMSs are computer learning management systems in online learning environments (OLE). The technological evolution allowed the development of different LMSs adopted in educational, governmental and corporative environments (Hosie, Schibeci, & Backhaus, 2005; Oztekin, Delen, Turkyilmaz, & Zaim, 2013). Over the last few years, the complexity related to the development of such systems increased a lot in terms of interaction, content management, and available resources. Thus, it became necessary to evaluate these platforms in order to increase the quality of the learning and teaching processes that take place in them (Brusilovsky, 2004). Usability and User Experience (UX) play an important role in the quality of LMSs. While usability deals with the pragmatic aspects of the process of creating interfaces, such as the creation and execution of tasks by the user, UX is concerned with hedonic aspects such as emotions and stimulus to the user during the interaction process with a given product (Hassenzahl, Platz, Burmester, & Lehner, 2000).

The purpose of this paper is to describe an EE used to understand the research field of usability and UX evaluation in the context of LMSs. We sought to identify the techniques that have been used over the last years in the evaluation of OLEs from the use of LMSs. It was possible to identify the SoTA in the research field and to contribute to the recognition of UX usability and evaluation techniques in use in the context of

LMSs. This paper is organized as follows: Section 2 presents the papers analysis and method used to select such papers. Section 3 describes the methodology applied to conduct this Exploratory Study. Finally, section 4 presents the discussion and some considerations to the future of the research project.

LITERATURE REVIEW

In this section are presented the model used to select the papers and the results found based on the analysis performed.

Papers selection method

This EE started with the search for papers related to the keywords: "HEURISTIC EVALUATION E-LEARNING" without geographical restriction. The language of search of the papers was English, but some Portuguese articles were retrieved and accepted. The searches were conducted on repositories[1] such as Google Scholar, Emerald, Online-journals, Springer, Scopus, Scielo and B-on; in scientific magazines, university websites and social academic networks such as Research Gate and Academy. References could be papers, thesis, conference papers or scientific communications. The first round of research resulted in 21 papers; of which only 18 fits were considered to be of interest to the LMS theme, (3 did not match the keyword of interest, even if they had been retrieved by the search). Of these 18 papers, 2 papers were excluded by repetition (the same paper appears twice or more times in different repositories). After this refining, 16 papers were evaluated. The publications were cataloged in a bibliographic management system called Zotero. Data such as Title, Year, Location, Research Object, Methodology, and Area were inserted into a worksheet to help the categorization e comparing. In some situations, it was necessary to go to the site of the researcher's department or in scientific networks to obtain the missing information. The papers were arranged in chronological order. Then, each paper was read and analyzed individually to provide support to the SoTA analysis. It was observed that different fields have been contributed to the evolution of the HE/UX analysis of LMSs and other educational systems like Computation, Instructional Technology Design, IT with Education associated, Information System, Product and Systems Design Engineering, Medicine, Education, Human-Computer Interaction, Games Development, Computation and Artificial Intelligence (AI), Education Technology associated with Instructional Design, and others. Chronologically, references were made to studies from 2002 to 2018 in several countries: Brazil, Canada, Cyprus, Greece, India, Italy, Kuwait, Nigeria, Saudi Arabia, South Africa, Spain, Turkey, and USA.

SoTA and Papers Analysis

In the paper "Usability and Instructional Design Heuristics for E-Learning Evaluation", the Nielsen protocol (Nielsen & Mack, 1994) was modified and refined to evaluate e-learning systems used by participants at a Ph.D. seminar held at the University of Georgia between August and December 2001. In 2002 an approach was used to broaden these criteria, e-learning. In the study, for each criterion of analysis, a specialist assumed the role of learner evaluating the inconsistencies found in the system and reporting the problems on a severity scale, which ranged from simple visual problems to

[1] https://scholar.google.com, https://www.emeraldinsight.com/, https://online-journals.org/, https://www.springer.com/, https://www.scopus.com/, http://www.scielo.br/, https://www.b-on.pt/, https://www.researchgate.net/, https://www.academia.edu/

the inability to use LMS in total. The evaluator had to classify the extent of the problem, creating a report to inform if that inconsistency was a localized issue or a generalized problem. In the end, the inspector should present recommendations to improve the usability of the system related to aspects such as: Visibility of system status, Match between system and the real world, Error recovery and exiting, Consistency and standards, Error prevention, Navigation Support, Aesthetics, Help and Documentation, Interactivity, Message Design, Learning Design, Media Integration, Instructional Assessment, Resources and Feedback. The authors mention that heuristic evaluation is not enough to evaluate e-learning programs (Reeves et al., 2002).

In 2004, a paper addressing guidelines for usability of interfaces called "Towards Guidelines for Usability of e-Learning Applications" was published in the "8th ERCIM Workshop on User Interfaces for All Vienna, Austria, June 28-29, 2004" (Stary, Workshop on User Interfaces for All, & European Research Consortium for Informatics and Mathematics, 2004, p. 192). In the extensive article, Ardito et al. (2004) argue that poorly designed e-learning environments discourage students and create a barrier to effective learning. The authors demonstrate the need for guidelines based on User-Centered Design (UCD) and Learner-Centered Design (LCD) are needed to extend and improve the usability and accessibility of OLEs. The paper demonstrates that the heuristic evaluation at the time was still very general and subjective. As one of the research results was the proposition of a set of guidelines and criteria for the analysis of e-learning platforms in a more oriented perspective. Another relevant point in the studies is the mention of the "syntactic" aspects of educational applications, which denote the influence of the Norman Research (Ardito et al., 2004).

One of the results presented by the authors is the "SUE (Systematic Usability Evaluation) inspection". The systematization uses evaluation standards, called Abstract Tasks (ATs) to guide the activity of the interface evaluator. The ATs accurately describe which features of the e-learning application should be executed and analyzed. Among other things, SUE prescribes as less experienced evaluators, lack of usability expertise and application mastery, may be able to find more complete and accurate analysis results (Ardito et al., 2004).

In 2008, a comparative study between recognized open source e-learning platforms was conducted and entitled "Usability in e-Learning Platforms: heuristics comparison between Moodle, Sakai, and dotLRN". Among other conclusions, the publication demonstrates that much of the existing e-learning solutions are not ideal from the user's point of view, as they can become difficult and tedious to use, generating high drop-out rates. The study performed the heuristic evaluation of the interface of the Moodle, Sakai and dotLRN platforms[2] with the participation of five evaluators who used the Nielsen criteria for OLE analysis. The authors argue that LMSs have particularities compared to other systems and websites. The study also used severity scores for each analyzed dimension (Martin et al., 2016).

The paper "Heuristic Evaluation (HE) of E-Learning Products" presents a product-oriented approach in the format of a compact disc (CD) used to foster technology-based learning in rural areas of India. The authors evaluated the CDs based on the extended Garrett's model of user experience (Garrett, 2011). The heuristic evaluation was based on Nielsen's heuristics and the user experience model suggested by Jesse James Garrett,

[2] Moodle: https://moodle.org; Sakai: https://www.sakailms.org; dotLNR: https://dotlrn.org.

which considers five steps to create a website: Strategy, Scope, Structure, Skeleton, and Surface (Joshi & Medh, 2006).

Two papers published in 2010, dealing with e-learning in higher education and children education were analyzed. The first, "Effectiveness of heuristic evaluation in usability evaluation of e-learning applications in higher education" describes meta-evaluation research that investigated a HE of a web-based learning application in South Africa. According to the authors, issues involving usability are of the utmost importance in e-learning, since students can only begin learning when they are already familiar with the learning environment. Researchers point out that HE remains the most commonly used usability assessment method. The research methodology reported by the authors sought to find in the literature the appropriate criteria for analyzing educational interfaces in OLEs. The study carried out the heuristic evaluation with the support of specialists and User Testing (UT) methods were replaced by surveys methods. In the end, a comparison was made between the two approaches. The criteria used for the research were adapted from Nielsen's heuristics (Ssemugabi, 2010).

The second paper published in 2010, entitled "Usability Heuristics Evaluation for Child E-learning Applications" was developed at Kuwait University. The publication presents the Heuristic Evaluation for Child E-learning applications (HECE), a comprehensive set of heuristics for child e-learning based on Nielsen heuristics and adapted for children's education. In addition to the traditional heuristic approach with expert analysis, the study makes use of UT method for comparison purposes. In addition to the 10 criteria developed by Nielsen (Nielsen & Mack, 1994), the authors listed 5 new criteria related to Child Usability Heuristics and 5 criteria for E-learning Usability Heuristics (Alsumait & Al-Osaimi, 2010).

Two papers published in the year 2011 regarding the evaluation of OLEs were identified. The first one, "Heuristic evaluation of e-learning courses: a comparative analysis of two e-learning heuristic sets" presents a comparative study conducted in two representative e-learning heuristic protocols. The protocols chosen for analysis extended the traditional proposal of Nielsen heuristic evaluation criteria and covered technology-enhanced learning properties. The study was conducted by usability experts who performed the empirical application of two heuristic protocols in usability evaluation of e-learning applications. After that, they made suggestions for developing the new protocol sets (Zaharias & Koutsabasis, 2011). The authors argue that the traditional Heuristic Assessment often translates into subjective results and based on the evaluator's judgment, generating false positives and lack of systematization. Therefore, it is necessary to invest in new models of interface quality analysis. The pedagogical aspect was considered relevant in the definition of the validation criteria of educational interfaces and in this direction the works of Albion (1999) present an attempt to adapt the Nielsen criteria to the field of educational content production in the multimedia format (Albion, 1999).

In 2011, the publication of Zaharias & Koutsabasis (2011) presents a discussion about the approaches adopted to analyze educational interfaces. The first approaches, in the direction of maintaining the Nielsen criteria as heuristic evaluation standards and the second one, prioritizing the learning research, learning models and theories. The process of validation of criteria conducted by the authors demonstrated the concern to seek criteria that were in tune with the educational environment (Zaharias & Koutsabasis, 2011).

In 2013, the study "An efficient approach to improving the usability of e-learning resources: the role of heuristic evaluation", produced in the medical area, pointed out that factors such as shortage of financial resources and time could interfere in the final quality of the products of e-learning. In this study, specialists in areas such as usability, e-learning, instructional design, informatics, and medical content carried out heuristic investigations in a medical e-learning resource, seeking to identify usability related problems. The research made use of usability inspection tests conducted by specialists. One of the reported results was to demonstrate the importance of use tests combined with heuristic analysis. The authors also mention the importance of considering the affective, aesthetic, fun, and learning flow dimensions as indispensable to increase user motivation and enhance enjoyable experiences of using the environment. The publication highlights that the inclusion of interface evaluation routines is already common in the software development environment, but it still remains incipient when it comes to creating learning environments. The study also mentions the "evaluative effect" according to which the more evaluators participate in the inspection, the lower the chances of distortion between the results found (Davids, Chikte, & Halperin, 2013).

In 2013, an paper published in the American Society for Engineering Education, titled "Online Learning Environment Design: A Heuristic Evaluation", presents the results of the application of the heuristic evaluation to gauge the quality of and suggest improvements to a psychological education website. The publication presents the need to apply heuristic evaluations that take into account the perspectives of educational environments. However, the authors chose to carry out an evaluation process based on the Nielsen Heuristics, carried out by five experts. The evaluation process was performed considering the execution of tasks on a website aimed at female Ph.D. students. The evaluators analyzed the heuristic violation classifications according to degrees of severity (Hildebrand, Bekki, Bernstein, & Harrison, 2013).

A study conducted in Brazil in 2015, called "Evaluation of Virtual UFMG in the view of deaf students from the perspective of Semiotic Engineering" carried out the analysis of the communicability in a learning system aimed at deaf students, developed based on Moodle. The approach used by the study to evaluate the quality of the interface used the Intermediate Semiotic Inspection Method (ISIM), based on Semiotic Engineering (SE). According to the authors, the ISIM aims to characterize the communication between the designer and the user, mediated by an interface. The inspection of the system is mediated by specialists in SE and is given through a semi-structured interview that occurs during the inspection of the system (Souza, Oliveira, Dias, & Bernardino, 2015). The Semiotic Inspection Method (SIM) seeks to understand how the quality of the interaction between the user and the designer, represented by the interface, occurs. The evaluator, usually a specialist, performs interface analysis in order to find inconsistencies in the process of using signs classified in three categories: static, dynamic and metalinguistic. The static signs are elements without movement, the dynamic signs that are evidenced from the interaction of the user with the artifact and the metalinguistic signs make reference to other static and dynamic signs of the interface (Júnior, 2017).

The paper “Heuristic Evaluation of a Mobile Hand-Writing Learning Application” published in 2015, presents a study using heuristic evaluation of a mobile hand-writing learning application using Heuristic Evaluation for Child e-Learning (HECE) method. The heuristic evaluation was performed by evaluators and aimed to present a guideline

that could extend the quality of mobile learning interfaces developed for educational products consumed in tablets and smartphones (Yilmaz & Durdu, 2015). The nature of these devices imposes new forms of use and interaction and the research aimed at this aspect has become more common (Swearngin & Li, 2019).

Also in 2015, the Indian paper "Online Education: A Heuristic Evaluation and Comparison of eLearning Features" presents a study that seeks to demonstrate which criteria should be taken into account when making the choice of OLE, considering the requirements necessary to the students. The study was based on Nielsen's heuristics and compared the following LMSs and e-learning software: Moodle 3.0, Massive Open Online Courses (Mooc 4.0), Edmodo and Google Classroom. The authors mention that factors such as emotion, mood and feelings should be taken into account during the analysis of the interfaces (Paul & Deshpande, 2015).

In 2015, a publication called "Impact of Usability on Learning by Educational Digital Games", presents a usability study in educational games to identify the impact of usability on learning through educational digital games. The paper presents the proposed use of prototypes combined with the use of questionnaires and user tests to evaluate the usability of interfaces based on the heuristic evaluation of Nielsen (Cheiran, Ecar, & Junior, 2015).

In 2017, the study "Evaluating the Internal and External Usability Attributes of E-Learning Websites in Saudi Arabia" presented the analysis of internal and external usability attributes of 20 websites of e-learning platforms of that country, performed by usability specialists. The paper mentions the guideline ISO 9241-11, which deals with aspects such as effectiveness, efficiency, and satisfaction in the specified context of use, in the scope of the Web Content Accessibility Guidelines (WCAG) (BSI Standards Publication, 2018). Several tools, which identify HTML elements for analysis on web pages like W3C HTML, UsableNet LIFT, and Bobby WatchFire, HTML Toolbox and Web Page Analyzer, WebQual tool are cited in the paper. The publication presents tool-based evaluation methods like Qualidator, Website Grader, WebPage Analyzer, and Search Engine Optimization (SEO) software. The authors point out that few studies have evaluated the usability of e-learning websites by using automated tools. The evaluation of the external criteria (download time, SEO, Mobile friendly) was performed by automated tools, while the internal criteria (how the website was designed and developed) were evaluated from the Nielsen model (Al-Omar, 2017).

The paper "Heuristic Evaluation of an Institutional E-learning System: A Nigerian Case" published in 2017 argues that in several studies conducted in Africa, HE has often been used to evaluate web-based interfaces such as Moodle. However, such research is still largely focused on the adoption and acceptance of technology, disregarding pedagogical aspects. The SUE model and ISO 9126 which deals with the Quality Model was proposed as a standard framework for evaluating e-learning systems that are used in educational settings are cited in the study. The work carried out made use of three sets of heuristics: Web 2.0 Heuristics, Learning Heuristics and Tool Heuristics. The research made use of user tests and surveys (Daramola, Oladipupo, Afolabi, & Olopade, 2017).

Finally, the paper "Usability and User Experience Evaluation of Learning Management Systems A Systematic Mapping Study", produced in Brazil in 2017, presents an extensive study of analysis of scientific publications to characterize usability and UX evaluation techniques in the context of LMSs based on one systematic mapping method (Takashi

Nakamura, Harada Teixeira de Oliveira, & Conte, 2017). Similar to this EE, the study sought to identify the methodologies and the SoTA of the heuristic and UX evaluation in LMSs. Although, in different perspectives, in terms of approaches and depth, it was possible to find similar results in both. Initially, the publication was collected in the methodological perspective adopted by this EE. However, when starting the evaluation of the publication, it can be seen as a similar approach to help to understand the context of the HE and UX analysis of LMSs. The paper contributed to the comparison of the results.

DISCUSSION AND CONCLUSION

The EE can find papers in different fields, however, the approaches of HE are still very related to the use of the already established and substantiated criteria of Nielsen, alone, or conjugated with UT, inspection by evaluators, surveys and other qualitative approaches. Few initiatives have been seen in the direction of a more specific approach with the pedagogical field. It is possible to perceive a certain overlap of scientific production, which makes repeated use of standards and other methods already consolidated. If, on the one hand, this contributes to revalidation of approaches, on the other hand, it interrupts possible new cycles of innovation. The heuristic analysis criteria are still restricted and can be extended. In several papers, it was possible to observe the suggestion of the use of criteria such as effectiveness, efficiency, and satisfaction, in the context of UX.

Several authors mention that the development and analysis of e-learning applications are influenced by time, cost and human resources available. The heuristic analysis of OLEs over the last few years has been focused, almost exclusively, on the qualitative perspective. The approaches are still analogical in most cases and there is a lack of digital approaches. For example, AI or other technology could be considered to automate the process of interface analysis in a much faster way. Quantitative approaches based on automation can be considered to accelerate analysis, extend possible outcomes, and reduce costs. Quantitative analysis requires computational artifacts and technological resources that have recently become available, with Artificial Intelligence (AI), Deep Learning (DP), Artificial Neural Network (ANN), and the development of specialized systems. The use of feedback systems characteristic of AI was not identified in the studies analyzed. UX criteria were rarely mentioned or used in OLE analyzes.

It is worth questioning why, after so many guidelines, proposals for criteria and interface quality guidelines, the field of education still suffers from problems such as abandonment of educational environments, lack of interest on the part of students and teachers, problems of engagement and learning, among others. The SoTA served as an opportunity for the scrutiny of the research field of heuristic evaluation of interfaces. It was possible to identify criteria, guidelines, and methods that have been applied throughout the years 2000 to evaluate the quality of e-learning interfaces. New rounds of analysis will still be needed, making use of different keywords in order to broaden the references of possible criteria and guidelines. For the proposal of the research project will be carried out a Systematic Mapping Study extending the terms of interest, considering the fields of UX, AI, and DP.

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New social robots design methodologies to promote empathy in human-robot interaction

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ABSTRACT

The introduction of social robots into society is an unavoidable reality and it is considered that in the near future there will be a robot in every house and institution. However, their transfer from the research units seems difficult and their deployment in domestic environments still distant. The current method of development of a robot centered on the user is typically based on a specific purpose, and the design process is constrained by the profile of a target user, ignoring the untapped social potential of the machines and possible cohabitants. In this research proposal we suggest, alternatively, to support the creation process in a universal profile, acquiring standard features - aesthetic, ergonomic, behavioral, etc. - that promote empathy in humans and that should integrate the genesis of the design of a machine when the goal is the direct contact with people, regardless of its function or target user.

Keywords: Human-robot interaction, emotional design, social robots, biological data

INTRODUCTION

The development of a social robot implies a complex multidisciplinary approach. When inserting a robot in a social context with humans, considerations must be made at multiple levels: technological, psychological, emotional, cultural, economic, ethical, etc. This study focuses on the emotional and psychological levels, with the intent of fostering familiarity with a machine, creating empathy on people who will interact with it, being the target user or not, and thus facilitate its introduction into personal spaces, whether they are households or institutions.

The Emotional Design purpose is to create products that provoke specific emotions in order to establish a positive experience and relationship with a product. Humans have three levels of information processing when it comes to the emotional connection with an object: visceral, behavioral and reflective. The visceral level is described as the “gut” feeling that you get when you first encounter an object, the most influent features being related with the general aesthetics and materials. How an object looks and how it feels gives you an instant engagement of the senses and a gut response, be it negative or positive. The behavioral level relates with usability and performance issues, the way that a person is going to use an object and how easy is going to be. The Reflective level is concerned with the impact of the product in our lives: what values, desires or status

does it imply when you use it and how does it make you feel by owning it (Norman, 2004). All three levels are equally important in the design process, but this research will focus on visceral level analysis.

Even though the singularity of individuals with different tastes and needs is considered, the visceral level of processing information (Norman, 2004) is intrinsic to the modus operandi of the human being, which resulted from centuries of evolution. For instance, we do not like to feel too hot or too cold, we do not like loud noises, there are colors, sounds and textures that transmit messages to our brains like "good", "bad", "safe", "unsafe". The intention is to study the degree of impact on people (emotional, intellectual, functional, etc.) of the characteristics identified and how they should be treated in this context (Norman, 2004; Kamil & Abidin, 2013).

The primary goal of this study is the creation of an innovative process of conceptualization of social robots that can guide designers in the design process to ensure a high level of acceptance of the machines by people and to establish a natural human-machine relationship, regardless of the purpose for which the product was created, of its real function and to whom it is intended.

The secondary goals of the work are two-fold. First we aim at researching about the state of integration of robots in people's homes, their degree of freedom and how they are perceived. We must analyse the interaction of machines not only with end users, but also with cohabitants that may arise in different contexts (Auger, 2014; Bedaf, Marti & De Witte, 2017; Von der Pütten, Krämer & Eimler, 2011). Second we intend to produce a definition of the relevant characteristics of social robots (aesthetic, ergonomic, behavioral, shape, size, diverse idiosyncrasies, etc.) and access the level of impact of these characteristics on people (emotional, intellectual, functional, etc.) (Norman, 2004; Kamil & Abidin, 2013; Bedaf, Marti & De Witte, 2017; Von der Pütten, Krämer & Eimler, 2011).

STATE OF ART

The development of robots has been exponential. In recent years, robots of all types, forms and functions (Hegel, Muhl, Wrede, Hielscher-Fastabend & Sagerer, 2009) have emerged with the aim of optimizing processes and improving the quality of life of society in general, including social robots, which will be the target of this study. There are several definitions of what is a social robot, but the deconstruction of the definition of social robot in a sum between robot and social interface, in which the interface is a metaphor that includes the social attributes through which the observer infers or not the robot as an interaction partner (Hegel, Muhl, Wrede, Hielscher-Fastabend & Sagerer, 2009), is the most appropriate considering the purpose of this study. This research deals specifically with the definition of social interface, in the determination of its characteristics and in the evaluation of its impact on people (Huang, Chen, Wang & Pheng Khoo, 2012).

Several methodologies have been proposed to address the social interface design problem, for instance Kansei (Huang, Chen, Wang & Pheng Khoo, 2012; Nagamachi, 1995), User-Centered Design (UCD) (Adams, 2002), Design Thinking (Meinel & Leifer, 2012) and Co-development (Nagata, Šabanović, Piatt, Lee, Chang, Bennett & Hakken, 2017). The Kansei methodology, also known as sense engineering, develops products features based on translated consumer sensations. This is a quite successful methodology that has been applied for several decades. However, its first step is

defining the aimed user and the object function (Huang, Chen, Wang & Pheng Khoo, 2012; Nagamachi, 1995), which can limit the social potential of the robot. For instance, if we create a robot to interact with a senior, and we design it to please as much as possible this age group, the other people that are part of the coexistence nucleus, like children, grandchildren, employees or nurses, may not be able to establish any kind of empathy with it, and thus it will never be a naturally integrated element. It is relevant to bear in mind that if the intention is to promote the entrance of a robot in our homes, it should be perceived as positive for all people who may interact with it.

The other methodologies mentioned show the same gaps observed in Kansei, as demonstrated in Figure 1: they intent to fill shortcomings and respond to market niches, developing robots with a specific function, be it the accompaniment of seniors (Lazar, Thompson, Piper & Demiris, 2016), recreation for children and adults (Lupetti, 2016) or interaction with specific groups with diseases (eg, autism, dementia) (Severson, Stanton, Gill, Ruckert & Kahn Jr., 2008; Roger, Mordoch, Thompson, Osterreicher & Guse, 2012).

These researches have made a fundamental contribution to the progress of robotics but, perhaps because there is always a specific problem to be solved or because the design process of the social interface mentioned above only appears later, it is still not possible to realize what are the transversal characteristics of existing robots that attract users, and which, on the other hand, repel them. These characteristics are preponderant to the natural integration of social robots in our daily life, in our spaces and our lives.

Researchers, designers and engineers who participate in the development of robots typically demonstrate a concern to set a profile of their target user, establishing age, gender, education, among others (Pedersen, Reid & Aspevig, 2018). Although design centered on the user is considered imperative, this research intends to be the previous step, in which there is still no function or target user, not limiting a priori the social potential of a machine nor ignoring the cohabitants who can interact with it.

In summary, this work explores the existence of basic characteristics, before which we have, as human beings, a positive or negative visceral response, independent of questions such as usability, functionality or specific purpose (Norman, 2004; Kamil & Abidin, 2013).

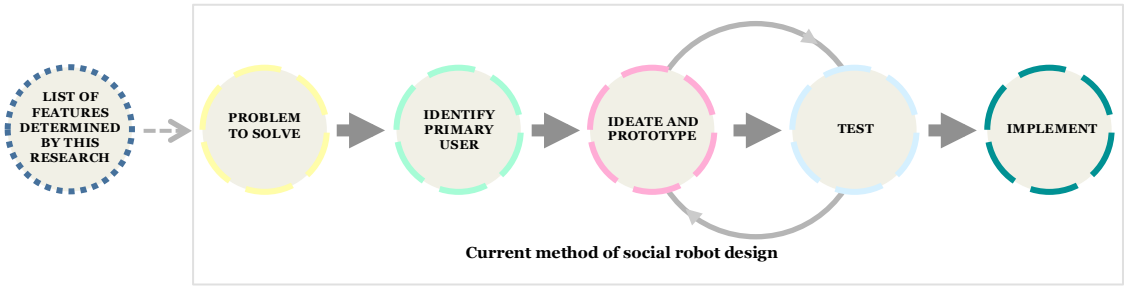

Figure 1
Diagram of robot design steps

TECHNICAL DESCRIPTION

To achieve our objectives, the work plan considers three tasks. In the first task we analyse existing social robots, real and fictional, and evaluate the unconscious vs. conscious reaction of people, through biological data analysis and questionnaires, in order to establish the prevailing attractive characteristics. The identification and listing

of these attributes will allow to perceive what will be observed in the tests with robots. The list will serve as a guide to categorize robots by features.

The first robots came out dozens of years ago, and people's opinions are heavily influenced by social media, literature, and the film and television industry. Most people are disappointed when interacting with a robot because they expect it to be autonomous physically and intellectually. There is already a pre-conceived idea of the state of development of artificial intelligence, the mechanical properties, and the overall appearance of a robot. Nevertheless, it is intended to make an analysis of the conscious and unconscious reaction of the people, with the existing social robots, real and fictional, like the examples in figure 2, looking for the aforementioned characteristics in order to establish a pattern. The analysis of the conscious reaction will be done through surveys and in situ tests (Weiss & Bartneck, 2015). On the other hand, the analysis of the unconscious reaction will be done using visceral reaction perception tools (biological data analysis like EEG and peripheral signals) (Chanel, Kronegg, Grandjean, & Pun, 2006).

Figure 2

PARO[3] (Real companion robot) and EVE[4] (Fictional from Pixar movie Wall-e)

The second task will undergo an iterative design process, using robots (Figure 3) such as VIZZY (Moreno, Nunes, Figueiredo, Ferreira, Bernardino, Santos-Victor, Beira, Vargas, D.Aragão & M.Aragão, 2016), ICUB (Becchi, Vernon, Tsagarakis, Metta, Beira, Caldwell, Righetti, Sandini, Ijspeert, Carrozza, & Santos-Victor, 2007), Monarch (Sequeira, Silva & Ferreira, 2015), NAO (Gouaillier, Hugel, Blazevic, Kilner, Monceaux, Lafourcade, Marnier, Serre & Maisonnier, 2009), among others, implementing a process of rapid prototyping and mock-ups, changing or adding characteristics in these robots. These prototypes should undergo further conscious and unconscious reaction tests, such as those previously developed, for validation of the concept.

Finally, the third task will produce a compilation of the studies carried out, creating a guide or baseline for the design of robots with the inferred desirable characteristics. It will be devised an application of the guide in a robot design or redesign in which the characteristics are applied for validation of concept, including on-site testing and impact assessment.

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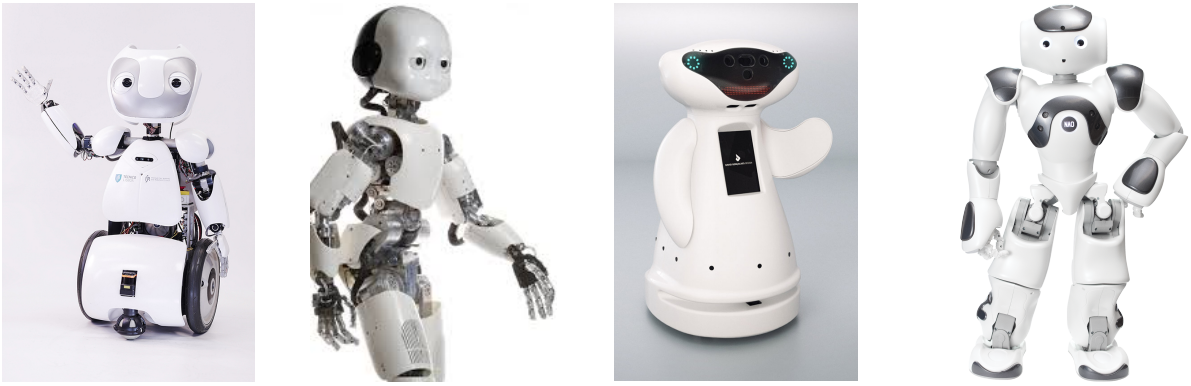

Figure 3

Vizzy[5], iCub[6], Monarch[7] and NAO[8]

EXPECTED OUTCOME

The main outcome of this research will be the compilation of the executed studies, creating a guide for the design of social robots, with the desirable features, serving as a baseline on top of which should be incremented usability related features more appropriate to the target audience and specific function. Furthermore, the result should include a prototype of a robot, properly validated by users and on site testing.

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The Resource-Based View Theory as a tool to value the Design Process of smaller companies in the automotive industry

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ABSTRACT

This paper reflects part of literature review of a main research on the domain of Industrial Design and with the automotive industry and smaller supplier Portuguese companies as background. The research is based on three constructs: the resource-based view theory (RBV), design as a process for product development and the Portuguese automotive industry. This text presents the first part of this review. Later, the second and third topics will be established and integrated, to develop a sound research model. The role of design and design management capabilities have been explored as strategic resources or core competencies. However, Design is not typically found in smaller supplier firms as resource (as opposed to Design studios in larger companies) but found as a process in resource-capability combinations, establishing the need for a new research approach. Therefore, the RBV is a tool to value the design process as a sustained competitive advantage. The RBV conceptualizes a framework to determine or identify the strategic resources available or needed within a company. At these lenses, the basis for a sustainable competitive advantage lies in the application of the bundle of valuable resources identified and at the firm's disposal and the combinations with its capabilities.

Keywords: Automotive Industry, Small Firms, Industrial Design, Strategic Management, Resource-Based View.

INTRODUCTION

Setting up a literature review is fundamental in order to set up a theoretical framework, showing a clear understand of the key concepts and exploring the ideas and studies related to the topic. It is for the utmost importance to manifest knowledge about the history of the research topic and related controversies.

The starting point of this literature review was author Mari Sako, associated researcher of the most influential IMVP – International Motor Vehicle Programme - of MIT, whom defined the automotive industry (where network links are dense) plus dealers, service providers, systems and materials suppliers as a resource-based view industry concept.

Furthermore, she also reflects on the concept of industry which is no longer defined as a group of firms producing products demand-oriented or supply-oriented (Sako, 2007).

Today's conceptual definition of an industry is of a firm carrying an indefinitely large number of activities, activities related to the discovery and estimation of future wants, to research, development and design (Richardson, 1972). Hence, the resource-based view theory defines that an industry is primarily a set of activities which are bound by a dense network of cooperation and affiliation (Sako 2007). These activities must be carried out by organizations with appropriate capabilities – knowledge, experience and skills (Richardson, 1972). Furthermore, according to seminal author, Edith Penrose (1959), firms are widely acknowledged to be bundles of resources and capabilities.

THE RESOURCE-BASED VIEW THEORY

This theory, originally from the scientific field of strategic management research, conceptualizes a framework to determine or identify the strategic resources available or needed within a company. The fundamental principle of the RBV (Resource-Based View) is that the basis for a competitive advantage of a firm lies primarily in the application of the bundle of valuable resources identified and at the firm's disposal and the combinations with its capabilities.

Many authors and researchers (Penrose, 1959; Wernerfelt, 1984; Barney, 1991) have placed numerous discussions and arguments as an attempt to describe and explain what a competitive advantage is and most important, how can a competitive advantage be sustainable. The competitive advantage concept has long been a focus area of strategic research; hence many approaches have taken shape and several theories have been proposed and researched. Understanding sources of competitive advantage for firms has become a major area of research in the field of strategic management (Rumelt, 1984). These approaches have been developed and talked about in a few seminal academic works. One of the approaches is the Resource-Based View (RBV). Later on the approach was complemented by Dynamic Capabilities Theory.

As a theory, RBV articulates the relationships between resources, capabilities and competitive advantage of a firm. RBV attempts to explain competitive advantage and its sustainability based on competences and capabilities developed by the firms with the availability and deployment of resources they possess. Hence the evolution and development of the RBV as a theory and strategic tool is needed to be addressed to understand the role played by key resources and capabilities for attaining sustained competitive advantage within the firm.

One of the authors that is deeply related to the origins of the RBV, is Edith Penrose. Her seminal work (Penrose, 1959) attempts to understand the process of a firm's growth and the limits of it. Penrose had an assumption that firms can be appropriately modelled as if they were relatively simple production functions. According to Penrose, a manager has a task to exploit the bundle of productive resources controlled by the firm using an administrative framework created in the firm, to generate advantage (Penrose, 1959). Hence, Penrose emphasizes that a firm's growth is based on a firm's resources and limited by managerial resources.

The Wernerfelt (1984) and Barney (1991) articles are seminal works in the RBV stream. While Wernerfelt emphasizes resources and diversification, Barney provides the most detailed and formalized depiction of the business-level resource-based perspective.

Birger Wernerfelt, analyzed firms from the resource side rather than from the product side (Wernerfelt, 1984). This author developed a simple economic tool for analyzing a firm's resource position relating it within its profitability. Nevertheless, Birger Wernerfelt stated that "For the firm, resources and products are two sides of the same coin" (Wernerfelt, 1984), an innovative strategic approach. As a matter of fact, Wernerfelt's paper (Wernerfelt, 1984) launched the basis for the RBV theory that later author Jay Barney (Barney, 1991) matured and detailed.

Jay Barney, explores that in a Resource-based view conception, there is a relation between firm resources and sustained competitive advantage. Meaning that the resource-based view (RBV) concept, offer strategists a means of evaluating potential factors, so that they can be deployed to confer a competitive advantage to a firm. According to this theory, an organization can be considered as a collection of physical resources, human resources and organizational resources (Barney, 1991). Resources of organizations that are valuable, rare, imperfectly imitable and imperfectly substitutable are the main source of sustainable competitive advantage for sustained superior performance (Barney, 1991). This author assumes that firm resources are heterogeneous and immobile and that a firm that exploits its resource advantages is simply behaving in an efficient and effective manner (Barney, 1991).

However, not all resources are of equal importance, nor possess the potential to become a source of sustainable competitive advantage. Nevertheless, Jay Barney explains that, understanding the causal relationship between the sources of advantage and successful strategies can be very difficult in practice (Barney, 1991). Hence, Barney developed the VRNI criteria (Barney, 1991) where the firm's key resources should be evaluated as: Valuable, Rare, Imperfectly Imitable and Non-Substitutable (Barney, 1991). These criteria form a framework suggesting questions to be addressed in order to understand whether a given firm resource is a source of sustained competitive advantage (Barney, 1991). This resource-based model of sustained competitive advantage also has a variety of implications for the relationship between strategic management theory and other business disciplines. Hence, strategic management decisions should point to develop, nurture and protect resources that follow these criteria.

Another important theorist of the resource-based view concept is George Day and Robin Wensley, which introduce the idea of sustained competitive advantage (G. Day, R. Wensley, 1988). These authors propose an integrated view based on positional and performance advantage as a consequence of relative superiority in the skills and resources existing on a business. "These skills and resources reflect the pattern of past investments to enhance competitive position. The sustainability of this positional advantage requires that the business set up barriers that make imitation difficult. Because these barriers to imitation are continually eroding, the firm must continue investing to sustain or improve the advantage." (G. Day & R. Wensley, 1988). Hence, the proposed framework identifies as superior skills and superior resources the sources of advantage. Only the sources of advantage can become a source for a firm's strategic positional advantage as superior customer value and lower relative costs. This strategic positional advantage would then be the performance outcome that leads to a sustained competitive advantage (satisfaction, loyalty, market share and profitability). These authors also state that part of the profits should be re-invested directly on the sources of advantage as a way to sustain them (G. Day & R. Wensley, 1988).

Nevertheless, authors George Day and Robin Wensley emphasize the importance of the correct diagnosis of the current and prospective advantages of the business within the served market (G. Day, & R. Wensley, 1988). They also make the following question “How do managers know whether the available assessments are aiding the search for advantage or hindering it with misleading and partial information?" Hence, the lack of a good internal assessment on the firm’s actual skills and resources can mislead to a correct strategic positional advantage.

Author Robert M. Grant (1991) have similar views. According to Grant, the resources and capabilities of a firm are central considerations in strategy formulation; resources are also termed as primary sources for profitability of firms. However, criticising the resource-based theory itself due to the lack of a single integrating framework and due to the lack of effort on developing a practical implication of the theory (Grant, 1991), he proposes a framework for a resource-based approach to strategy formulation. This proposed framework is based on the comprehension of the relations between resources, capabilities, competitive advantage and profitability as well as to understand how the competitive advantage can be sustained over time. Grant further argues to identify the resource gaps and develop a resource base for the firm. Robert M. Grant also focuses on filling of resource gaps by exploiting resources to extend positions of competitive advantage and broaden the firm’s strategic opportunities. As per (G. Day & R. Wensley, 1988), sustaining the advantageous situations requires the constant development and reinvestment on resource bases.

Through Wernerfelt (Wernerfelt, 1984), the strategic position of the firm should be according to its internal assets and not to the market. This author used the “two sides of the same coin” metaphor for product/market strategic positioning. From this point, seminal authors, Ingemar Dierickx and Karel Cool (I. Diericxx, K. Cool, 1989) wrote that managers often fail to recognize that a bundle of assets, rather than the particular/product market combination chosen for its deployment, lies at the heart of their firm’s competitive position. Hence, low or no attention is given to the inside of the firm, to its own assets where the core resources and assets lie. Furthermore, these authors (I. Diericxx & K. Cool, 1989) discuss the notion of accumulation of asset stocks. Meaning that strategic assets stocks are accumulated by choosing appropriate time paths or flows over a period of time. Also in this paper, and particularly for the R&D case, it is explained that the presence of time compression diseconomies implies that maintaining a given rate of R&D spending over a particular time interval produces a larger increment to the stock of R&D know-how than maintaining twice this rate of R&D spending over half the time interval (I. Diericxx & K. Cool, 1989).

As market is dynamic, firm’s resources also need to change over a period of time to make them relevant in regimes of rapid change. This perspective, based on the dynamic capabilities and its outcome for the resource-based view was developed by authors David Teece, Gary Pisano and Amy Shuen (Teece, Pisano & Shuen, 1997). The dynamic capabilities have been defined as firm’s processes that use resources specifically the processes to integrate, reconfigure, gain, and release resources. While the resource-based view primarily concentrates on types of resources and capabilities for its strategic importance, the dynamic capability concentrates on how these resources and capabilities need to change or update over a period of time to keep their relevance relatively to the changing market conditions.

The resource-based view theory considers resources and competencies as static, meaning that they can be addressed as stationary at a certain time frame and will also remain so over a period. The main point is that when firms are having resources that are valuable, rare, inimitable and non-substitutable, it enables these firms on developing value enhancing strategies that are not easily copied by competing firms (Barney, 1991; Wernerfelt, 1984). However, in the current era of dynamic economy, there is the need for firms to build up new capabilities or competencies for sustaining such competitive advantage (Teece, Pisano & Schuen, 1997). Dynamic capabilities thus are the organizational processes or strategic routines by which firms develop new configuration for updating resources as per the time changing market requirements. Such concept requires that organizations establish processes that enable them to change their routines, services, products, and even markets over time. Initially, to cope with market forces, the market-based view was conceptualized, subsequently the focus shifted to the resource-based view. Finally, to respond to challenges of the ever-changing globalized world, the concept of Dynamic Capabilities became a well-accepted theory.

The dynamic capabilities approach is especially relevant today when global competitive forces are changing the industrial landscape. Hence, ways of achieving competitive advantage are changing fast. As such, firms need to have timely strategies, flexible infrastructures, and an ability to utilize resources and capabilities coupled and innovate ways (Teece, Pisano & Schuen, 1997). Therefore, in contrast with traditional resource-based view assumptions, competitive advantages gained in the dynamic marketplace may be based on capabilities, which have greater homogeneity and substitutability across firms. Competitive advantages achieved through dynamic capabilities are therefore based on the ability to change the resource base of the firm. This means dynamic capabilities alter resource bases by creating, integrating, recombining, and releasing resources (Eisenhardt & Martin, 2000). Dynamic capabilities have been tightly coupled with a dynamic or rapidly changing environment (Teece, Pisano & Schuen, 1997). Furthermore, Barreto (2010) conceptualizes an alternative definition for dynamic capabilities based on past research:

> "A dynamic capability is the firm's potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to make timely and market-oriented decisions, and to change its resource base" (Barreto, 2010: 271).

The Resource-Based View Theory: Critical Appraisals

Through this comprehensive review, an interesting critical appraisal of the resource-based view theory done by Richard Priem and John Butler, came across (Priem and Butler, 2001). These authors examine the resource-based view theory (Barney, 1991) in terms of theory, method, empirical evidence and operational validity.

Examining the resource-based view in terms of theory, Barney's definitions indicate that additional conceptual work is needed if the foundation of the RBV is to meet the lawlike generalization standard. The underlying problem in the statement "that valuable and rare organizational resources can be a source of competitive advantage" (Barney, 1991: 107) is that competitive advantage is defined in terms of value and rarity, and the resource characteristics argued to lead to competitive advantage are value and rarity. Instead, the characteristics and outcomes must be conceptualized independently to produce a synthetic statement (Priem & Butler, 2001).

Another, seminal appraisal from Priem and Butler (2001) regarding Barney's article (Barney, 1991) and the logic of the RBV is that "value is the fundamental component determining the extent of competitive advantage. If a firm consistently generates value greater than that generated by other firms in its industry, it must have at least one rare resource. If a firm has rare resources, however, it does not follow that it will generate value greater than that of other firms in its industry (Priem and Butler, 2001).

The resource-based view theory has developed as a series of related propositions that seek to explain the relationship between a firm's resource endowment and its performance and growth. However, it has not generated clear unambiguous hypotheses in the manner of more narrowly conceived theories of firm behaviour or even transaction cost economics. The paper (Priem and Butler, 2001) discusses the practical difficulties arising in the RBV methodologies.

On the operational side, one fundamental question for strategy researchers would be the utility of the RBV in developing practical management tools in the form of actionable prescriptions for practitioners. As per Priem and Butler critical appraisal, advising practitioners to obtain rare and valuable resources in order to achieve competitive advantage and, further, that those resources should be hard to imitate and non-substitutable for sustainable advantage, does not meet the operational validity criterion (Priem and Butler, 2001). Furthermore, prescription regarding competitive advantage itself, however, still is hindered because the criteria for value in the RBV remain, at present, in an exogenous "black box" (Priem & Butler, 2001).

Operationalising the Resource-Based View of the firm

One can conclude the dissatisfaction with the traditional strategic management tools as a framework for creating and sustaining competitive advantage. As the main cause of difficulty in operationalising the RBV is its high level of abstraction. Through the review of Priem and Butler's critical appraisal on the resource-based view of the firm theory, researchers often mention, but have rarely addressed questions related to the operationalisation of the resource-based view theory. Hence, operationalisation formalises the theoretical concepts into applicable models and guidelines for strategy formulation and decision-making process for practitioners and managers

Scott Newbert (Newbert, 2008) tested the RBV hypothesizes at a conceptual level. This author published an empirical study examining the relationships between value, rareness, competitive advantage and performance. Results from conceptual level studies do provide insight in what attributes resources and capabilities must own to improve a firm's competitive position (Newbert, 2008). These are the same attributes, that authors George Day and Robin Wensley (G. Day & R. Wensley, 1988) emphasize the importance of the correct diagnosis. Furthermore, Newbert introduces the need to predetermine which characteristics of resources and capabilities ought to be correlated with competitive advantage and/or performance. Even if a given resource may have the potential to produce a valuable service, that service will remain buried until deployed through a relevant capability. Hence, even if a resource (or a capability) might have potential value, its value can only be realized when it is combined with a matching capability (or resource). Moreover, the more valuable the firm's resource-capability combinations, the greater the advantage it will enjoy as a result of their exploitation.

In its study, Newbert (2008) concludes that the value and rareness of a firm resource-capability combinations contribute to its competitive advantage, hence contributing to

its performance. In this study (Newbert, 2008), by inclosing the independent variables in terms of resource-capability combinations (as opposed to individual resources or capabilities) correctly captures the dynamics by which resources and capabilities have long been argued to contribute to competitive advantage (Newbert, 2008). Furthermore, Newbert's (2008) study finds evidence on the idea that a competitive advantage via the implementation of a resource-based strategy is an important means by which a firm can improve its performance.

Concluding, author Scott Newbert was able to find that competitive advantage fully mediates the rareness-performance relationship, it appears that to increase any performance gains from its resources and capabilities, a firm must first achieve the competitive advantages that outcomes from their combined exploitation. Hence, improving performance is not a direct function of the value or rareness of a firm's resource-capability combinations but rather of the advantages it creates from their exploration. Hence, firms need to deploy those resources and capabilities to which they do have access but through new and different combinations such that they are able to reduce costs and/or respond to environmental conditions (Newbert, 2008).

CONCLUSION

The role of design and design management capabilities have been explored as strategic resources or core competencies (Borja de Mozota, 2003) or more recently by Muratovski (2015), emphasizing the increasingly recognized role of design as a strategic resource. Opposing to the status quo existing in some larger companies, Design is not usually found in smaller supplier firms as a resource but established as a process in resource-capability combinations. This condition creates the need for a new research approach, integrating the resource-based view theory.

The theory highlights the internal resources and capabilities of a firm in strategy design to achieve a sustainable competitive advantage. Hence, internal resources and capabilities determine strategic decisions made by firms even though competing in their external business environment. Furthermore, firm's abilities do add value in the customer value chain developing new products (R&D), hence expanding to new markets. When firm's capabilities are considered as supreme in the creation of a competitive advantage, it will focus on the reconfiguration of value chain activities – resources and capabilities. Hence providing an opportunity on identifying the capabilities within the value chain activities which provide a sustained competitive advantage. Furthermore, the resource-based view draws upon the resources and capabilities that reside within the organizations in order to develop a sustainable competitive advantage.

Resources might be considered as inputs that enable firms to carry out its activities. Nevertheless, not all the resources of the firm are to be considered as strategic resources and hence sources of competitive advantage. According to the resource-based view of the firm theory, a competitive advantage occurs only when there is a situation of resource heterogeneity (different resources across firms) and resource immobility (the inability of competing firms to obtain resources from other firms). If the resource is not perfectly mobile (i.e., the resource is not free to move between firms, or if a firm without a resource faces a considerable cost burden in developing, acquiring or using it, that a firm already using does not), then the resource is likely to be a source of sustained competitive advantage (Barney, 1991).

Furthermore, we have learnt from Edith Penrose seminal literature that, resources consist of a bundle of potential services (...) the services yielded by resources are a function of the way in which they are used (Penrose, 1959: 25). Hence, while a given resource may have the potential to produce a valuable service, it does not necessarily mean that will create a competitive advantage since it will remain buried until deployed via a relevant capability (Newbert, 2008). Similarly, rareness does not necessarily come from the possession of rare resources and rare capabilities but the ability of pair them into a combination. Hence, the best performing firms will not necessarily be the ones that explore the most valuable and rare resource-capability combinations, but instead, those firms that explore these combinations most effectively.

Galbreath (2005) findings suggest that resources may potentially impact higher on firm success when examined as part of an interconnected system rather than when examined individually. Therefore, there is a need, not only for analysing the relationship between design (resource) as a competitive advantage (input) for firms and their performance (output), but also the resources and capabilities combination, including design as a contributor element, with the background of an industrial segment operating on a complex and dense network, as the one as the European Automotive System. This relation will be translated into a research model, combining the specific design processes, and illustrating the relations between resources, capabilities, competitive advantage and ultimately yielding to performance within a resource-based view strategy.

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Application of Small Scale Wind Turbines Systems in Lisbon

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ABSTRACT

Electricity generation through small and micro wind turbines is gaining worldwide popularity. However, studies into public attitudes to this source of energy from a design perspective are still scarce, especially related to innovative ways of its use in cities. Thus, this paper has an exploratory approach by analyzing some of the technical aspects related to small and micro scale wind turbines in view of a scientific basis for further studies related to the integration of this object in the city of Lisbon in order to explore different patterns and systems. Following a state of the art analysis, a number of solutions will be generated, selected and represented using a 3D computer program and validated by specialists in the field. Subsequently, qualitative tests will be performed with residents of Lisbon using virtual reality, followed by quantitative questionnaires. The data will be processed using a computer program, and analyzed to present as research findings. It is hoped that this study will contribute to society through the analysis and generation of new ways to use small or micro wind turbines in the city of Lisbon through a design bias.

Keywords: Small and Micro Wind Turbines, Integration, Patterns and Systems.

INTRODUCTION

The damage to the environment over the years, intensified by the development of world capitalism, especially in the post-Industrial Revolution period, are sources of concern since they alter the ecosystem and damage human life. As Manzini and Vezzoli (2012) argue, designers has to considers reflections of products and systems on the quality of life and well-being of the population, so that one of the important requirements to be considered when designing a product is sustainability, which is a key factor in most of the design methodologies. Morin (2015) identifies designers as transformers of society, since their projects affect the life of consumers, create new social proposals and influence attitudes. The knowledge of the designer should contribute to the creation of products that have the least possible environmental impact while remaining economically viable.

According to Barros, Piekarski e Salvador (2017), the energy demand across the globe has increased in many folds due to technological advancement; rapid growth in industries and increase in household energy demand. There are request for investments, developments of new technologies and knowledge about the environmental performances of different sources of electricity generation. Solar, wind, biomass, mini hydro are some of the resources used worldwide to generate energy.

Today, 54% of the global population lives in cities and by 2050, 66% of the world's population is projected to be urban causing great social, environmental and economic impact. Cities need to create sustainable alternatives and solutions while respecting the natural limits of the ecosystem. Action plans for science, technology and innovation (STI) are essential to face the main challenges of making cities more sustainable. One of the solutions to achieve that is the use of renewable energy, including wind power (Cagnin, Fraga, Vilela, 2015).

As explained by Novais (2017), wind energy allows the diversification of forms of energy production, and thus, the reduction of external energy dependence by the countries that import fossil fuels. This form of energy is an integral part of the production of energy by renewable sources, contributing to the achievement of the goals established by the European Union for the Member States, where Portugal is inserted. A recent European directive stipulates an overall target of 20% of the incorporation of renewable energy in final consumption in 2020, and for Portugal, a mandatory target of 31%. According to Almeida (2017), at the end of June 2016, Portugal registered 5040 MW of installed capacity.

Purpose of the Study:

Considering that the present work seeks to analyze an artifact of great relevance and contribution to the environment and society, the research problem permeates the use of small scale generators in Lisbon. The valorization of the concept of sustainable cities also corroborates the importance of solving the problem to be addressed. From the perspective of design, there are few data on the use of small scale wind turbines, as well as the use of innovative systems using this technology. Considering that this system can be improved and more exploited as well as to promote more scientific data on this subject, the purpose of the study is to create and exploit possible applications of systems that use small wind turbines in the city of Lisbon to generate renewable energy with the objective of promoting the use of this technology as well as obtaining statistical data on the subject. The, the research question is: How to generate and apply innovative systems that use wind small or micro generators in the city of Lisbon seeking the three main functions of the product (practical, symbolic and aesthetic), addressed by Lobach (1976) in order to promote scientific data relevant to the academic and business community?

SMALL WIND TURBINES

This section will present the classifications of wind turbines as well as the state of the art.

Classification of Wind Turbines

Wind turbines can be defined as intermediate machines for capturing wind kinetic energy through a rotor and later transforming into electric energy through an electric generator. There are two basic types of wind turbines: horizontal axis wind turbines (HAWT) and vertical axis wind turbines (VAWT). Wind turbines are classified according to their size and power: large, medium, small, very small, and micro generator. However, there are several approaches on how to classify the wind turbines according to these two features. Based on the Deutsche Windenergie-Institut (DEWI), wind turbines can be classified according to Table 1.

Table 1: Classification of Wind Turbines.
Source: Adapted from DEWI.

Classification	Rotor diameter (m)	Power, up to (kW)
Small	0,0 a 8,0	20
	8,1 a 11,0	25
	11,1 a 16,0	60
Medium	16,1 a 22,0	130
	22,1 a 32,0	310
	32,1 a 45,0	750
Large	45,1 a 64,0	1.500
	64,1 a 90,0	3.100
	90,1 a 128	6.400

State of the Art

In a study, on the implementation of an energy conversion system suitable for urban use, Wenzel (2007) suggested that HAWT was the most adequate for this case. Emphasis was placed on the following aspects of the application of small and micro generators: safety (to prevent blade detachment or the fall of a turbine from the top of the building); easy operation, mounting and maintenance; lower noise level, (lower than that produced by the motor vehicles and wind in the trees surrounding the area); and installation (according to health and safety standards and regulations to prevent damage to the building structure by vibration and high-performance), (Wenzel, 2007).

Figure 1 shows the evolution of the height of the wind towers since the year 1980. It is observed the consecutive increase of the height of the towers until the year of 2010, however, in 2014 a project developed by Smitha Rao and Chiao, potentiates the generation of micro turbines. The developed propeller is 1.8 mm in diameter. This evolution points to a path that meets the process of product miniaturization, in which, it is also sought, the reduction of consumption and the generation of energy by the user and reduction of environmental impacts through reduction of noise pollution, well-being and greater safety generated by the use of smaller turbines (Candido & Garay, 2015).

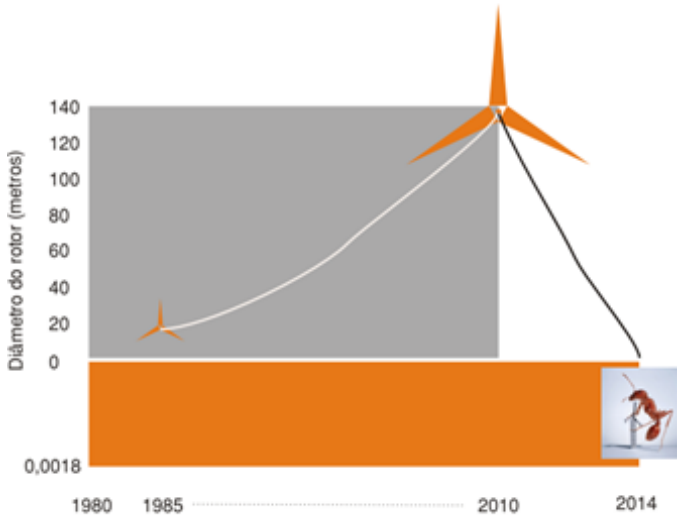

Figure 1 –Evolution of the height of the wind towers.
Source: Cândido and Garay (2015).

An example of a system that uses small wind turbines is the “L'éolien 2.0”/“WindTree ”. (figure 2). This “tree” transforms wind energy into electricity. This is based on a small vertical axis wind turbine called Aeroleaf. The WindTree is a steel structure on which 54 Aeroleaf are installed. The total hight is 30,2 ft; the total weight is 480,3 st; the diameter is 26,2 ft and the aeroleaf’s height is 3 ft. L'éolien 2.0 can captures all types of wind, whether there are turbulent or laminars. The technology don´t have neither belts nor gears, creating no noise disturbance. The uninterruptable power supply (UPS) allows to provide the receiving equipment with an alternative voltage, directly connected the local grid (Windtree Data Sheet by New World Wind, 2018).

Figure 2 – L´éolien.

Source: Adapted by the author.

For security reasons, the Aeroleaf integrates a brake system. The launch speed is 2,5 m/s. The brake is activated when the Wind speed exceeds 18 m/s which corresponds to a rotational speed of 700 rpm. The power produced is therefore limited to 100W per turbine. The WindTree´s installed capacity is 5400 W, the Aeroleaf Peak Power is 100W and the output voltage of the inverter is 110/230 V (Windtree Data Sheet by New World Wind, 2018). It is possible to observe the power curve (W) in relation to the wind speed (m / s) in Figure 3.

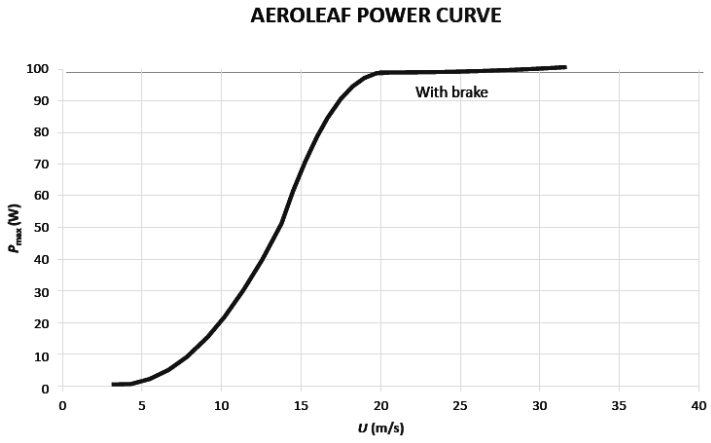

Figure 3 – Aeroleaf power curve.

Source: WindTree Data Sheet by New World Wind.

The WindTrees can be installed in varied locations, with consideration to spatial requirements and wind availaibility. It is connected to the local grid through an electrical cabinet. A dedicated space should be prepared for the cabinet, within a maximum distance of 50 meters. The overall installation is compliant with the current European standards.

Figure 4 illustrates some existing solutions on the market in relation to the application of small wind turbines. The figures were named in alphabetical letters (A to E) and they appear above each figure. Some technical data has been found on these sites. It was not possible to find this data in scholarly works or books. Here are the descriptions of each of the solutions:

This system was conceived in 2006 and uses micro winds on the roof of school building of Shau Kei Wan Government Secondary School and can generate 100W.

This turbines was produced by Aerovironment in 2008. The system integrates into the parapets of buildings and increases 30% in energy production of a house, having adaptable, modular assembly. Installations have little structural impact upon buildings and are easily scalable starting at 6KW. Each module weighs approximately 200 pounds, measures 4 feet tall by 4 feet wide.

Small-wind project from 2012 was unveiled at the Oklahoma Medical Research Foundation in Oklahoma City. Boasting 18 wind turbines each at 18.5 feet tall, the system has been billed as the largest rooftop wind farm in the world. This system was developed by Venger Wind and produces enough energy to power seven-average sized homes for a year.

In 2015, 58 micro-turbines were installed on the roof of the Intel building located in Santa Clara, California. Each one is between 6 and 7 feet (~2m) tall and weighs 30 pounds (13kg). They generate power about 65 kilowatt-hours. They have been installed on the roof's edge in order to best capture the wind and provide optimized power generation.

This are array of 1008 small, extruded acrylic turbines that spin in the wind. The translucent white plastic surfaces capture light and shadow as the turbines respond to the passing breezes. Even though each turbine is free to spin independently, adjacent turbines sometimes align into organized patterns. This project was completed in 2009 in Santa Rosa Junior College Gallery, Santa Rosa, California.

The sources of the information above are placed below Figure 4. Most of the results found have the characteristics of the use of the wind turbine at the top of the building. L'éolien (Figure 2) as well as the project represented by the letter E (Figure 4, in counterpoint, demonstrate more innovative solutions in relation mainly to the application and aesthetic and symbolic functions.

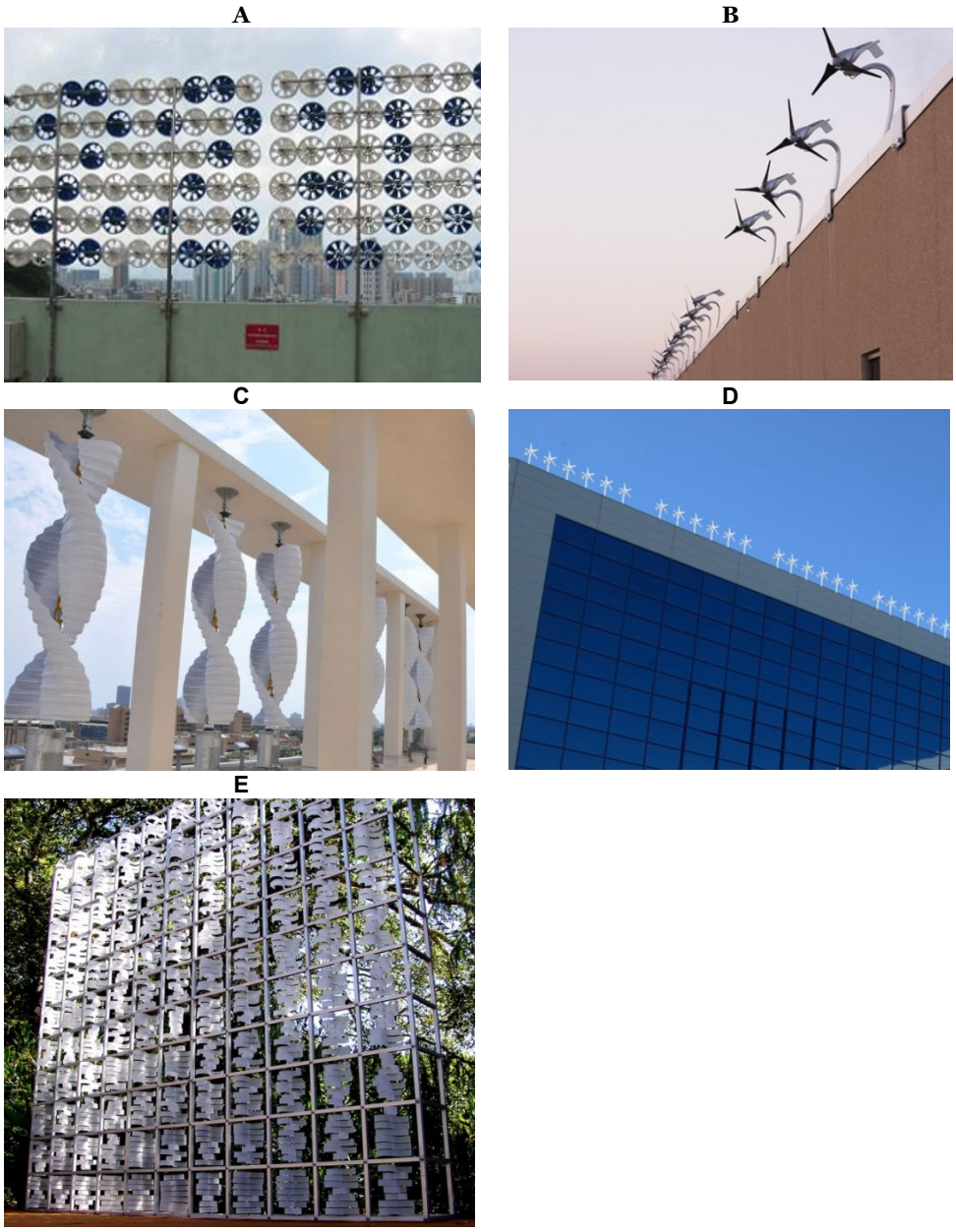

Figure 4- Applications of Small Wind Turbines.

Source: A- https://re.emsd.gov.hk/english/wind/small/small_ep.html;

B- https://inhabitat.com/architectural-wind-modular-wind-turbines/;

C-https://cityworksinc.wordpress.com/tag/building-integrated-wind-turbine/;

D-https://newsroom.intel.com/chip-shots/chip-shot-intel-headquarters-building-topped-with-wind-turbines/; E- http://nedkahn.com/portfolio/microturbines.

RESEARCH METODOLOGY

For the determination of the probable research methodology for the proposed work, were taken into account the 3 functions Lobach (1976). Therefore, in the first moment through the literature search will be defined the small scale turbine that which will be object of study of this work. After this definition, a virtual model will be made through a 3D computer program and then prototypes will be made using rapid prototyping technology by fused deposition modeling (FDM). For the validation of these systems in

terms of practical function, that is, energy efficiency, these analysis as economic feasibility, material efficiency and distance from the wind turbine to a wall, for example, will occur through wind tunnel. Then the wind turbine will be multiplied in order to generate a system (considering the wind turbine as a module) and this system will be submitted to computational tests.

After this analysis will be made in-depth interviews to the target audience (people residing in Lisbon) of qualitative character. Next, qualitative interviews will be conducted. These interviews will aim to validate the systems in relation to 2 of the 3 main functions of the product (the aesthetic and symbolic) aiming to understand what are the attributes of this system that are desired by those who would use it.

The first interview (of a qualitative nature) will have a more restricted population, since in-depth interviews demand a smaller population sample. Thus, it is estimated that around 20 in-depth interviews will be conducted. In relation to the interview of a quantitative nature, interviews will be conducted with a population sample of more than 200 people. All interviews will be done with the resident population of Lisbon as mentioned above. The target audience will still be defined in view of the type of system to be addressed. For the analysis and treatment of data of the interviews will be used computational programs to be defined. Figure 5 shows the flowchart of the research steps.

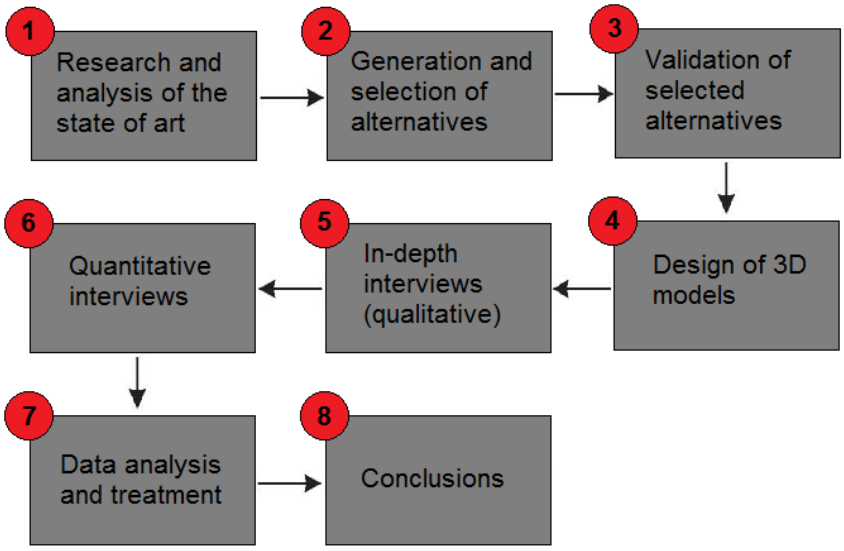

Figure 5: Flowchart of the Research Steps.
Source: The author.

CONTRIBUTION

The thesis will seek to provide scientific data of great importance to the academic community in view of the fact that it deals with a theme relevant to society and the search for a more sustainable future for cities. Thus, the extent to which all data and analyzes will be carefully described can be replicated. The evolution of wind energy through micro-generation of energy is still a subject little addressed, even more in the universe of Design. After analysis of the state of the art, it is possible to justify the choice of the small turbine as an object of study of the research that is sought. There are few studies related to the application of small turbines in cities through new and

innovative standards and systems demonstrating that this is a research area that can be more explored.

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Co-creating transformation: synchronizing operations and organisational change through design

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ABSTRACT

Organisations are being forced to change at a rapid pace, and design seems to be consistently closer to this transformation's helm. In this context, private and public organisations have been embedding design at their core; from bringing design principles to traditional industries' activities, to creating Chief Design Officer roles for municipalities, it seems that the need for fostering innovation cultures for an ever-changing world has resulted on increasingly relying more on design. Design, arguably because of being a problem-solving methodology with an adaptable framework and a set of ready-to-use tools for tackling numerous challenges at an operational level, has consequently been under the spotlight. And although various of its dimensions have been studied at this level, namely co-creation, human-centricity, iterative mindset, creative exploration or even process agility, in comparison, there's still marginal research with regards to its relation with organisational change. One of the research gaps that has been unveiled, is the role of design in the interrelation between those two levels: organisational change and operations. This paper intends to draft an exploratory path of the research subject, precisely in the direction of understanding the role of design in this interrelation in the standpoint of municipalities, for future research developments in the context of a PhD in Design project.

Keywords: Design, Operations, Organisational change, Municipalities

INTRO: DESIGN AND ORGANISATIONS

Along with bringing a design-led approach to organisations, whether it is at a design culture or practice level, several challenges tag along as well.

According to previous studies, some of these challenges are grounded on resistance to change, disbelief or mismatch between operations and organisation (K. Elsbach, I. Stigliani, 2018; F. Rizzo, A. Deserti 2015). This last one unveils a very interesting insight in this context, being it the asynchronism between two forces in organisational bodies: the operations level and the organisational structure.

This asynchronism may be impeding the establishment of the needed harmony for organisations to thrive in a sustained way.

Furthermore, as highlighted by authors as Alessandro Deserti and Francesca Rizzo, the relation between organisational change and services provided, when Design enters the equation, seems to be a research space within this problematic, yet to further explore:

> "The interaction between the introduction of design as a new approach in public organisations and the management of their change thus appears as a relevant node that should be investigated. In our perspective, this investigation can lead not just to finding ways of combining the already existing change management knowledge and practices with the already existing service design knowledge and practices, but to the construction of a new frame, in which both disciplines can influence each other, introducing elements of novelty for both." (Rizzo & Deserti, 2015, p. 87).

And from this citation the proposed approach extracts three main ideas. Firstly, the interaction between the two different levels, as exposed above, secondly the public organisations' context to be elaborated later, and thirdly how it can result on the construction of a new frame. This frame may as well become a useful tool aiding the assessment of organisational change needed for an effective introduction of design culture and practices in specific contexts and organisations.

EXPLORATORY PATH

Scope: Public Organisations

The problematic may be as relevant in the context of private organisations as it is for public ones (Buchanan & Herbert, 2008). This research will focus on the latter, more specifically on Lisbon's Municipality, for various reasons, namely:

Lack of research: in general

Private organisations have been leading innovation and experimentation for leveraging performance, whereas public organisations have only more recently been trying to learn from them and have been adopting practices aiming to leveraging their own performance, even if with some misconceptions along the way. (Deserti & Rizo, 2014).

Timely: an ever-growing urban world

Considering that according to the United Nations the world has officially become more urban than rural in 2009 and that "the urban population is expected to increase by 84 per cent by 2050" (UN - Urban and Rural Areas, 2009), challenges to be tackled in urban areas are critical and potentially ever-growing. Maybe that's also part of the reasoning behind the recently created roles of Chief Design Officers for cities, having as pioneer Helsinki appointing Anne Stenros in 2016, followed by Los Angeles that in its turn appointed Christopher Hawthorne in 2018.

Lisbon: Focus of Research

Challenges are many, and Lisbon is a city for which the interest has been rising in many different areas such as Tourism and Entrepreneurship, rising as a global player and promoting micro-management, resulting in a constant turnover of visitors and short time residents, or growing as an investment destination, just by itself accelerates challenges, namely regarding mobility, among others. And beyond being a point of interest, Lisbon's municipality is also accessible and potentially interested in such research.

Trending needs from the Sector: Municipalities

Municipalities are by themselves a challenging context, regardless of the scale we'd choose to frame the assessment when looking into it. It's so, firstly because politics and public service are at its base, meaning that the organisation's relation with the end user is determined through elections and not by a linear commercial relation. It means that above all, its reason to exist is to serve society.

Serving society also means that it needs to be in constant update mode, to find new answers to what could be also called new and complex challenges; from an ageing population, to a more nomad and multicultural, not to mention a more demanding one.

In addition, and as part of its distinguishing complexity, the multiple stakeholders with different interests at stake are one of its most challenging managerial issues.

Thus, acknowledging the nature of its mission and the ever-changing complexity of the challenges these organisations need to face while managing multiple stakeholders, there has been a growing trend of embedding design principles, such as human-centricity and co-creation, as an effort to leverage the efficiency of its actions, at many different levels in the most future-proof and sustainable way possible (Junginger, 2018; Mulder, 2018).

POTENTIAL OUTPUTS

Approach: Asynchronies

This research approach will lean on the asynchronies between two levels within organisations: Operations level and the organisational structure.

The investigation will start from both ends, therefore promoting an encounter between top-down and bottom-up assessment of the fit between these two extreme levels. Thus, it will be assessing the subject from both design culture and practices' point of view.

These two levels have been subject of previous investigations, though it seems that it has never been studied as far as aiming to create a new frame focused on the interaction between organisational structure and operations level, that can lead to better understand the role that design can play in organisational change. (see Fig. 1)

Furthermore, recent research provides promising indicators with regards to an inter-relation between the use of design tools and organisational culture, as exposed by Elsbach and Stigliani (2018).

> "In general, it suggests that the use of design thinking tools in organisations triggers an experiential learning process that ultimately supports the development of organisational cultures defined by a user-centric focus, collaboration, risk taking, and learning, which in turn support the further use of design thinking tools"(p.28).

This research in its turn, aims to go beyond organisational culture and further advance towards organisational change.

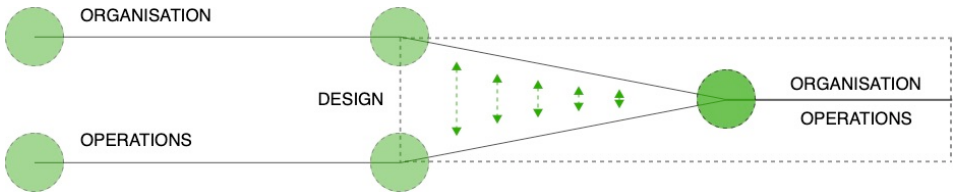

Figure 1
Assessing the role of design in synchronising the organisational and operational levels

Approach: Scalar framing

Municipalities are complex organisations shaped by multiple forces, including political ones, and driven by numerous stakeholders while managing, providing and facilitating many services. Too many to be responsibly assessed in this research (Jonsson, 2008; Mintron, 2016). This definition introduces a concept of operations in a municipality's environment, influenced by multiple stakeholders, subjected to an increasing public scrutiny and lacking solutions to new challenges, either from internal or external sources.

There are levels at which this research would necessarily have to step in other fields of knowledge in depth, and that regardless of its interest, they should be considered for future research, namely when considering exploring it at a policy-making level (see Fig. 2).

In order to define the boundaries of this research, the proposed approach will be referring to Jamer Hunt's "Scalar Framing", in which he defines an approach on different scales to assess the same issue. This scalar framing approach, when considering municipalities may range from users and beneficiaries at a street level, and in our case, up to the organisational structure. In the context of this research, a clear number of framed-scales will be defined, and for which we'll determine the design and organisational change dimensions to be assessed, and develop the research methodology accordingly.

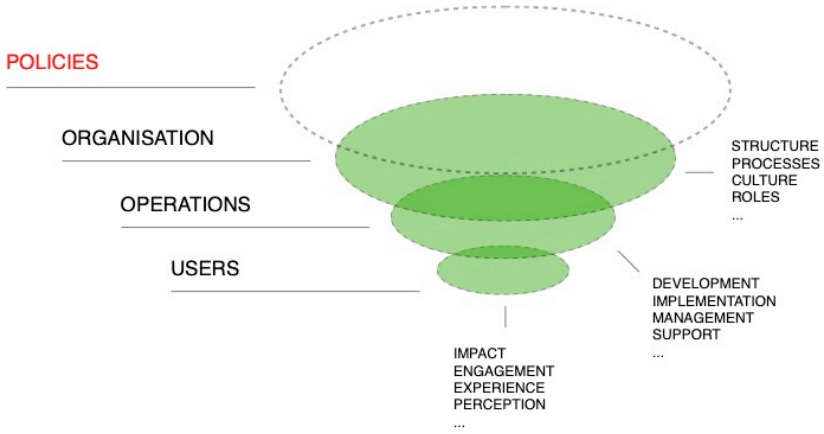

Figure 2
Scales in, and out of scope of this research

Approach: Dimensions to be analysed

Ultimately, the dimensions to be analysed will be enclosed between two areas of research; organisational change and design.

The research model will start from bringing these two areas together, to then identify elements of tension between the organisation and the outside context, in which it is operating. Moreover, the consequent assessment is planned to be performed from both ends; bottom-up, from the operational level up to the organisational structure, as well as top-down. Hence, it will be looking at the crossing between the influence that design-lead activities at an operational level, may have at the organisational change level, and how a design approach to organisational change may ease tensions between both levels, thus producing better results. (R. Buchanan, 2008; S. Junginger, 2008) (see Fig. 3)

This outlined approach shall be further developed and operated through the research methodology.

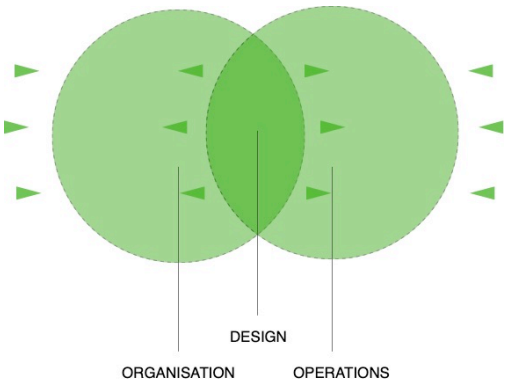

Figure 3
Synchronizing organisational change and operations through a design-lead approach to both

RESEARCH METHODOLOGY

The research will be developed in two phases:

1. Exploratory

By having such an overarching organisation that is the city Municipality as a subject, the outlined approach requires the choice of specific contexts to focus the research on. In this stage the research activity will be directed to:

- Develop the background for conducting the case studies and later explore the outputs;
- Establish the prerequisites for the inclusion as a case study;
- Choose the cases to study.

Mainly through documents analysis and conducting open-ended interviews with experts and respondents from CML (Câmara Municipal de Lisboa).

For this mapping stage an evaluation grid will be developed to scan the organisation's areas, departments and activities. The evaluation grid will be developed considering dimensions related to the areas of this investigation; organisational change and design.

These dimensions, when brought together, will help identifying specific contexts in which the subject of the role of design in the interrelations between the organisational change and the operational level, manifest to be more relevant.

2. Cases studies

Considering the subject and object of the proposed research, the case study has revealed to be the most indicated research strategy, when “a "how" or "why" question is being asked about a contemporary set of events over which the investigator has little or no control” (Yin, 2003, p. 9). Case study allows phenomena to be analysed in a real context, using many different quantitative and/or qualitative sources of evidence simultaneously. Several case studies will be settled in order to build an explanation on how and why change took place and to provide foundations for theory-building development and toolkit definition.

CONCLUSION

Ultimately, and considering the trend that municipalities (and organisations in general) are going through, with regards to the embodiment of design at a practice and culture

level, to tackle challenges from a more human-centred and participatory standpoint, this research intends to be a contribution for the present and future of these public organisations, by focusing on synchronizing operations and organisational change through design.

On that account, this research is being drafted, aiming to achieve a framework to help organisations assessing the impact and best fit between organisational change and operations when the implementation of design culture or practices are under consideration, or already taking place.

Such framework may be useful for both a top-down and bottom-up approach to this subject. Whether the starting point is to match operations and services with the existing structure, and by doing so, understand how far should design practices be actually implemented at an operational level. Or, on the other hand, to be helpful in understanding through which changes should the organisation go, to match its operations.

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Performance evaluation of artificial intelligence (AI) algorithm on the LOGO DESIGN creative process

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ABSTRACT

The main objective of my future research is to evaluate the performance of an Artificial Intelligence (AI) algorithm in the creative process of a logo design.

Keywords: Algorithm, artificial intelligence, graphic design, creative process, logo.

INTRODUCTION

The 4th Industrial Revolution, the age of cyberphysical systems, will bring about changes at a speed, scale and force unlike any we have experienced before, it will affect the very essence of our human experience. Today, we know that all these innovations will bring radical changes to all systems in just a few years, the interaction between fields like nanotechnology, brain research, 3D printing, mobile networks and computing will create realities that were once unthinkable. According to Schwab, K. (2017), access to technology will spread quickly and comprehensively, making available many tools capable of promoting the invention of new products and services quickly and cheaply. The current business models of any and all industries will inevitably be transformed in face of this reality, professional training and practice in all sectors of our society will undergo profound changes, including the craft of design as a whole.

Today we see the increasing insertion of Artificial Intelligence (AI) algorithms at different levels of the creative processes previously known and applied to us. This new way of doing design is proven to have very positive results, impelling us as designers to adapt to this reality, that urges us to understand what the limits of this new technology are and how we should prepare ourselves in front of this.

ARTIFICIAL INTELLIGENCE IN DESIGN

Today many new terms are covered by the 4th Industrial Revolution, although apparently invisible, are widely present in our daily lives. Among them, Artificial Intelligence (AI), bringing back to the forefront the thoughts of Arthur L. Samuel (1962) where he exposes the idea of AI to break the barrier between thinking and doing capabilities, previously imagined as the great differential between us humans and machines.

From fiction to reality today AI algorithms are able to navigate at very high speed across multiple, complex and extensive information networks, processing and analyzing

immeasurable volumes of data to help us with simpler tasks such as choosing a movie to watch after (Haykin, S., 1999). In this paper, we present the results of the analysis of the results of the study. (figure 1)

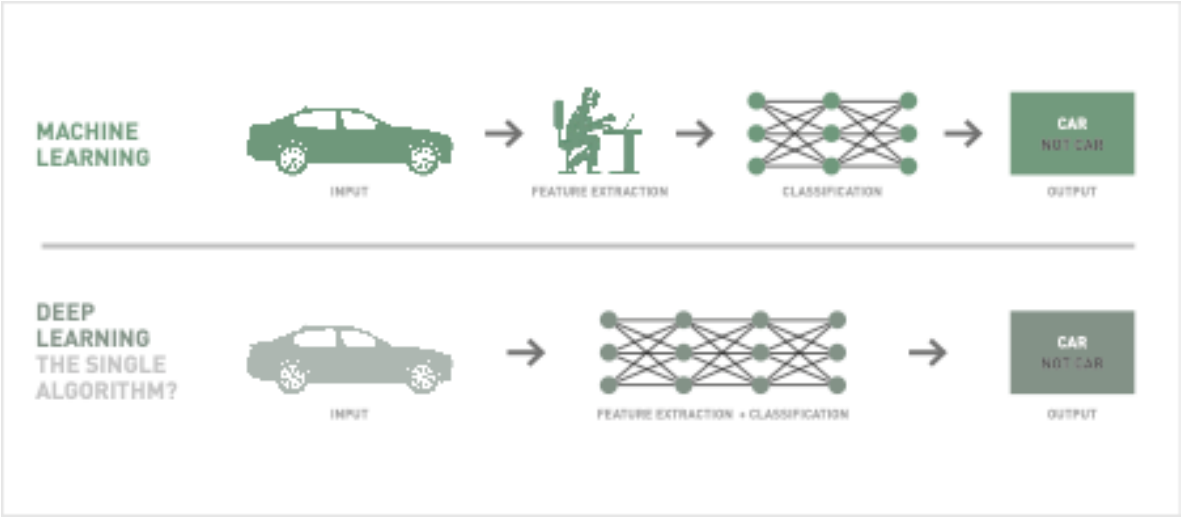

Figure 1

Difference between Machine Learning (ML) and Deep Learning (DL).

But evolution does not stop. "We do not expect computers to be creative: we expect them to do what we tell them to. If we told them to be creative, then we have automatic learning (Deep Learning)", explains Domingo, P. (2017). These AI models can find patterns that are often unobservable or even obscure for us humans, opening previously unthinkable possibilities to the most diverse fields of application and study, making it an important tool for many companies and industries in the search for efficiency in not only the management of their businesses, as well as the production and innovation of their products. (figure 2)

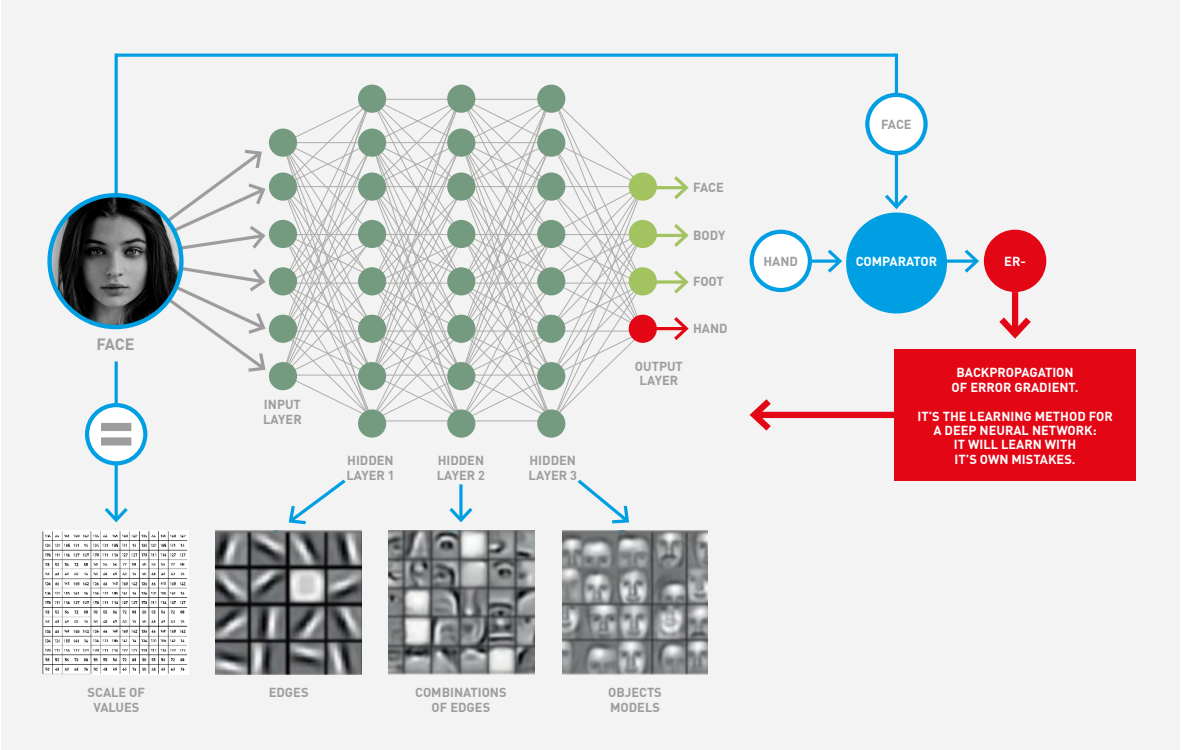

Figure 2

Deep Learning. The network that learns with it's own mistakes.

In the field of design, Deep Learning has been gaining more and more space, working at different levels within creative processes, revolutionizing the way many companies think and design.

For example, important sports brands use today Artificial Intelligence (AI) algorithms, Deep Learning model, as the basis for their entire digital infrastructure to create their products. This algorithm is trained to search, analyze, select, classify, prepare and provide important information for their designers to develop products quickly, accurately, efficiently and cheaply (figure 3).

But the use of this Deep Learning goes further. Still in the field of product design focused on sport, in order to better understand and exemplify AI's growing participation in the creative process as a whole, adidas brand launched in May 2019 the 4D (3D + YOU = 4D) product line where an algorithm is able to produce, using a 3D printer, a running shoe with a sole exclusively made for you, as a result of analysis of your personal data coming from a previous diagnosis with the crossing of data from more than 20 years of research and testing with athletes and consumers. In a simplified way, to explain this complex and innovative production process, this algorithm is able to control the concentration of material applied within a structural form of support of the sole created by the designers, with this precisely changing its density in different parts thus adjusting the unique and specific needs of each individual in the act of treading during the practice of running (figure 4).

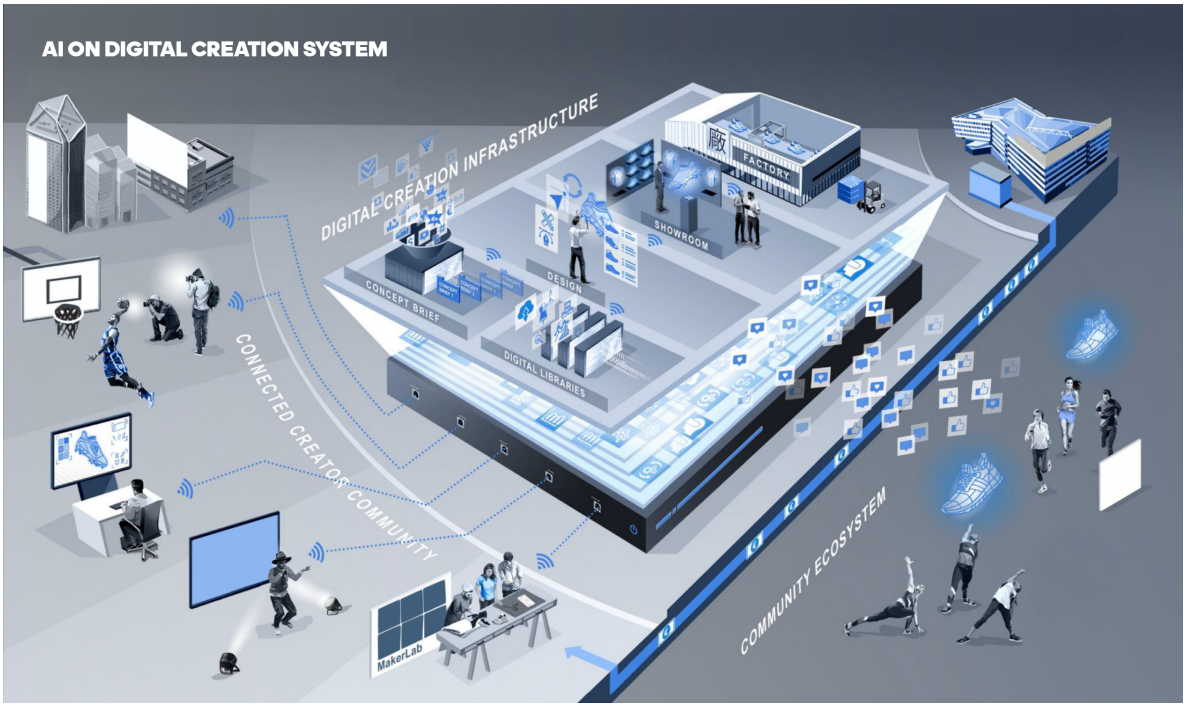

Figure 3
AI on digital creation system.

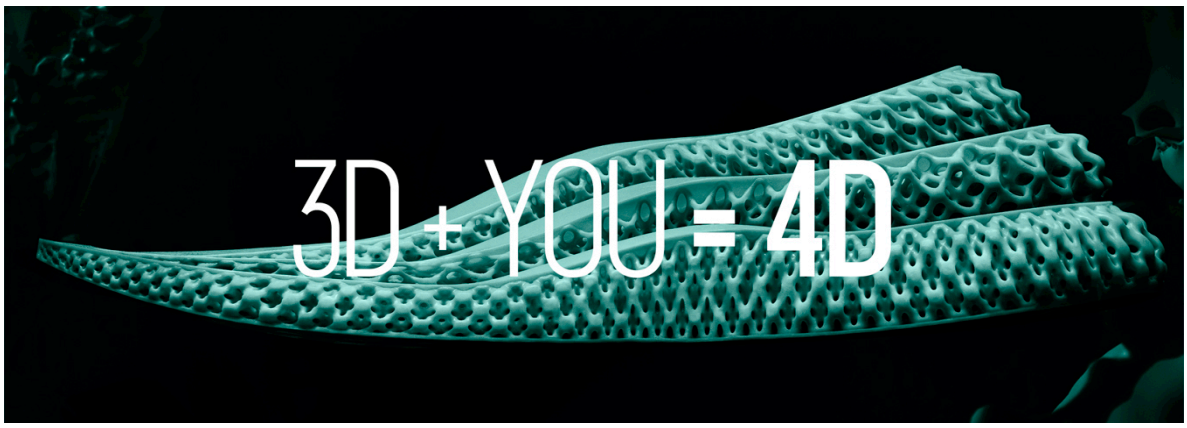

Figure 4
Adidas 4D project. 3D print sole.

But would an AI algorithm be able to act directly in the design of a product's shape, giving only initial inputs provided by designers for this task? Yes, this is possible. During Milan Design Week 2019, renowned designer Phillipe Starck along with Kartell and Autodesk released the world's first chair created by an AI, thereby breaking a further limit on the participation of algorithms in the creative design process (figure 5).

Figure 5
Philippe Starck, Kartell and Autodesk world's first chair designed with AI.

In the field of graphic design, there are no differences on the increasing use of AI algorithms in the creative processes of their projects when compared to those of the product design. As an example, in 2017 the team of designers of Ogilvy & Mather Italia created a project named Nutella Unica, where it used the ability of the AI to decipher, generate and print exclusive images. Nutella has created 7 million designs of packaging unrivaled for the Italian market. It was a great success, inspiring more than 10,000 videos of consumers and selling all the pots in 30 days (figure 6).

Figure 6
Nutella Unica project.

Also in 2017, MuirMcNeil's graphic design studio used an AI algorithm to create 8,000 unique covers for the annual Typography Special of Eye magazine. They used HP Mosaic - a software developed for the HP Indigo digital press that allows the creation of millions of unique designs from a limited number of original designs, called "seed" image files (figure 7).

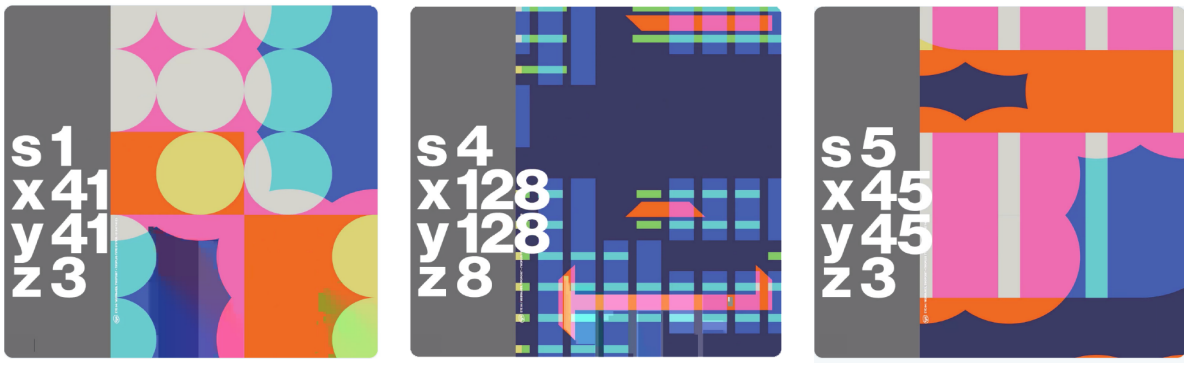

Figure 7
MuirMcNeil's graphic design studio create 8,000 unique covers with AI.

When we compare the above examples of the application of AI algorithms in the creative processes in graphic design, we can see that both are very similar as to the inputs provided by the designers and in the obtained results. Randomly using colors, shapes and composition, are presented as solution varied patterns of simple visual language.

But what will be the behavior and quality of graphical response of an algorithm when a project requires a deep conceptual basis like a Logo Design? In fact, will this be possible? If possible, will they be accepted by the public? Is it possible to perceive the differences between Logo design created by man and by machine? Can specialist designers understand the differences? Do these same designers agree that an algorithm is used? What are the real benefits and differences if applied? These are many other questions that drive me to investigate the use of algorithms in creative Logo Design processes.

CONCLUSION

It is already a fact, that automatic learning or simply Deep Leraning is present in the creative process in design. But what are its limits? Is there in the near future the possibility of an algorithm completely replacing the role of the designer in this process?

Ginni Rometty, CEO of IBM may have the answer when he says AI would be more useful to artists and designers if they understood it as enhanced intelligence, rather than a frightening artificial intelligence.

Today, as we approach the subject of Artificial Intelligence, some of us are reluctant, skeptics even afraid, others enthusiastic believe in a positive future, but regardless of opinion, we have to be all prepared and educated to face it according to Daugherty P. and Wilson H. (2018).

With this in mind, my major goal and desire is that my future research positively contributes to prepare and educate current and future generations of graphic designers facing the growing reality of the use of AI algorithms in the creative processes of Logo design.

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How to experiment if visual metaphor in a logotype has significance to remembrance

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ABSTRACT

We investigate metaphor (symbolism) in logotypes, its perception and its effect on memory. Thus, one visual standard experiment was developed for this effect. This model can be adapted to other logotypes (fig.4 and fig.6). Our research methodology aims to evaluate if this perception of symbolism within the logo occurs and if it has a consequent mnemonic effect on the observer. "Memorability is one of the most relevant descriptors to access logo effectiveness" (Rand, 2014). Many designers incorporate universal symbols in the graphic concept of "logos". For example, Linden Leader (1994) for FedEx incorporates an arrow, symbolizing to move swiftly and directly. Nike's logo is a further abstraction on the same symbolic theme of swiftness and directness even though it is inspired on the wing of the renowned statue of the Greek goddess of victory, Nike, who served as the cause of motivation for the distinguished and audacious warriors. We, therefore, evaluate the condition of adding a universal and common graphic characteristic to a logo and its communicative reach. All graphic identities are intended to accomplish remembrance. It's the designer's exertion and experience that will complement symbolism and novelty in a graphic form, until then unknown.

Keywords: symbol, logotype and logo, logo, mnemonic, creativity, metaphor

INTRODUCTION

"A symbol is a sign that stands for its referent because of convention." (Peirce (1932) "

Empirical Research for Developing Guidelines

Some investigation of "experimental aesthetics" (Berlyne, 1971, 1974), Gestalt psychology (Clement, 1964), graphic design (Dondis, 1973), and logo strategy (Peter, 1989) suggests many design characteristics that should influence affective responses to logos.

"Some of the logo strategy research is unpublished and has not been subjected to the rigors of statistical tests or peer review. As such, the literature does not provide unambiguous predictions of what sorts of logo designs should be selected to evoke the desired responses." (Henderson & Cote, 1998). Most theoretical estimates are based on the expertise of professionals and not on empirical research.

When a logo is selected, substantial time and money are spent to build recognition, positive affect, and meaning. “It is possible that desired responses are not achieved because the selected logos have designs that are difficult to store or access in memory, are not likable, or fail to create any sense of meaning” (Henderson & Cote, 1998). This statement is sustained by findings that the logos of some companies with small budgets (e.g., Arm & Hammer) are more familiar and positively evaluated than logos of some big spenders (e.g., American Express) (Bird 1992).

HYPOTHESES

Several researchers emphasize that a logo should readily evoke the same intended meaning across people (Durgee and Stuart, 1987; Kropp and Hillard 1990; Vartorella, 1990) but provide little means for testing it. Paul Rand emphasis, “the principal role of a logo is to identify, and simplicity is its means” (Rand, 2014). Rand provides a 7-step logo-test to access logo effectiveness. The descriptors are distinctiveness, visibility, adaptability, memorability, universality, timelessness and simplicity. These guidelines are set up to evaluate the quality of the logotypes and are unquestionable issues for valuation.

Our investigation touches two of these descriptors:

- Memorability: the goal of a logo is to be unforgettable. We will be testing the long-term memory (LTM) on a logotype (see Methodology).

- Universality: When a logo can carry a consistent meaning to a diverse range of people.

We will design tests with common representations such as letters and well-known images (see Methodology).

We also examined the Henderson & Cote 1998-experiment findings and methods in “Guidelines for Selecting or Modifying Logos” that uses symbols but no company names.

Our study and method follow the semiotic concept of a sign being constituted by “signifier” and “signified” (Saussure, 1916). The “signifier” can be thus inferred as the word and image of the Sign (Symbol/Logotype) and the mental concept is the metaphor of the “signified”.

Our hypothesis examines the mental concept created by the designer (the metaphor) and its consequence on remembrance. We examine the effects of design on responses to logo affect.

Logo strategy literature emphasizes that a logo should readily evoke the same intended meaning across people. In an advertising point of view Keller similarly argues that marketing stimuli should communicate one clear message that is difficult to misinterpret (Keller 1993). Semiotics literature suggests that the meaning of a stimulus can be assessed by examining the core or consensual meaning it evokes (Perussia 1988).

A clear meaning neither entirely specifies nor unduly constrains the nature or content of the meaning communicated, which enables companies to choose a design that communicates the most desirable message (Schmitt, Simonson, and Marcus 1995).

Michael Beirut made a comment about symbolic metaphor recollection when he was six years old and was pointed at a forklift truck parked in a nearby lot. Beirut’s father pointed out how the word ‘Clark’ had been designed (figure 1). Clark was the logo on the side of the truck. “See how the letter L is lifting up the letter A?” explained his father.

Figure 1

"It's doing what the truck does." Beirut describes this moment as if an amazing secret had been revealed, right there in plain sight. He was dumbfounded and thrilled. "How long had this been going on? Were these small miracles hidden all over the place? And who was responsible for creating them?" He relates to this remembrance until today demonstrating the effectiveness of the graphic metaphor (Beirut, 2007).

CONCEPTUAL BACKGROUND

The Logotype

The subject of this research study is the logo-symbol popularly known as "logotype", and in our case understood as the visual and symbolic representation of an organization's identity (Villafañe, 1999).

Logotypes, known in the study of graphic signs (Signography) as emblematic, incorporate in their meaning all the associations that accompany the brand (Stötzner, 2004).

In this sense, a logo is a sign of a symbolic nature with its own autonomy, whose construction is based on some of the connotations of the expressive elements that constitute it (García García, Llorente Barroso & García Guardia, 2010).

If a logo has a clear meaning, it can be linked more easily to the company or product (Block 1969; Durgee and Stuart 1987; Kropp, French, and Hillard 1990).

Stages of Memory

For psychologists, the term memory covers three important aspects of information processing: Encoding, Storage, and Retrieval (Figure 2) (McLeod, 2013).

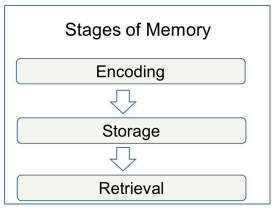

Figure 2

There are three main ways in which information can be encoded (changed):

Visually (picture), Acoustically (sound) and Semantically (meaning) (McLeod, 2013).

We will be studying long-term memory, as opposed to short-term memory (STM) because the principle encoding system in long-term memory (LTM) appears to be semantic coding (by meaning). Evidence suggests that the principle coding system in short-term memory (STM) is acoustic coding and therefore is not applicable in our study.

Most adults can store between 5 and 9 items in their short-term memory (Miller, 1956).

In contrast, the capacity of LTM is thought to be unlimited. Information can only be stored for a brief duration in STM (0-30 seconds), but LTM can last a lifetime. STM is stored and retrieved sequentially. LTM is stored and retrieved by association.

METHODOLOGY Qualitative & Quantitative Tests

The moment for the tests is coherent and pertinent within our investigation time line.

This study applies methods commonly used in experimental aesthetics, in which most empirical studies on design have appeared. Namely, we choose unfamiliar stimuli, follow traditional procedures for obtaining their ratings, and factor analyse the ratings to identify the underlying dimensions (Berlyne, 1971).

The experimental study will take a two-stage approach where respondents are asked firstly to examine twenty different panels and secondly, with a three-month interval, evaluate their remembrance about the first experiment (see Experiment I e II).

Experiment I (Qualitative Test)

A universal random sample of any adult public is suitable since the applied designs for testing have never been published and are unknown.

Each panel is shown individually (e.g. figure 3), to the respondent, to establish the recognition (or not) of the visual metaphor and the respondent is requested to give his opinion on the visual metaphors and meaning of the unknown logotype (should he encounter any).

Colour and type influence were minimized by the use of only black and white and the same typeface throughout all testing. Colour and type assessments are not on the scope of our investigation.

Figure 3
Experiment I

In figure 4 we demonstrate a set of some variations of the tests.

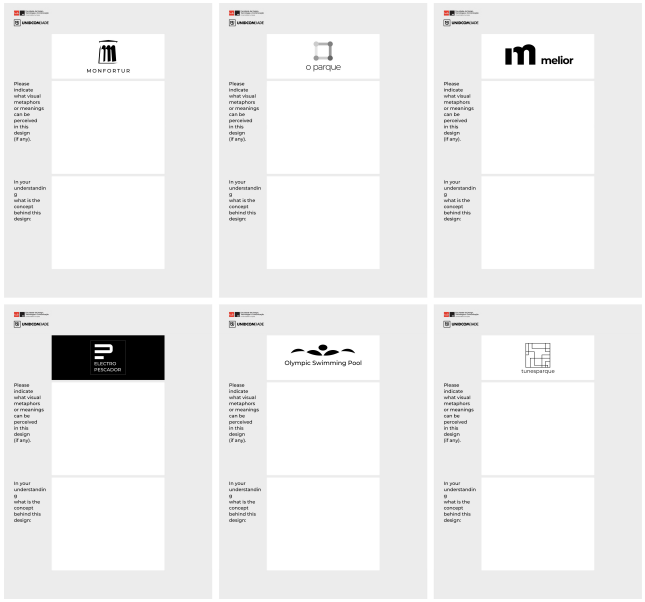

Figure 4
Panels 1-6

Panel 1 has primarily indented typographic and architectural (figurative) metaphors; Panel 2 has a primarily indented figurative metaphor; Panel 3 has primarily indented typographic and figurative metaphors; Panel 4 has a primarily indented typographic metaphor; Panel 5 has a primarily indented figurative metaphor; Panel 6 has primarily indented typographic and figurative metaphors.

Experiment II (Quantitative Test)

The same sample of "Experiment I" was utilized.

We proceeded in a second stage, with a three-month gap, to evaluate if there was a co-relation with remembrance from Experiment I. Six new panels were designed. For each panel the original logo and four other similar designs (positioned in a randomly chosen order) were shown individually (figure 5), to the respondent. We are still evaluating on the adequate number of alternative designs to be shown.

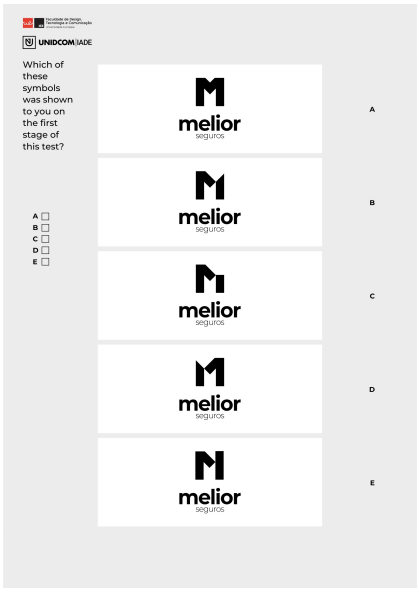

Figure 5
Experiment II

The analysis is conducted in two phases. First, we use factor analysis to identify underlying design dimensions (independent variables). Secondly, the design dimensions are regressed against the response dimensions.

Criticisms of Memory Experiments

Ecological validity refers to the extent to which the findings of research studies can be generalized to other settings. An experiment has high ecological validity if its findings can be generalized, that is applied or extended, to settings outside the laboratory.

We hope to minimize ecological validity by the use of digital testing such as Google forms. Personal and class interviews are viewed as laboratory conditions.

In figure 6 we demonstrate a set of variations of the tests.

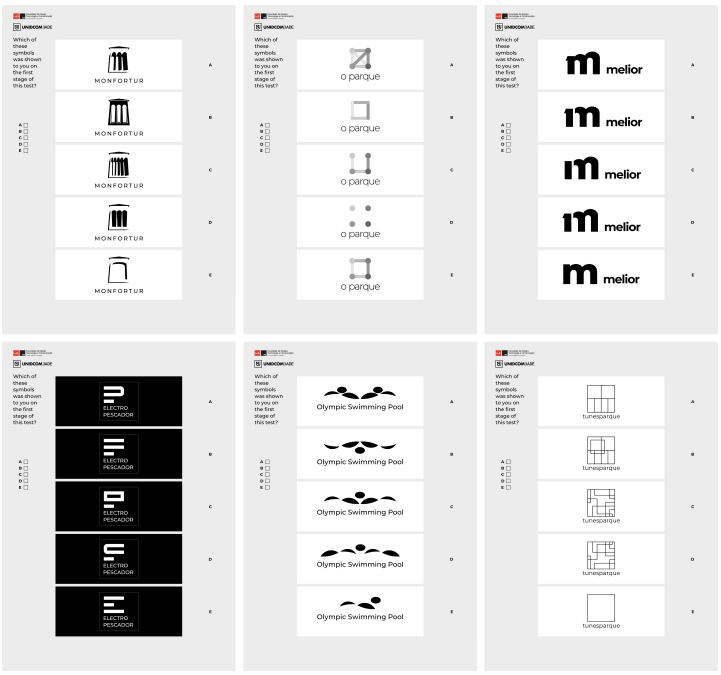

Figure 6
Panels 7-12

DISCUSSION AND EXPECTED RESULTS

Our discussion aims to determine if the most effective logotypes, hence of greater brand value, are those that attained remembrance through the graphic metaphor they imply. Does this engagement with the receiver, allow the logotype to establish his own empathy? Is the logotype saying to the observer someone thinks what you think?

We debate if this "reciprocity" is one of the main objectives for designers working with graphic marks and argue that light shed on this matter will valorise designer's exertion, experience and valorisation.

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The Connection Between Experiential Fashion Marketing and Emotional Fashion Branding

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ABSTRACT

Today's fashion consumers are interested in the value of the product they add to their lives rather than the function of the product they buy. As a result of the demands of consumers to be a part of the brand, experiential fashion marketing and emotional fashion branding strategies have taken their place among the most powerful marketing strategies of today. Although these two strategies have their own strong characteristics since these two cases complement each other and are frequently used together, the distinction and connection between them is not made clearly. Therefore, this paper presents a literature review on the meaning of 'experiential fashion marketing and emotional fashion branding' with the aim of clarifying the relationship between the two expressions. As a theoretical framework, this study divided four section. Emotional fashion branding helps consumer to understand who they are with. And to do this successfully, fashion brands use experiential marketing strategies. All these strategies must be coordinated from a wide perspective and branding organize that system.

Keywords: fashion, fashion marketing, fashion branding, experiential fashion marketing, emotional fashion branding.

INTRODUCTION

Recent marketing and branding approaches shows us how consumers' needs transformed from the traditional way to the emotional way. After the industrial revolution, fashion business became mass global market. All the fashion brands needed to promote their selves to gain customer royalty, in this case marketing and branding strategies became crucial and everything became so fast and temporary (Smilansky, 2018; Abbing, 2017; Kim, Sullivan, 2019). Today consumers want to be more involved to their beloved brand and they are seeking more fun, experience and identity (Abbing, 2017; Choi, 2016; Gobe, 2010, Rath, 2015). Today's fashion consumer keen on experience the fashion more than buying the fashion (Rathnayaka, 2018), they want to engage with the brand authentically thus they add value to their lives. Consumers

inspire to their beloved brands; they want to be a part of the brand and what is associated with it. When they become advocates, they start to do promotion for the brand (Smilansky, 2018). Fashion marketing before the digital age, uses three forms of advertising; print, TV and radio. With the digital era, fashion marketing opportunities has transformed to search marketing, PPC (pay per click), social media and content marketing, e-mail marketing, apps, tv and radio, prints etc (Lamerton, 2016). So experiential marketing and emotional branding strategies has become very suitable and efficient areas to give the consumers what they need.

This study will focus on the connection between these topics and in the relationship between brands and consumers expectations.

THEROTICAL FRAMEWORK

We've divided it into four sections to get a better understanding of the issue. Such as; Marketing and Fashion Marketing, Experiential Marketing and Experiential Fashion Marketing, Branding and Fashion Branding, Emotional Branding and Emotional Fashion Branding.

1. Marketing and Fashion Marketing

> *'Marketing is a process that includes the communication of all information that sellers want to share with consumers, from the time a product or service is an idea through its purchase, use, evaluation, and disposal by the customer (Rath, 2015, p.10).'*

Rath (2015), states that marketers must always be evaluative and innovative. She defines areas of marketing such as; branding, product development, advertising, media planning, sales promotion, public relations, professional selling, communications, global marketing, direct marketing, distribution, supply chain management, customer relationship building and maintenance, pricing strategies, social media and word of mouth, website design and implementation, community involvement, psychology and sociology. The same author (2015) defines recent marketing approaches such as: Buzz marketing that allows, consumers can participate in spreading news about the brand; Hype marketing that puts some activities in motion before the official appearance of a new product or service; Guerrilla marketing as an unconventional marketing strategy aims to get maximum profits from minimum resources; Ambush marketing that spreads a marketing message to the large amount of people and stealth marketing that prepares advertises there are hidden marketing objects in it. Rath (2015), also adds that, these are parts of the WOM (word of mouth) marketing strategies which are all based on the sharing people's habits. Fashion brands like Adidas, Gucci, Forever 21, Tiffany use WOM strategies. E. Jerome Mc Carthy, mentioned by Rath (2015) defined crucial marketing tool called 4P (product, price, promotion, place) more than 50 years ago. Today, this marketing tools have been transformed to other forms like; 4C (customer needs/wants, cost to the user, communication, convenience) or new version of 4P (purpose, passion, participation, profit) which is Saatchi & Saatchi redefined.

According to Easey, mentioned by Barnes (2013), fashion marketing is different from the other marketing approaches because of the dynamic nature of the fashion world. A fashion product has a short-term expectancy.

> *'Fashion marketing is concerned with understanding the complex needs and wants of consumers of fashion and with orienting both strategic and operational business activities to satisfy those demands; fashion marketing's particular complexity as a business philosophy arises from the diversity of fashion-related influences which shape consumer*

> *needs combined with the fast-moving pace of fashion-product lifecycles (Barnes, 2013, p.26).'*

In fashion industry, there are two different marketing approaches; design-centred approach that designers are the main force and marketers are a tool and helper to reach the market; In this view, marketing activity is carried out by public relations companies and publicity agencies so, in this view, marketing is a promotion and marketing-centred approach which deems it appropriate for designers to design their designs according to economic limits, seasonal expectations of purchasers and selectors, and consumer expectations determined by marketing research (Sevil,2006). Barnes (2013), divides fashion marketing research into two separate parts such as fast fashion research (the fast fashion concept, fashion trends and consumer demands, fast fashion and supply chain concepts) and digital fashion marketing research (media commerce, omni-channel fashion, social media). In addition, e-commerce fashion sales increase rapidly. It is expected that more than %25 of fashion sales in Western Europe takes place online by 2020. Therefore, fashion brands marketing strategies has replaced digital (Distler et. al., 2018).

2. Experiential Marketing and Experiential Fashion Marketing

> *'Experiential marketing is a process of identifying and satisfying customer needs and aspirations profitably, engaging them through authentic two-way communications that bring brand personalities to life and add value to the target audience (Smilansky, 2018, p. 12)."*

Experiential marketing is a customer- centric approached methodology. It communicates effectively with the target consumer. It is especially useful for creating brand advocacy, encouraging WOM, making deep connection between brand personality and consumer's long-lasting memories and deep emotional bonds. WOM increases profits more effectively than advertising. Traditional marketing communication channels has transformed rapidly by technology and Gen-ers (a mix of millennials and Gen Z). Advertising has turned to create a brand awareness by brand experience, direct mail has evolved to personal gift boxes which is sent directly to the customer's house, channel and PR has transformed live brand experience (Smilansky, 2018).

According to Smith and Hanover (2016), experiential marketing grew very quickly because it carries the strength of many..., it is unstoppable, the first singular converter, an accelerant, the marketing mix's charger, an engagement multiplier and it drives life time value. Using experiential marketing, creates the customer engagement and real business results for many brands. Since fashion is no longer just being about runway shows and press events, fashion brands have to find creative solutions to reach more consumer and to gain their loyalty.

Today many companies use experiential marketing, with changing perception the brand experience becomes most popular interaction tool (Smith, Hanover, 2016). Furthermore, fashion brands have become involved experiential strategies rapidly. Experiential has become key tool for fashion brands (Fairley, 2015). Today fashion brands use experiential marketing dynamically; Kenzo presented The Kenzo Fashion Bus which was a pop-up boutique. The bus took visitors on a scenic Dubai tour. The brand also opened a pop-up installation which was an interactive virtual aquarium. It aimed to highlight overfishing damages. Visitors was able to buy shirts to support the Blue Marine Foundation. Vogue opened luxury branded cafes in Dubai and Moscow.

Prada opened a luxury pastry shop and a restaurant with Wes Anderson who worked with Prada's ads campaign several times. The restaurant has themed as 50s cinematic nostalgia. Fendi, Hermes and Joyce have created luxury mooncake desserts for the Moon Festival. Chanel opened a pop-up boutique in St. Tropez. Gucci opened the fashion brand's first high-end dining service which is called 1921 Gucci Café in Shanghai. Burberry opened a pop-up café which is called Thomas in London. Berkeley Hotel has offered Alexander McQueen branded tea service in London. Givenchy made a collaboration with Fauchon. Fauchon sold their decadent eclairs with Givenchy's signature branding and hereby boosted their business again. Givenchy also created perfume-inspired cocktails for London's Hotel Café Royal for a limited time. The Ritz Paris Hotel opened a luxury spa by Chanel (Pijak, 2015). Topshop opened World's first Twitter-powered crane at their Oxford Street flagship store in London and Nike installed a vending machine in New York which gave out free products in a secret location (Fairley, 2015). These examples are evidences that brands use the experience as a way to solidify the consumer relation with the brand.

3. Branding and Fashion Branding

> *'Branding is a design, marketing, communication and human resources tool. It should influence every part of the organization and every audience of the organization all the time. It is also a co-ordinating resource because it makes the corporation's activities coherent and above all makes the strategy of the organization visible and palpable for all audience to see (Olins, 2010, p.21).'*

Some people think that brands are products, and for the others, brands are names or luxury goods or a symbol (Olins, 2010) or a brand can be seen as belonging exclusively to the domain of marketing (Abbing, 2017).

Abbing (2017) states that, branding was a sign of ownership in the past but now it is a representation of a vision. It was connected to their owner, now it is also connected with consumer. Consumer has become a co-creator of the brand. Clothes and accessories are the reflections of the people feelings and how they see themselves (Tungate, 2012) for this reason consumers love their fashion brand which they feel like they belong to the brand (İsmail, Spinelli, 2012).

Davis (2017) defines brand strategy such as; communication strategy, creative execution (naming and logo, advertising and promotion, digital presence, brand guidelines), research (market and audiences), social and environmental considerations. He also defines forms of branding collaboration as sponsorship, co-branding, endorser brands, ingredient brands, alliances, and collaborating for innovation. To use branding effectively is an important factor for all fashion brands and also it effects consumer satisfaction and their brand loyalty. Consumers prefer branded fashion products not just for functionality but also social requirements such as self-image projection, reflecting life style and social status. Proper branding strategies can create a win-win situation between consumers can be more satisfied and brands can make more profit. Co-branding is a quite preferred strategy in fashion field, as an example H&M has done many co-branding campaigns with Karl Lagerfeld, Lanvin, Jimmy Choo, Stella McCartney, Marni and Maison Martin Margiela (Choi Ed., 2016). Marni and H&M collaboration collection was sold out by lunchtime in London (Milligan, 2012).

4. Emotional Branding and Emotional Fashion Branding

Emotional brand attachment reflects the connecting bonds between consumer and brand and also involves feelings towards the brand (Malar, 2011). Many consumers now expecting to be more connected with the brand and total transparency from the business of the brand (Davis, 2017). There are five types of reward that brands give to the consumer to make their relationship as a long term. These are; economic, hedonistic, social relational, informational and functional. These types honour the consumer's purchasing and make them feel special. As a result, consumer have an emotional bond with the brand and their long-term relationship starts (Berman, Evans, Chatterjee, 2018).

Robert Jones states that;

> *'We are very promiscuous as a brand audience. Our loyalties change. Traditionally we were 'buying into' the brand; now we can decode all this and emotional engagement on its own is not enough. Audiences want a more practical relationship with brands, where reality and functionality matter.' Robert Jones Wolf Olins (Davis, 2017, p. 73)*

More than three thousand new brands come to the stage each year, not including e-brands, so the difference between them (same product with a different brand) is emotional connection. This strategy works successfully because human being responds emotionally to their life experiences and projects emotional values onto the objects around them naturally. Therefore, According to Gobe; traditional concepts of awareness evolved from consumers to people, product to experience, honestly to trust, quality to preference, notoriety to aspiration, identity to personality, function to feel, ubiquity to presence, communication to dialogue and service to relationship. Therefore, the four pillars of emotional branding become relationship, sensorial experiences, imagination and vision (Gobe, 2010).

Kim and Sullivan (2019) defines emotional branding such as; market place trends (consumer experiences, authentic self, warm glow, co-creation), emotional brand strategies (sensory branding, storytelling, cause branding, empowerment) and brand loyality.

Brakus et. al. (2009), build upon Schmitt (1999) definition of five sensory experiences (think, feel, sense, relate and act) propose four dimension for emotional branding as affective, behavioural, sensory and intellectual experiences. These experiences strengthen emotional bonds and lasting impressions in consumers, leading to the success of branding efforts (Parise & Guinan & Kafka, 2016). Fashion retailers use emotional branding as a way to linked with their consumers and aim to become more competitive (Kim & Sullivan, 2019). Franze (2017) says that when brands give the feeling, we or us rather than you and me, they become more successful. In this case a new growing trend called warm glow (Aknin & Dunn & Sandstrom and Norton, 2013) gives the opportunity to feel warming of helping people via volunteering and donating. As an especially paramount in the post-modern consumption era, Co-creation by content marketing is in many channels like magazines, videos, blog posts, websites (Pulizzi, 2012). In traditional market, consumers do not have any role in brand value creation, but in postmodernity via social media brands let their consumers to involve in value creation (Kim & Sullivan 2019). As a fact of emotional branding strategy, sensory branding, triggers consumers' five senses such as sound, taste, fell, smell, and sight (Khrishna, 2012) and fashion retailers successfully provides sensory experiences to the customers. Hollister marketing strategies (Khan, 2016) and Chanel marketing strategies

(Karmali, 2017) focus on sensory marketing via store atmosphere and scent that is signature of the brand. Storytelling strategy appeals or inspires consumers as a successful marketing strategy (Silvestein & Fiske, 2003). Fashion brands such as Louis Vuitton, Under Armour and Stuart Weitzman use digital storytelling as a marketing strategy. Cause branding offers to the consumer, purchasing for a positive change for the social issues (Kim & Johnson, 2012). Levi Strauss & Co. foundation has social changes connected to HIV/AIDS and workers' rights. Empowerment marketing makes customers feel like as a hero who have force to fulfil their own life (Bauhau, 2012). It helps to increase consumers' self-esteem and self-efficiency (Earl, 2017). Nike uses empowerment marketing on the 'Just Do It' campaign to give courage to the customers (Kim & Sullivan, 2019). To use branding effectively is an important factor for all fashion brands and also it effects consumer satisfaction and brand loyalty. Co-branding is also a quite preferred strategy in fashion field. As an example, H&M has done many co-brands collaboration such as Karl Lagerfeld, Lanvin, Jimmy Choo, Stella McCartney, Maison Martin Margiela and Marni (Choi, 2016). Marni and H&M collaboration collection was sold out by lunch time in London (Milligan, 2012). Consumers prefer branded fashion products not just for functionality but also social requirements such as self-image projection, reflecting life style and social status etc. proper branding strategies can create a win-win situation between consumers and brands by this way consumers can be able to feel more satisfaction and brands can make more profit (Choi, ed. 2016). This study aimed to analyse the connection between experiential fashion marketing and emotional fashion branding. In 20th century advertising and brands evolved, taking on unique characters, consumers are encouraged to desire a lifestyle that represented by the brand via customer-centric marketing communications. This has changed rational message to an emotional message of the brand or they have used both of them (Smilansky, 2018).

CONCLUSION

As a result of our research; it is founded that, Experiential fashion marketing is a promotion of brand's products. It is about to make a good profit and how you attract the consumer's attention. Experiential fashion marketing builds awareness, changes and evolves dynamically marketing is based on curiosity and purchasing motivation. The fashion brand encourages consumer to buy a product and supports fashion brand's marketing activities. Emotional fashion branding is bigger than any experiential fashion marketing efforts. It is about to create a brand loyalty. It has to be stable because branding is based on trust, loyalty and belonging and it gives all the identity and value of the brand to the consumer as an emotional connection. Unless marketing is based on curiosity and purchasing motivation. Fashion branding is about who you are and fashion marketing is about how you attract the consumer's attention. But at the same time, it can't separate from each other. Emotional fashion branding helps consumer to understand who they are with. And to do this successfully, fashion brands use experiential marketing strategies. All these strategies must be coordinated from a wide perspective and branding organize that system.

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Mobile Comics:

Comics' Features focusing on small screen devices

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ABSTRACT

Webcomics has attracted increasing interest in academic studies, which is driven by the demand for this type of content distributed over the internet. This is potentialized when considering its reading in small screens, due to the popularization of this type of mobile devices. However, there is some concern amongst comic artists revolving the design of their works, focusing on reading on these small screen devices, with different visual characteristics. Thus, the present article seeks to understand what differs mobile comics from classic comics, and in what form these characteristics contribute to the reading experience. Ten characteristics were identified, based on an analysis of content platforms for webcomics available on the Internet, ranging from the best use of vertical screens, infinite screen reading and breathing areas, to small groupings of frames, such as narrative units, allowing the identification of a possible new subgenre of comics.

Keywords: Design, Webcomics, Mobile Comics, Small Screen Devices.

INTRODUCTION

In countries such as Japan and South Korea, where comic book magazines production is massive, the transposition of these comics, originally created for print media, into digital media, mainly mobile, is a lucrative market. The problem is that, unlike websites - which can be worked with responsive design in an automated way – comics, being originally created for reading in paper of much larger sizes than the small smartphone screens, are not as successful at resizing: the little texts inside the balloons, the reminders, the sound effects, and even details like the expressions on the faces of the characters can end up being lost in the reduction, forcing readers to enlarge and navigate on the pages.

Although the expression "mobile comics" is still associated with academic studies that seek classic comic pages fragmentation for reading in small screen devices, it is still possible to find this expression in sites focused on the profession of comic creation. So, this article's objective is to answer the following research question: what differs classic

comics and webcomics from mobile comics, and in what form these characteristics contribute to the reading experience in small screen devices?

WEBCOMICS READING, FRAGMENTATION AND ADAPTABILITY

According to Pophal (2018), "People spend more time consuming digital media on mobile devices than on a desktop and this trend will definitely continue." Nowadays, any media that offers information or entertainment already has digital versions that predicts for this type of reading. Concern over content adaptability ranges from rearranging websites to making smartphone reading enjoyable, to, for example, descriptive captions on videos that will be watched in public places, and often with the audio options turned off. So, it is understandable to notice a movement of researchers perceiving how to make all the content of printed comics into digital, focusing on compatibility with small screens reading, to take advantage of this market gap.

As Schade (2017) states, "Mobile designs need to do more than shrink a desktop experience to a smaller screen". In the case of webcomics, a mere reduction of pages that were originally created to be read on sheets of average 17x26cm sized paper might not get the visual impact intended by the comic author. However, what is found so far in academic studies concerning comics for small screen devices with readability seeks the path of page fragmentation, as explained in Figure 1, where algorithms automatically identify isolated frames of the narrative and display them separately on the reader's device (QIU; ZHANG; HUANG, 2004; CHAN; LEUNG; KOMURA, 2007; HAN et al, 2009; PONSARD; FRIES, 2009; ARAI; TOLLE, 2010; TOBITA, 2010; TOBITA, 2011).

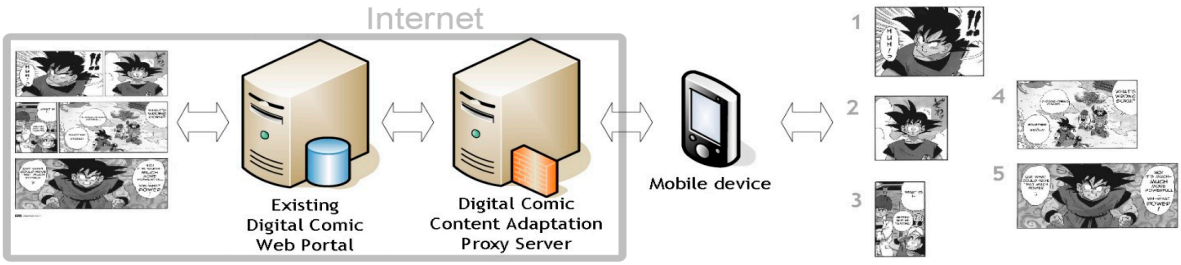

Figure 1: *Comics pages fragmentation for reading on small screen devices*
Source: Adapted from ARAI; TOLLE, 2010, p. 2.

However, it is not uncommon to find different solutions for this same problem. One of them, for example, is presented by Google[9]: in the comics sold on the GooglePlay content store, the automatic magnification of the balloons of the pages is offered for better reading on small screen devices (PRADO, 2016), as showed in Figure 2.

Figure 2: *Balloons magnification at GooglePlay Content Store*

[9] Available at https://play.google.com/store, accessed in 31/10/2017.

Source: PRADO, 2016.

This concern in converting printed comic pages on digital content for reading on mobile devices - including small screen ones - nevertheless presents weaknesses, as the proposal of Figure 1's authors, Arai and Tolle (2010) suggest, when they state that their algorithm presents a 92% success rate of frame detection in performed tests, and admit that when there are contents extrapolating the frames, besides being more difficult to identify, they can be lost. At the same time, the algorithm is based on the balloons detection to be able to identify the frames, and may not work when the comic does not use this graphic feature. Similar conclusions occur in other studies with similar proposals, such as those mentioned above. On the other hand, the solution presented in Figure 2 makes it possible to read the texts of the balloons, but fails to display the page's art richness of details, which virtually disappear in the reduction.

Contrary to this reasoning, webcomics created with a focus on reading for small screen devices are found on the internet, avoiding the need for the reader to enlarge or navigate the pages for readability.

WEBCOMICS PLATFORMS

In order to better understand both webcomics publishing platforms, as webcomics itself, this article will analyze the major platforms of this style found on the internet so far.

The items to be looked for in these platforms are: 1) The availability, or lack thereof, of applications for reading on mobile devices; 2) The comic formats it provides; and 3) The possibility and use of hypermedia elements.

The comic formats mentioned in the second item, to be searched on the platforms, will be identified by their visual composition characteristics, and will be defined by means of the following nomenclatures (Figure 3):

- **Classic Strips (CS):** when presenting comic strips that follow the same classic model of printed comic strips, with the horizontal frame's layout;
- **Vertical Strips (VS):** when there are short narratives, similar to classic comic strips, but arranged vertically, providing better visualization on mobile devices screens;
- **Paged (PG):** When the digital comics follow the same pattern of classic printed comics, with pages separation, without using the possibility of the infinite screen;
- **Infinite Screen (IS):** when the comics make use of the infinite screen possibility;
- **Digitized (DI):** When comics are originally made for print media, scanned and made available online.
- **Small Screen (SS):** When the comics are presented with composition and design concerns that allows reading on small screen devices without the use of features such as zooming, enlarging or fragmenting frames.

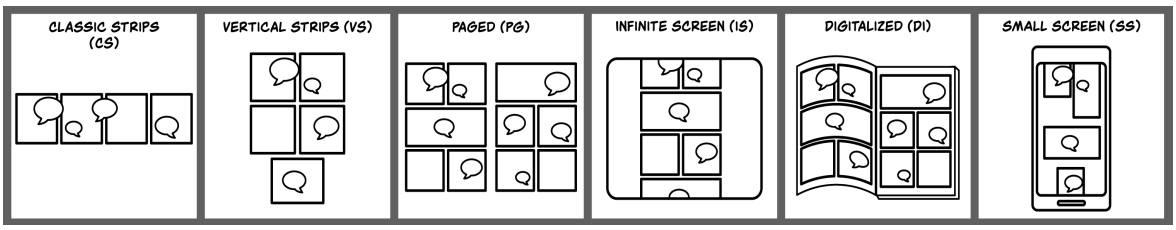

Figure 3: *Webcomics formats*
Source: The Authors.

In Table 1, only webcomics platforms that legally distribute their content are included. The several platforms that distribute digitized comics without permission of the authors or publishers are not considered.

#	Platform	Mobile App	Formats	Hypermedia
1	Social Comics socialcomics.com.br	AppStore, GooglePlay	PG, DI	No
2	Tapas tapas.io	AppStore, GooglePlay	CS, VS, PG, IS, DI, SS	Yes
3	Comixology comixology.com	AppStore, GooglePlay, KindleFire	PG, DI	No
4	Lehzin Comics lezhin.com	AppStore, GooglePlay	PG, IS, SS	No
5	Marvel Unlimited marvel.com/comics/unlimited	AppStore, GooglePlay	PG, DI	No
6	Read DC Comics readdc.com	AppStore, GooglePlay	PG, DI	No
7	Panel Syndicate panelsyndicate.com	No	PG	No
8	Webtoon www.webtoons.com	AppStore, GooglePlay	VS, IS, SS	Yes
9	Smack Jeeves smackjeeves	No	CS, VS, PG, DI	Yes
10	Hiveworks hiveworkscomics.com	No	CS, PG	No
11	Stela stela.com	AppStore, GooglePlay	IS, SS	Yes
12	Daily Comics comics.azcentral.com	No	CS	No
13	Go Comics www.gocomics.com	No	CS, VS	No
14	Webtoon Factory www.webtoonfactory.com	No	VS, IS, SS	Yes

Table 1: *Comparison of webcomics platforms*
Source: From the authors, according to information collected in April of 2019.

Table 1 shows that 8 of the 14 digital comic distribution platforms offer applications for the major mobile devices, indicating a concern with this potential audience. However, of these 8 platforms, only 4 feature comics that were developed for comfortable reading on small screen devices; the others offer comics that visually work better in larger formats, whether on large screens or printed.

As can be seen in Figure 4, the most frequent webcomic formats found on the platforms are Paged (PG) and Digitized (DI), that is, presenting the classic way of reading and developing printed comics, followed by other styles, all with equivalent amounts. Of the

14 platforms, 7 present comics can be read in small screen devices, which is half of the platforms researched.

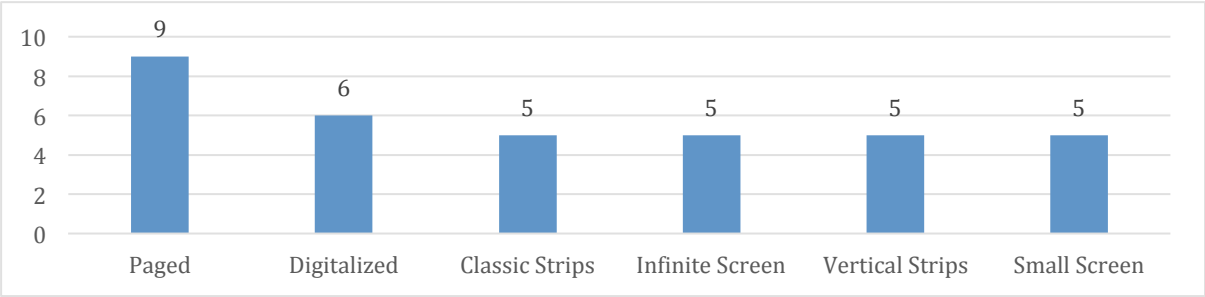

Figure 4: *Quantities of Comic formats found on platforms*
Source: From the authors.

Finally, regarding hypermedia elements, five platforms that present their use were found, most with animations, made possible by the use of Animated Gifs, and some with the possibility of soundtrack insertion.

MAIN CHARACTERISTICS OF MOBILE COMICS

With the analysis of the webcomics offered in the previous section selected platforms, this study identified ten design features that facilitate small screen reading, which characterize the Mobile Comics and differ them from other types of webcomics, as presented in two main formats, as follows.

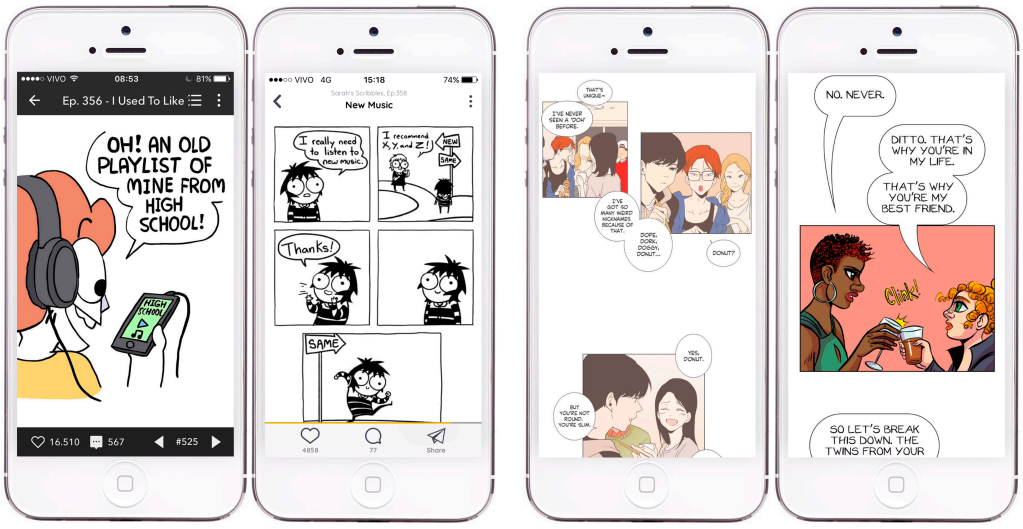

Figure 5: *Screen captures of the Vertical Strips "Blue Chair" and "Sarah's Scribbles", and Infinite Screen Narratives "Something About us" and "Roommate Assassin".*
Source: Assembled from the authors, from platforms Webtoon and Lezhin.

As illustrated in Figure 5, the two main webcomic formats identified that allow reading on small screen devices without the use of features such as magnification and fragmentation, are the Vertical Strips and Infinite Screen Narratives.

Vertical Strips are short narratives, which usually fit entirely on a small screen or require little scrolling. They work in the same way as the classic comic strips published in printed newspapers, but with a layout free of publication size restrictions and with vertically stacked frames, to enable reading on devices in vertical position, which is how they are usually held by users.

For this format, the present study identified four striking design features:

- **Simplicity**: fewer colors and simpler strokes are used, which avoid a great loss of quality in the image files, in case the comic is redistributed on social networking sites that use more severe compression algorithms.
- **Breath Areas**: Generous blanks spaces are used, which makes the design cleaner and the reading easier, taking advantage of the layout freedom of a media that is not physically limited as one that is printed.
- **Larger lettering**: Despite following the well-known norms of using typefaces that imitate manual handwriting, the lettering is applied in proportionally larger sizes, seeking a comfortable readability in small screens, without the need of enlarging the frames. It is also quite common to find genuinely handwritten lettering, made possible by short narratives that require little text.
- **Identification**: The comics usually earn a signature of the author, with the address of their main site, email, or username of some social network site, so readers can trace it back to its author in case the image is redistributed without the link of the original publication.

Thus, **Infinite Screen Narratives**, which are longer narratives, and requires the readers to scroll to continue the story, present other five identified characteristics:

- **Silence Areas**: the use of large empty spaces in the gutters, between one frame and another, that aim to isolate certain scenes to modify the reading pacing, as well as to isolate scenes of greater impact in the narrative.
- **Dramatic Units in Frames or Clusters**: As stated by Kneece (2015), each comic page must be considered a narrative development dramatic unit, with cause and effect, that will be part of a whole. In the case of mobile comics, the use of the Silence Areas mentioned above contributes to the drama of the narrative, bringing this function of dramatic unity to the frames, alone or clustered in small groups.
- **Screen Width Usage**: Horizontally aligned frames appear infrequently, and only when less important situations are being narrated. In order to make the most of the small space, the frames make use of the whole width of the screen to give more space to the relevant details and expressions of the characters.
- **Vertical Route Reading**: Complementarily, the zig-zag reading route, proposed by Eisner (1999) in Figure 8 is usually replaced by a vertical reading, aided by scrolling the infinite screen.

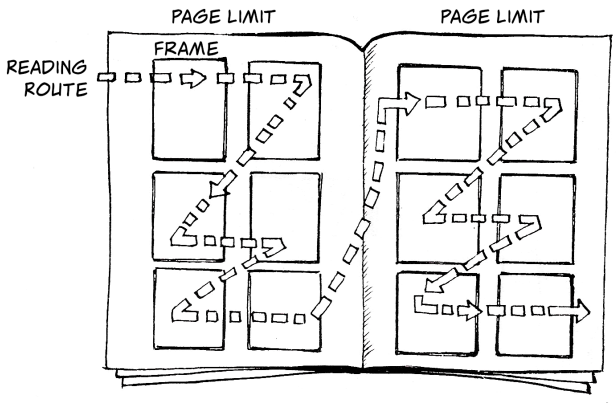

Figure 6: *Common Reading route for printed comics*

Source: EISNER, 1999, p. 41.

- **Hypermedia**: animations, when used, are small and looping, to emphasize some event of the narrative and, generally, to increase the comic factor. Soundtracks, which can be activated in certain chapters or scenes according to the dramatic construction of the narrative, also seek to immerse the reader in the story.
- **Varying Length Narratives**: Although not a significant feature, it's noticeable that Infinite Screen Narratives, freed from imposed limitations by printed pages count, usually present serial chapters with variations of length.

From these ten listed characteristics, Table 2 presents an organized comparison with main points of divergence between the classic and mobile comics.

	Classic and digital comics	Mobile Comics
Publication Media	Printed/Screen larger than 7" (Tablets and Personal Computers)	Screens smaller than 7" (smartphones, Phablets and digital readers)
Reading	Zig-zag route, from left to right, and then up-down (in countries where those are the reading rules)	Up-down first, and then zig-zag left to right, if applicable
Dramatic Unit	The page	The frame, or small clusters of frames
Lettering	Minimum font size of 8pts, following printed design rules	Proportionally larger font size, without possibility of size definition, because of devices screens' vast variety
Design	Richness of detail and concern about filling entire page for better use of the space allowed by the printed publication	Fewer details, and higher usage of close-up scenes to emphasize the characters' expressions, as well as great spaces of breath and silence in the design
Hypermedia	No	Use of small looping animations for emphasis on some event of the narrative or comedy, in addition to ambience soundtrack.

Table 2: *Summary of classic and mobile comics characteristics compared*
Source: From the authors.

CONCLUSION

In order to understand what differs digital classic from mobile comics, and in what way these characteristics contribute to the reading experience in small screen devices, the present article carried out an analysis of publications in several online platforms of Comics content distribution, in relation to its main design features.

The analysis gave rise to a list ten design features that distinguish them into two distinct formats - Vertical Strips and Infinite Screen Narratives -, both in their development and for reading, which are: Simplicity, Breath Areas, Larger lettering, Identification, Silence Areas, Dramatic Units in Frames or Clusters, Screen Width Usage, Vertical Route Reading, Hypermedia, and Varying Length Narratives.

Comic books are, by nature, guided by the creativity and daring of their authors, who are always looking for new ways to surprise readers through this medium (PRESSER; BRAVIANO; FIALHO, 2017). Thus, identifying significant changes in visual language and design imply a phase of great relevance in the development of this form of visual expression, so popular and widespread among diverse cultures around the world. The maturation of this recent way of making comics may be considered, perhaps, a new subgenre, such as comic strips, cartoons and mangas, within the hyper genre Comics, as stated by Ramos (2012); or, on the other hand, be considered as an entirely new media,

unrelated to its origin. A more precise understanding of its nomenclature, however, is not the purpose of this article, and can be addressed in future studies.

This analysis in mobile comics and its platforms was finalized in April 2019. Some of the characteristics pointed out were identified only recently in digital publications, which reinforces the idea of a changing media. In this sense, the possibility is also opened for more in-depth studies on the characteristics identified, pointed out and interpreted in this article, as well as quantitative or qualitative research with professionals and comic readers on their perceptions in this regard.

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The Gaze of Culture and Communication

Strategic analysis of consumption and trends

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ABSTRACT

This paper explores the articulation of three cultural analysis approaches in order to provide data and insights that can be applied at a strategic level to generate and design better solutions – in terms of communication, product design and others – for consumption collectives. The attention to concepts and methods within the Humanities and Social Studies helps to map a set of practices that can add value to trend analysis, business practices and strategic thinking.

Keywords: communication, consumption, cultural analysis, trend studies.

INTRODUCTION

The study of consumer culture has been flourishing for the past decades, giving birth to new approaches like consumer culture theory (CCT) among others (see Arnould and Thompson, 2005) [10]. Following the concepts and methods of disciplines like Anthropology and Sociology, in close association with Marketing, consumer culture has been growing in terms of scientific dissemination and publication as an answer to an increasing fluidity within markets and the consumer himself. The rapid changes and liquidity that underline the current sociocultural structures and dynamics (see Bauman, 2000) require an increasingly in-depth analysis of consumers and their collectives (see

[10] The authors underline the importance of the market mediated cultural production of meaning within a symbolic world and the existing ways of life: "CCT explores the heterogeneous distribution of meanings and the multiplicity of overlapping cultural groupings that exist within the broader socio-historic frame of globalization and market capitalism. Thus, consumer culture denotes a social arrangement in which the relations between lived culture and social resources, and between meaningful ways of life and the symbolic and material resources on which they depend, are mediated through markets" (Arnould & Thompson, 2005, p. 869). In this sense, the cultural analysis of texts and trends offer methods for the generation of strategic insights.

Canniford, 2011 and Hawkins, 2018) in terms of managing representations, practices and artefacts that compose daily life; that help to articulate lifestyles; and that are an important instrument for urban tribes. Therefore, it is important not only to underline analytical instruments from other approaches but also to connect them in order to generate new results and insights[11]. This paper explores approaches within the Humanities and Social Studies in association with others, specifically at the level of Culture Studies, Arts and Ethnography. In order to comprehend emergent cultures in a complex society we use the concept of emergent outlined by Canevacci (1990) which means the cultural models, lifestyles and behavioural innovative techniques applied by groups which have growth potential to become mainstream at least in relation to their sociocultural referents. Thus, this conceptual paper maps a set of analytical practices that can generate interpretative data and insights on consumption practices both in the digital and the urban spaces. Following perspectives of sociocultural trends and consumer culture analysis, we problematize the concepts and practices behind the following methods: a) Textual Analysis; b) Walking as a research practice, following the perspective of Careri (2013) and others; c) Trends research and coolhunting, following the perspectives of Dragt (2017) among others. The connections between these three methods provide the foundation for a cultural analysis proposal of consumption that can generate insights about consumer behaviour, mindsets and emerging projects in the urban scape.

THE ANALYSIS OF CULTURE AND COMMUNICATION: INSIGHTS FOR CONSUMER BEHAVIOUR.

To understand different consumer groups is to see the unravelling of complex lifestyles structures within a sociocultural context of constant and growing change. Whether we are analysing a brand community (see Canniford, 2011 and Hawkins, 2018), or a consumer tribe (see Canniford, 2011), individuals articulate their identities and behaviours by means of their practices, representations and artefacts (see McCracken, 2007). The consumption and exhibition of such objects determines the emergence of specific patterns and generates processes of integration and exclusion from groups and specific associations. Brands explore this symbolic set of objects and associated practices, determining their meanings within communities. Cultural analysis of the macro/external sociocultural context generates insights that can be used in a strategic level. Here the analysis of sociocultural and consumer trends underlines behaviour patterns and the construction of meaning that can inform solutions for communication, product design and brand management. In the following pages we present specific methods that can be applied in this cultural and market(s) setting.

[11] Olsen (2004) and Donatella della Porta and Michael Keating (2008) suggest that Cultural Triangulation involves ways of combining practices and knowledge, combining data or methods that complement each other, usually getting two or three perspectives upon a topic or question under study (Olsen, 2004, p. 3-4; Porta and Keating, 2008, p. 34). Because of this, it is possible to articulate different methodological approaches and methods to retrieve deep cultural insights that can be applied.

Textual Analysis: Semiotics, Myths and Narratives.

Following the observations of Manuela Baptista (2009), textual analysis deals with texts[12] in an approach of stories and narratives that explain the world in a systematic fashion; as well as with a semiotic approach where the text is seen as a sign. Here, we look for ideologies and myths (Baptista, 2009). In this sense, the interpretative analysis of the textual object allows for the identification of the signs that compose it. This way, in considering the relation signifier-signified (see Saussure, 1999) that compose each sign, takes place the denotative perception (the more literal and delimited meaning of something) and the connotative one (the broader associations) (see Volli, 2003). In the second layer of signification (connotative), the creation of new meanings takes place, a new signified. Roland Barthes underlines the emergence of myths in a third layer (Barthes, 1972, p. 113), where the sign is emptied of its original meaning and receives a new one. These perspectives allow researchers to understand the construction of stories and the associations between signs to create meaningful narratives. We underline the importance of understanding the association of signs and the construction of meanings, which are used in sociocultural narratives, including corporate ones, and impact consumer behavior, acting also as a means to social articulation and processes of identification.

This textual analysis approach, within the methodology of cultural analysis, offers an important base for the study of consumer trends, informing on meanings that lay behind texts and narratives, objects and products/services, as well as "signifying practices" (see Hall, 1997, p. 8). With an interpretative nature, it adds a critical layer to other sociological, anthropological and ethnographic practices that we will review in the next topics. To review consumer behavior and its patterns, we must understand in depth the symbolic associations and meanings that are associated to its settings.

From Coolhunting to Trends Research

Analysing society and its processes is useful for better strategic articulations between products/services and objects in general, which are created by man in a "liquid" and changing society (see Bauman, 2000). To understand these changes, the role of Trend Studies, as an academic approach, has been important in the decoding of attitudes, mindsets and patterns to map new paths of strategic actions (see Vejlgaard, 2008; Higham, 2009; Dragt, 2017). Coolhunting as a practice for trends research is understood as a methodological approach for the analysis of society, social practices and consumer behaviour, as well as the objects that inhabit daily life, in order to locate hidden meanings that help to identify mindsets and trends (see Gomes et al., 2018).

Within this context, the emergence of the term 'coolhunting' is associated with the article The Coolhunt, published in 1997 in the New York Times, by Malcolm Gladwell, who proposed a definition for coolhunting as an action of research to analyse different and plural manifestations lost in society. However, as a practice within the scope of qualitative analysis and in terms of an ethnographic inspired research, the search for signs of changing mindsets (and consequently new trends) stems from the definition of

[12] Baptista provides a review that suggests textual approach as a reflection on several ways of interpreting objects (texts) in different perspectives as semiotics and as narratives that encompass myths. In this way, the text can be seen as a provider of meaning and as stories that communicate and try to explain the world in a systematic fashion (Baptista, 2009, p. 458).

the very concept of cool problematized by Gloor and Cooper (2007, p. 07) as something that contributes to the community and gives meaning to our lives. Carl Rohde (2011) also contributes to the definition, suggesting that three characteristics encompass the definition of cool: attractive, inspiring and with growth potential. Therefore, Gomes, Cohen and Flores (2018), articulating the perspectives of these and other authors, propose a parameterization of the concept and at the same time suggest a model to describe/analyse cool signals (Gomes, et al., 2018, p. 72-77). The aim is to observe the sociocultural landscape and to identify objects that correspond to the given observation, performing a descriptive discourse followed by an analysis that generates creative and strategic insights latent in each signal, according to their association to identified sociocultural trends (see Gomes et al., 2018; Dragt, 2017; Rohde, 2011). However, we should emphasize that the terminology itself has fallen into disuse due to its wrongful application in the recent years. Gomes, Cohen and Flores (2018) underline the need for crossing methods with the practices of coolhunting, flowing in parallel with the analysis of culture, where the collection of data across multiple areas lets you work in a multidisciplinary fashion. Understanding dynamic cultural backgrounds allows for the definition of new contexts for an analysis of culture with a strategic perspective.

Having approached coolhunting, it is pertinent to address trends research as a concept closely linked to a continuous cultural observation and social understanding that accompanies the development of trends. As Els Dragt suggests, this can be seen as “a method to identify and understand change in a structured way in order to be aware of possible directions of change. It can be applied to social, public and commercial challenges” (Dragt, 2017, p. 14).

In parallel, Martin Raymond (2010, p. 34) brings the notion of constant and profound analysis in the sociocultural aspects of society to justify the understanding of trends. The author reinforces the ideas that we also saw in Dragt (2017, p. 38-39), alerting to the needs for an active spirit, extremely attentive about the world in order to capture changes in mindsets. This perspective raises a need to use coolhunting as a tool for the observation of changes and to exam sociocultural trends. That seems to bring benefits to various fields, particularly in the observation of internal markets and in the development of innovation, an idea that we also see in Vejlgaard (2008). At the heart of trends research resides the process of continuous observation of sociocultural processes, structures, objects and practices that become relevant in light of a solid cultural analysis that informs about the vast and plural changes that affect the liquid societies we inhabit.

Walking and the Arts

As an emergent set of practices and concepts, based on Culture Studies perspectives, the analysis of (consumer) trends demands alternative methods for inquiry and data collection. Many authors discuss the topic of poetics and certain procedures based on arts that involve “walking” as a research method (Jenks & Neves, 2000; Careri, 2013; O'Rourke, 2013). We find that these artistic based perspectives can provide not only data, but a new way of embodied research regarding cultural dynamics.

We propose that walking can be understood not only as an artistic or aesthetic practice (Careri, 2013), but also as a way to describe a new methodological approach. In doing so, we underline four procedures: the baudelairian flâneurie, the dadaist visit, the surrealist deambulation and the situationist drifting (dérive) (see Careri, 2013, p. 71-90).

The flâneur character of the author Charles Baudelaire (1821-1867) represents the author's perception of the 19th century's shifts on tradition, aesthetics, the ideal of beauty, and the modern urban life. As Baudelaire describes, the flâneur is a passionate incognito observer who finds refuge in the crowd (Baudelaire, 1996). The flâneur distinguishes a new type of existence associated with modern ideals by walking and observing city life. Contemporary flâneur can lead researchers into new experiences and understandings. This is grounded in everyday life and "should be considered a narrative tool towards producing knowledge in a social environment" (Rizk & Birioukov, 2017, p. 3282).

Inspired by the baudelairian flâneur, the Dada movement carried out the first urban ready-made and the first aesthetic action on the reality of everyday life (Careri, 2013, p. 71-77). This action, constituted as a visit13, abandoned of futuristic utopias aiming to see the urban space as banal (see Careri, 2013). Throughout this practice, the dadaist visit creates the basis for the surrealists' research. In our study, the dada visit's perspective can add a notion of contrast and comparison between urban places and its sociocultural dynamics, based on the concepts of banal and cool14.

Differently from the dadaist visit, and as stated by Careri, the surrealist deambulation is not about visiting a specific place, but in letting one be carried away by abandonment, disorientation and hazard (Careri, 2013, p. 77-83). The surrealist city is seen as a producer of affections and relationships, an open space to hazard and wonder, which can be crossed by the mind to reveal an invisible reality (see Careri, 2013). Such a perspective opens room for the possibility to generate new narratives about the urban space and the gathered research data, which will be better examined in the situationist perspective. As described by the situationist Guy Debord (1958), the dérive is "a technique of rapid passage through varied ambiances. Dérive involve playful-constructive behaviour and awareness of psychogeographical effects and are thus quite different from the classic notions of journey or stroll" (Debord, 1958, n.p).

The dérive can involve the elaboration of perception maps. This technique is called psychogeography and consists in moving through a landscape collecting experiences and data (Hindley, Knowles, & Ruth, 2015). This information can be registered in multiple ways: photos, recordings, sketches, videos, among others and may conduct the development of visual or sensory maps15.

The use of these poetic(s) and methods can support coolhunting and other practices of ethnographic inspiration in the urban context. It can also provide interesting and creative data to work through emergent cultures (see Canevacci, 1990), in order to generate insights about consumer behaviour, mindsets, and emerging opportunities on the complex contemporary scenario.

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13 Careri (2013, p. 76-77) describes this visit as an anti-walk.

14 See the concept of cool in Rohde (2011).

15 These practices can be further reviewed (see Canevacci, 1993; Jenks & Neves, 2000; Suri, 2010; Hindley, Knowles & Ruth, 2015; Rizk & Birioukov, 2017) as an integrated approach for the unveiling of meanings, objects and processes that take place in the urban landscape, informing not only strategic insights, but also putting into context the data gathered in the other two approaches (textual analysis and coolhunting/trend analysis).

CONCLUSIONS

The articulation of the presented methods underlines an important contribution to an in-depth analysis of consumer trends. The connections of these methods contribute to the exploration of an analytical perspective of spaces and sociocultural patterns that serve as a basis for the identification of behaviour patterns. The insights resulting from the methods generate strategic paths that can contribute to the development of design, both in an initial planning phase and in the development of products/services, that is, triangulation allows for the generation of insights that facilitate better design applications. With regard to consumption and cultural analysis, it is understood that there is a clear connection between both in a social perspective, since behaviours in society determine and contribute to the development of lifestyles. In this way, cultural analysis presents itself as a tool to understand the habits of audiences. It is still relevant to add that mapping culture is essential for the analysis of sociocultural and consumer trends. Through cultural analysis, we perceive behaviour consumer culture as a terrain of meanings that is important to situate sociocultural objects. For that reason, further empirical research in this topic is recommended, as well as a review of other methods.

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Satanik – woman antihero

Magnus & Bunker´s fumetti and gender issues

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ABSTRACT

The paper will focus on the analysis of female characters in the art of famous Italian duo of artists Magnus & Bunker that reflected the cultural freedom and loosening of moral grip of the Catholic Church. The aim is to study the concept of women representation in Italian adult comic books of the era with attention to different aspects of their visual and narrative presence and with the support of feminist and psychoanalytic issues to offer a new insight into the portrayal of women. As the object of study, will be used female antihero Satanik, a character created by Magnus & Bunker in 1964. Satanik is distinguished from the others of the genre by the massive presence of horror and erotic tones. Running for 10 years it ended in 1974 with 231 issue. The study will include the following selection of books from the series: N1 “La legge del Male” (literally The law of harm), N185 “Le Origini di Satanik” (The origins of Satanik), N47 “Il Faro del Golfo Nero” (The Farol of Black Gulf) and N62 “La vita sbagliata di Mae Wildt” (Wrong life of Mae Wildt). These books are not randomly selected but there´s a connection between them in terms of narrative. The character of Satanik will be analysed in terms of her role as a mirror of society and judged in sexual and non-sexual context. The analysis will be narrowed to the artist´s narrative and graphic approach to women representation and explore whether Satanik represents a reflection of her author´s fantasies, created for pleasure of male audience, or she can be seen as liberated empowered figure, a Beautiful lady without mercy”16 and a nemesis against men and society. Furthermore, it is argued that this power was transmitted to actual women readers and their empowerment have influence on today's visual communication.

Keywords: Magnus & Bunker, fumetti neri, women representation, feminism, comic books

[16] Belle Dame Sans Mercy - is a ballad produced by the English poet John Keats in 1819. he poem is about a fairy who condemns a knight to an unpleasant fate after she seduces him with her eyes and singing. The poem continues to be referenced in many works of literature, music, art, and film.

INTRODUCTION

Roberto Raviola (also known under the pseudonym Magnus)17 and Max Bunker (known under pen-name of Luciano Secchi)18 are two of the most famous and influential figures of the Italian comic-book genre, that emerged in the mid-sixties and became known as the fumetti neri (the black comics). Young and adventurous, they took inspiration from classic literature, mixing Robert Louis Stevenson with Oscar Wilde, Howard Phillips Lovecraft and Edgar Allan Poe. As comics historian Castaldi says, their works were "the most important link between the comics of the '60s and those of the post-'77 era" (2009, p. 36). The creative duo simply known as Magnus & Bunker is considered one of the most controversial of the decade of fumetti neri. The artists realised the potentials behind Diabolik and what they could add to it, so they added more grotesque, horror, eroticism, sex and violence. Bunker, the writer, came up with great creative ideas which Magnus, an original, innovative artist with a peculiar, sharp style, managed to expand and visualize. Anthony Logan/ Kriminal and Marny Bannister/ Satanik were often censored because of the violence and sex scenes they featured. Ruthless, cold-blooded antiheroes, that kill and seduce, as if it was the most natural thing in the world, they became a symbol of dissolution of traditional values, sending a moralistic and prudish Italian society into a kind of nervous agitation.

Released in 1964 "Satanik" was a second creation of the duo and is considered even more significant for the history of Italian comics than her twin-brother "Kriminal", because the main character of the story is an evil woman antihero. A stunning heartless killer Satanik is according to Roberto Curti (2015, p. 6) an evolution of the Beautiful lady without mercy of literature and opera. Satanik can be distinguished from others of its kind by the massive presence of supernatural and horror elements. The comic book, in black and white small pocket size format, was published for ten years, surrounded by many controversies, and ended in 1974. It had several problems with censorship, was reprinted various times, and is still considered a classic. Satanik was named Demoniak in France, in order to avoid confusion with Killing, which had been translated in French as Satanik.

I. A GREAT PAINTER DID IT

Roberto Raviola, better known as Magnus, was born in Bologna, Italy, on May 31st, 1939. The pseudonym was ironically derived from the Latin expression "Magnus Pictor Fecit" ("A Great Painter Did It"). After graduating from high school he then enrolled in a scenography course at the Academy of Fine Arts of Bologna in 1961. He started out as an illustrator before switching to comics in 1964 when he was invited to start working with Milanese writer Luciano Secchi a.k.a. Max Bunker. Together they produced very successful series "Kriminal" and "Satanik" in 1964, Dennis Cobb in 1966, inspired by Ian Fleming's 007 and in 1966 Gesebel, inspired by Barbarella of Jean Claude Forest, and "Alan Ford" in 1969. As a result, the duo became a mainstay of Italian comics throughout the '60s.

Magnus revolutionized his stories on a visual level, by using an innovative approach: a beautifully rendered black and white comic strip to recreate different atmospheres.

[17] Max Bunker, aka Luciano Secchi (born August 24, 1939)

[18] Roberto Raviola aka Magnus (1939-1996)

Master in his craft, an inspiring and imaginative character-creator and world-builder, he also had a very distinctive style of inking. As Pietro Favari (1996, p. 107) says, his drawing technique takes his negative heroes to a higher level of stylistic quality quite unusual for the time. The striking contrast between black and white and ability of employing screen printing and crosshatching make him a real master of the fumetto art. The author goes beyond stereotypical erotic representations. Magnus pays attention to details and particulars, gives rhythm to the story, increasing its expressive strength with brilliant use of blacks and silhouettes. The rigid 2-panel-per-page format (printed as small, pocket-size paperbacks) had the effect of a productive creative restraint on their composition and story-telling. He creates some interesting layouts, with the use of negative space and feathered inking, that, further inspired Charles Burnes19 (Fig.1). Moreover, Roy Lichtenstein20, who´s paintings are considered iconic examples of the Pop-art movement of the 20th century appropriated the techniques and styles of fumetti neri using them in his captivating compositions. The artistic quality of Magnus´s graphic stories are quickly recognizable. Magnus designed only the black silhouette for the main character and introduced film-shot-like vignettes, which gave life to a new way of designing comics.

Figure 1
A collage made by me: on the left a page from "Satanik" by Magnus, on the right a page from "dark Hole" by Charles Burnes.

Magnus´s beautiful creation Satanik, that took advantage of her sex appeal to conduct her crimes was quite innovative for her times and is still a symbol of women's sexual power and provides inspirations for fashion designers (Fig.2). Canadian designer Kat Marks, whose collections quite often revolve around the theme of empowerment, with exaggerated shapes and hint fashion and sexuality, created some pieces that evoke in their colours, shapes and materials Satanik's costume. Tomas Maier's at "Bottega Veneta" reinterpreted the themes of empowerment in his own original way in the Fall/Winter 2010 collection.

[19] Charles Burns (born September 27, 1955) is an American cartoonist and illustrator and one of the most notorious authors of horror comics.

[20] Roy Lichtenstein – (October 27, 1923 – September 29, 1997) was an American pop artist. During the 1960s, he became a leading figure in the new art movement. His work defined the premise of pop art through parody.[2] Inspired by the comic strip.

Figure 2
On the left: a dress by Tomas Maer, On the right: Kat Marks design pieces.

During his lifetime, artist´s work was published in the most respected, cutting-edge, adult-oriented comics magazines of the day, including Heavy Metal, Totem, and Frigidaire. He gave himself freedom to experiment different genres from noir to comic and from eroticism to sci-fi and western. His effortless use of clear line, blend of eroticism and attention to details, long-legged stunning women in suspenders and lingerie caused a lot of problems to the medium of fumetto, but, nevertheless, regarded as an essential milestone in the context of adult comics in Italy. In 2015, a prestigious literary publisher "Mondadori comics" reprinted the complete series designed by duo Magnus& Bunker and then Romanini[21] and Peruccia, after the duo left their work on the strip. The reprint edition includes 14 issues in chronological order.

II. FUMETTI NERI

Fumetti, officially appeared in Italy in 1908, with a creation of Corriere dei Piccoli (Children´s Newspaper) and were exclusively seen as a pedagogical tool and were very much censored. Corriere dei Piccoli shortly named "Corrierino" introduced American comics to an Italian audience. With a great impact of American culture on Italian comics creators, the first modern female character, a Tarzan-like Pantera Bionda (The Blond Panther) was introduced to Italian audience. Created by Gian Giacomo Dalmassio and Enzo Magni (under pen name Ingam) in 1948, she was inspired by American jungle queen Sheena[22]. The comic book immediately gained huge success and according to Laterza and Vinella (1980, p. 135) was the first female character in Italy that made her way through self-affirmative sexuality. A major reason of the great success was her costume – a leopard skin-top and a tiny bikini. The Blond Panther was a sort of jungle pin-up with gorgeous body, trained to perfection – aggressive and absolutely independent. She swang through the jungle, with the agility of Tarzan and was also a highly skilled horse rider and an archer viciously confronting tropical dangers.

According to Franco Fossati, cited by Guzzetta and Zaghini (2009, p. 60), despite the presence of her partner, a handsome American explorer Ted (or Fred in some versions) she didn´t need any protection from men but found it useful to have a lover and admirer. Together they had numerous adventures full of action and violence and fought against Japaneese troops and other different sorts of criminals. Her extremely brief

[21] Giovanni Romanini (1945, Bologna) Italian illustrator famous for his collaborations with artists like Magnus& BUnker

[22] Sheena, created by Will Eisner, was the first female comic book character to have her own series which debuted in spring 1942, preceding Wonder Woman which came out in summer the same year.

costumes and self-affirmative use of sexuality caused increasing pressure from the conservative Italian establishment and Catholic Church. The publishers of the Blond Panther were subsequently dragged into court and forced to suspend publications. After eight month of life the heroine was legally required to wear more clothing. Her little skirt was eventually stretched to cover her below the knees, and her bra expanded to conceal her shoulders and torso. The Blond Panther can be considered not only the first real heroine of Italian comics but a pioneer of the genre that will explode in the 1960s and also a proto-feminist whose sexuality was a positive source of empowerment. The Blond Panther was too emancipated for the moralistic and prudish Italian society. She didn´t frighten the authorities with her nudity but with her total liberation and inability to accept a subordinate role in a male world. The idea that women might be strong fearless fighters who were not submissive to men, but equal, was a disturbing thought for the traditional male-dominated society, and this attitude was not limited to Italy. Sheena, her predecessor in America, was also accused of fostering sexism, violence and providing young readers with over-sexualized role models. The Blond Panther gave only the start of new era when men and women began to examine their roles and to question whether they might need to make a few adjustments in their thinking. In this regard, Carla Lonzi (1974, p. 3) points out, "What is meant by woman's equality is usually her right to share in the exercise of power within society, once it is accepted that she is possessed of the same abilities as man.[...] Existing as a woman does not imply participation in male power, but calls into question the very concept of power."

Emerged as a reaction to the economic boom and focused exclusively on male protagonists, "sexy violent antiheroes", adult comics, better known as fumetti neri (the black comics) became all the rage in Italy of the 1960s. According to Encyclopedia of Contemporary Italian culture, the phenomenon of fumetti neri, was spontaneous and responded to the public's expectations and changes in taste (Moliterno, 2003, p. 178). The first comic book "Diabolik", labelled "for adults only", created by sisters Angela and Luciana Guissani came out in 1962, introducing a new genre and a new format (128 pocket-sized pages, two panels per page, with a complete story) and giving birth to the fumetti neri phenomenon. The comic strip rapidly became a hit because it suited the mood of the times and tapped into many people's deepest, most selfish fantasies. In Italy, where sexual matters were considered taboo, morals were changing and censorship loosening, hence, this was a perfect moment for a new trend.

Diabolik was a super-criminal in many ways opposite to an American superhero, with trendy evocative outfits and gadgets, gorgeous partner and insatiable desire for money and sex. His partner in love and crime, Eva Kant, first appeared in the shadow of "King of Crime", but with time evolved into one of the most famous female comics characters in Italy and a symbol of the emancipated woman in Italy. The pioneering example of Diabolik still retains a large popularity and continues to be published even today. Diabolik became an irresistible temptation for Italian readers, battling against censorship and moralistic repression and made possible everything that was forbidden in comics: from explicit violence, to radical political ideas. Roberto Curti (2016, p. 16) calls fumetti neri a "key moment" in the evolution of sexual matters and points out, that "comics existed in a universe totally of their own, where anything could happen, and readers could project all kinds of fantasies, with even ampler freedom than films would allow."

Inspired by Diabolik, the industry of the medium produced an endless series of it's imitations. Cheaply printed and barely edited, they flooded the market, copying the format and featuring masked anti-heroes as main characters. The stories mostly involved murders, robbery, sex, horror and other hinted forbidden content. Many of them had quite bizarre names like Fantax, Demoniak, Sadik, to mention just a few with the inevitable "K" in the names as an instant reference with the genre. Other successful fumetti neri and the most significant ones among many Diabolik follow-ups, were skeleton-masked "Kriminal" and the sexy evil "Satanik", both created in 1964 by Magnus & Bunker for Milan publisher Andrea Corno.

Their stories were innovative and far more violent and sexually explicit than those of their predecessor and broke the boundaries that Diabolik did not dare. Issued in small pocket-size and a two-panel page grid they were dominated by robbery, corruption, murder and sex, along with Magnus´s expressive style and characteristic heavy blacks and thick lines. They employed more elaborate graphic style and introduced many innovations in the Italian comics landscape and, according to Castaldi (2009, p. 36), were "the most important link between the comics of the '60s and those of the post-'77 era". The duo destroyed traditional values adding to their story grotesque and black humour and exploring the boundaries between horror and satire. Curti (2016, p. 49) says, that they displayed a cynical attitude that concealed a social commentary on an increasingly hollow and empty society founded on greed and moneymaking – where there were no moral values to be found. "Kriminal" and "Satanik" come out as an interesting contrast to "Diabolik" that took the use of sex and violence to an entirely different level. Both "Kriminal" and "Satanik" featured violence, crime and sex, but Satanik was considered as more dangerous representing everything that society wanted to repress, especially women's sexual power.

The year 1965 marked the beginning of a violent campaign against adult comics. Fumetti were accused of corrupting the youth and blamed of negative morals they heralded not to mention daring erotic content. Due to the violence and the explicit erotic scenes in the comic books, Bunker and Raviola had problems with Italian censorship. Bunker was prosecuted several times, but never condemned. The panels depicting semi-nude women were often censored even by the publisher. At the same time, according to Encyclopaedia of Italian Literary Studies (Marrone & Puppa, 2006, p. 789) the medium was recognised as a mainstream cultural expression.

III. SATANIK –WOMAN ANTIHERO

Debuted in December 1964, following the success of "Diabolik", "Satanik" was a second fumetto nero character, created by Magnus and Bunker. Marnie / Satanik took her name from the heroine of the psychological thriller film by the same name, directed by Alfred Hitchcock and released the same year. Satanik caused a big fuss when it came out and, somehow it is more important for the history of Italian comics than the "Kriminal" because it features an evil woman antihero breaking a gender boundary in the male dominated comics industry. The story can be distinguished from others of its kind by the massive presence of supernatural and horror elements. The protagonist of Satanik was Marnie Bannister, a middle aged scientist, whose face is marked by an unpleasant angioma. The third daughter of an alcoholic and a narrow-minded housewife, she lives with her parents and two beautiful sisters Dolly and Lydia, who continuously humiliate her because of her unpleasant appearance. One day, sick of the abuse and filled with

rage against the world, Marnie invents a serum following a theory of a mad alchemist Masopust for whom she works as an assistant. After drinking the serum and going through a painful transformation, Marnie is turned into a cruel, sensual seductress Satanik with neither morals nor sexual inhibitions. Naturally, her repressed anger transforms into an open revenge turns into a criminally insane woman and an unstoppable symbol of women's sexual power and might even seem a radical feminist. Here, it is important to examine the role of women in Italian culture of the era from a feminist perspective.

In Italy, as patriarchal country dominated by moralistic values of Catholic Church women were seen as inferior to men and a female body was seen as the object of the male gaze. The 1960s were years of profound change, social and Cultural Revolution, that has had an indelible effect on the art in general and comics industry in particular. If before the 1960s female figures in comics were quite scarce now they started becoming more prominent in this male dominated field. In fact, the world of comics has been often accused of sexism. Fumetti with a centralized figure of a woman came up as a reflection of culture and a reaction to radical changes the country was experiencing. As Natasha Walter (2011, p. 5), a British feminist writer, posits, this highly sexualized culture is often positively celebrated as a sign of women's liberation and empowerment. Depicted in her contextual and visual extreme Satanik had her own reasons for existing, beyond simply providing another sexy character for the pleasure of male viewer. As French philosopher and existentialist Simone de Beauvoir in "Second Sex" explains, that woman is always the "other" because the male is the "seer": he is the subject and she the object – the meaning of what it is to be a woman is given by men. De Beauvoir claims, that "for the woman there is, from the start, a conflict between her autonomous existence and her "beingother"; she is taught that to please, must make herself object; she must therefore renounce her autonomy. She is treated like a living doll, and freedom is denied her; thus a vicious circle is closed; for the less she exercises her freedom to understand, grasp, and discover the world around her, the less she will find its resources, and the less she will dare to affirm herself as subject (2011, p. 342)."

Andi Zeisler in her book "Feminism and Pop-culture" focuses on women and explains how the pop culture effects the way women see themselves and engage with visual media. She explains the often-cited feminist term "the male gaze", by citing Berger's "Ways of Seeing": "Men act and women appear. Men look at women. Women watch themselves being looked at. This determines not only most relations between men and women but also the relation of women to themselves. The surveyor of women in herself is male: the surveyed female. Thus she turns herself into an object—and most particularly an object of vision: a sight" (1972, p. 47). Further, she outlines Laura Mulvey's (1975, p. 835) "Visual Pleasure and Narrative Cinema" idea of female "to-be-looked-at-ness". Woman is "spectacle", and man is "the bearer of the look". According to Zeisler the male gaze is the idea that when we look at images onscreen, we're seeing them the way men do - even if we are women (this is what Mulvey didn´t suggest - because those images are constructed to be seen by men. "Without pop culture's limited images of women, many actual women in the real world might not have been inspired to fight for more and better representations of themselves (2008, p. 8).

Roberto Curti (2016, p. 119) compares Satanik, despised by her mother and two older sisters, to Cinderella, a beauty ideal that is shown to young girls. Cinderella is

submissive and quiet and her external beauty is synonymous with her moral purity. On the contrary to Cinderella Marny/Satanik is not a beauty myth23. She is not supported by society but rejected by the whole world, including her entire family. Her heart is not filled with love and purity but with anger and revenge. Though, the beauty serum is an update of the Fairy Godmother´s magic spell, which also looses it´s effects in the most inappropriate moments. It also has an unexpected side effect, making her a murderous criminal mastermind. In fact, Satanik is a sort of female version Dr. Jekyll and Mister Hyde, with two alter egos that hide beneath the surface her real desires that remain unspoken. She is the modern example of personification of the dichotomy between outward gentility and inward lust. This dark side of her personality was not active, before she drank a beauty serum. Famed psychoanalyst Sigmund Freud (1920, p. 37) called it repression. He believed that, humans repress some frightening or painful events and desires from their conscious minds, which are then banished to the unconscious mind. Those thoughts are not gone, however, but remain to affect the thoughts and actions of the conscious mind. In Freudian theory, a Jekyll and Hyde situation in real life creates a dual personality in one person. Sometimes that person seems more like the good Dr. Jekyll, but at certain times, the evil Mr. Hyde emerges.

"La Rossa del Diavolo", or literally Diabolik Red gained her nickname because of her red hair and cruel violent character. Satanik frightened the readers because her insatiable desire for money, men, power, sex and success, but, at the same time, she also attracted them "by her anarchic and violent rebelliousness" (Moliterno, 2003, p. 745). Complex and fascinating character she is condemned to solitude because of her duality. According to Guzzetta and Zaghini (2009, p. 99), despite character´s cruelty [...], she is a heroine, frustrated by unhappiness and loneliness, seeking for approval and acceptance: one should consider that Marnie tries to gain respect from people around her by working hard (at the beginning she is a talented researcher), but she soon realises that her ugly appearance prevent her from finding a man and being successful. In good or bad she is always alone and lonely, because she is rejected by the whole world, and then, she doesn´t love herself and has a great lack of self- acceptance. The readers understand, that behind her seductive appearance there´s an ugly truth and her real nature hides hatred against the world but still fall victims of her charm. It is not by chance, that Magnus represents men as week figures opposite to women that consider them inferior and treat them as their servants and instruments for getting pleasure (Ibid, p. 90). The story is told from Marnie´s point of view, hence all the male figures appear to be plain and often hypocritical. They openly show their disgust in towards her unpleasant appearance and get to desire her when she turns into a young beautiful lady. Often, those who fall victims of her hate are the transgressors from her past.

CONCLUSION

Comic books as a cultural product of mass consumption, or, in other words, a product of popular culture, grew from low culture and can be seen as a mirror of society they emerged from and contributed to it´s formation. They can´t be dismissed only as a medium of amusement and entertainment but as a force that creates mass consciousness. Italian fumetti created in a period of an extraordinary social, cultural and economic change should be seen and understood from the lens of the popular

[23] Term by Naomy Wolf

culture as a shorthand to what happened at the time and how it was seen and experienced.

A revolutionary female character Satanik created by artistic duo Magnus & Bunker appeared in a male dominated world of comics as an example of pioneering, progressive approach to female representation. A heartless killer and an unstoppable symbol of women's sexual power, she embodies every man's erotic dream and makes a social statement resonating not only with men and women of her time but also with people of later generations that saw her as a liberated figure, breaking down the gender-norms and ideologies. Female readers, especially the ones who don´t see themselves as fitting the canons of beauty myth set by society, can consider Satanik as a liberated and empowered woman, fighting for her rights against oppressive society. Satanik is concerned with freedom and what it means to be free confronting the hypocritical world, that judges women only by appearance, oppresses them by characterizing as incomplete – "the Other". With her defiance attitude she declares about her existence and proves that she is haunted by a sense of her femininity. Even now, after 50 years from her creation, her figure remains contemporary and continues to inspire and fuel women and feminism.

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The Blue Horse of Almada Negreiros:

The transformation of the Futurist ideals into an act of resistance to Estado-Novo censorship

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ABSTRACT

Essay on the early years of Portuguese Modernism, namely the vanguard Futurism. Focus on the relations of power and ideological influences of Almada Negreiros and António Ferro in the 1930s and how they transformed their own Futurist concepts into reality in the Portuguese fascist regime of Estado-Novo, a political regime inspired by Italian fascism that already incorporated some of the ideals of Futurism. In the Estado-Novo, mechanisms of state control were created that controlled cultural and artistic life and later also assumed the reins of censorship in social media. In the context of censorship, a mural of Almada Negreiros in the building of the newspaper Diário de Notícias is presented and is proposed the hypothesis of a hidden message in the artwork that can be interpreted as an act of resistance of Almada to the censorship.

Keywords: Almada Negreiros, António Ferro, Futurism, Modernism, Mural Painting,

INTRODUCTION

Almada Negreiros and António Ferro are two major Portuguese figures who, in their youth, where friends that shared the same modernist ideals based on an artistic vanguard movement, the Italian Futurism (1909). In 1915 they collaborated with the first Portuguese modernist magazine, Orpheu, that socked the cultural establishment. However, in the 1930s, they clash in the transformation of the Futurist utopia into reality and become rivals. Thus, the same idealism turns Ferro into an active fascist politician and the artist Almada into an activist, resistant to the regime policy.

In the same decade was created the political regime Estado-Novo, to whom Ferro had a major contribute namely with a propaganda strategy and the creation of authoritarian mechanisms, with focus on state control of cultural and artistic life and censorship of media organs.

In the context of the censorship that all the media and artists suffered in Estado-Novo, a brief analysis of an Almada mural existing in the building of the newspaper Diário de

Notícias is presented – this artwork is practically unknown to the public and is few times referred by the art specialists. A hypothesis is proposed for the mural as being a veiled resistance of Almada to the censorship organs managed by António Ferro.

THE TRANSFORMATION OF FUTURISM IDEALS

The Futurist Almada Negreiros

José Sobral de Almada Negreiros (1893-1970) was a multidisciplinary artist who left a vast work in painting, drawing, theater, dance, romance, short stories, conferences, essays, illustrated manuscripts, poetry, graphic narrative, mural painting and graphic arts, whose production extended over more than half a century. In his youth, and as all modernist aspiring artists did, he left for Paris in 1919 and stayed for a year and a half. But because he had scarce resources – for his livelihood in Paris, he danced at night and was a factory worker at day – he ended up not getting close to the artistic milieu.

His career was formed in the political context of the Estado-Novo (1933-1974) in which Portugal was a dictatorship under the aegis of the dictator Oliveira Salazar (1889-1970), based on the propaganda, censorship and repression (de Sousa, 2009).

The Estado-Novo was inspired by other authoritarian and nationalist European political regimes of the time, in particular the Italian of Mussolini – in the 1930s, the aesthetic avant-garde Futurism launched in Italy by Marinetti had already been adopted by Italian fascism (Torgal, 2017). Futurism had an aesthetic and political ideology, rejected bourgeois moralism, exalted the machine, the technology and the speed – but also had a rhetoric of a political vigorous authority, exalted the war and the necessary violence for the creation of a new society (Humphreys, 2006).

Although self-taught, Almada was a multidisciplinary artist and figurehead of Portuguese Modernism and in the first quarter of the 20th century was representative of the Futurist vanguard – he usually presented himself as Futurist et all. His personality had a restless and irreverent youth that challenged the conventions and statism of the Portuguese cultural and artistic milieu. After the 40's, he matured and his diversified work turns him into nowadays a recognized artist even by the general public: a recent exhibition of his work at the Calouste Gulbenkian Foundation (LUSA, 2017), received about 135 thousand visitors and in the last weekend, the exhibition was visited by over seven thousand people who formed long waiting lines to see his works.

A Futurist vision for Portuguese culture and arts

After five years in Spain, Almada returns to Portugal in 1932 and brings in the baggage an artistic and political ideology that he refined in the Spanish intellectual circles and against the figure of the Portuguese State as protector of the arts, the Single Direction: "The Single Direction (...) should be Unanimous Direction - in a concept that he [Almada] will later claim in 1935, affirming it as the direction of art itself, in full independence from patronage, official or otherwise." (França, 1995)

In 1933, the government created the SPN - Secretariat of National Propaganda, an institution that will be responsible for the control of culture and national propaganda that had a cultural policy strategy subordinate to the will of the regime (Barreto, 2010), the Política do Espírito (Policy of the Spirit).

As responsible for the recent SPN was António Joaquim Tavares Ferro (1895-1956), a former modernist Futurist comrade of Almada. Ferro has always been linked to cultural

and artistic media: he was a journalist, writer and the editor of the first modernist magazine Orpheu (1915), a magazine that outraged the cultural establishment and where Almada collaborated among other artists – the Modernism in Portugal was taking his first steps.

The rise of Ferro to politics stems from a skilled management of his career as a journalist, with a collection of interviews with European dictators that began in 1927. In this collection called Journey Around Dictatorships (Vrbata, 2004), Ferro interviewed public figures and politicians, such as Primo De Rivera, Adolf Hitler and Benito Mussolini (three times), of whom Ferro considered himself a disciple and who at the time had already embodied the Futurist ideals in his political regime.

This course allowed him access to the Portuguese dictator Salazar who Ferro interviewed in the end of 1932, the same year that Almada returns to Portugal. It was after the personal interview that Salazar named Ferro as the head of is censor mechanism, the SPN, with a mission: "Be truthful, defend the essential, protect the Spirit." (Salazar apud Damasceno, 2010)

The Policy of the Spirit that Ferro will develop consists of the "material defense of intelligence, literature and art, of all spiritual manifestations that free us from realism (...) that facilitate us to evade our daily lives, as opposed to the politics of matter." (Ferro apud Damasceno, 2010).

A Futurist clash with Marinetti in Portugal

Almada and Ferro, the two former Futurists comrades-in-arms, clashed with the coming of the Futurism Italian father to Portugal, Marinetti, for a conference at the National Society of Fine Arts in Lisbon. About the conference, organized and sponsored by the Portuguese State through Ferro, a revolted Almada will write in the newspaper Diário de Lisboa:

> In truth, for the Portuguese Futurists, (...) what Marinetti brought before them to the Fine Arts is twenty-three years old and one day, no more and no less (...) The three most categorized enemies of Futurism in Portugal, Dr. Júlio Dantas, Adães Bermudes and the journalist António Ferro were the three chosen masters (...) to carry the futurist chief piggyback before the Portuguese. Bravo to the enemies of Futurism! The "Policy of the Spirit" is the oldest interest of all new artists in Portugal and can in no way be subordinated to the worldly skills and caprices of Mr. Ferro's all-important program! (Negreiros, 1932)

The Art under the State control

Ever since his youth, Almada has always been outraged by the state of Portuguese society, both with intellectual misogyny in culture and arts and with the poverty and illiteracy of the most disadvantaged classes. In his disappointment he will say one day (França, 2003): "The buildings of the State are multiplying, but the walls are as naked as their walls, like an open book with no history for the people to read and fix". This background of Futurist utopia reveals itself with greater maturity in conferences, writings and artistic interventions, where he now more pragmatically appeals for a new vision for the nation and, above all, the independence of art and media (Judice, 2013).

After his creation in 1932, with the SPN under the control of Ferro, the State become patrons of the art and will control the cultural and artistic milieu. Around 1935, private

art orders are so few – and also supervised by the SPN – that artists, for the most part, agree with the political regime to have access to the enormous amount of orders for public works and State projects.

Some years before, in 1925, the famous coffee shop Brasileira do Chiado commissioned decorative panels to Almada, and they specifically required that Almada represents himself seated in a group around one of the tables of the coffee, because he was already a renowned artist. Seven years later, after his return to Portugal under Ferro's Policy of the Spirit, Almada had no projects or orders, so he had great financial difficulties. By this time, the employees of Brasileira do Chiado often offered him meals because he did not have the money to pay them.

The governmental control of the artistic activity consolidates itself through the contracts for the works of the State: "Mr. Duarte Pacheco [Minister of Public Works of the regime], who knew Almada Negreiros from high school, invited him to make the murals for the Gares of Alcântara, albeit poorly paid. The Minister asked Almada to be patient for this fact [promising him more works in the future], but his successor did not like Almada's painting and therefore thought it reasonable that the State should stop considering it in his future orders." (Rosmaninho, 2007)

Despite the radicalism of his Futurist rib, Almada was an ashamed admirer of the dictator Salazar, who in turn never had great respect for Almada (Dacosta, 2010): the dictator never forgot the irreverence of the youth of Almada nor the scandal of the magazine Orpheu. Later on, in 1940's, Almada became increasingly committed "to the institutions of Salazar's power and was one of the artists that had more works during the Estado-Novo" (Castanheira, 2015).

In the same decade, 1935, the SPN created by Ferro formally assumes also the coordination of censorship of the press and entertainment. As Salazar said at the time, (Caldeira, 2008), "the forced, necessary abolition of certain freedoms and certain human rights must be crowned with joy, enthusiasm and faith".

The Media under the State control

At the beginning of 1921 in Lisbon there was a huge strike in the newspapers that included journalists, typographers and distributors and led to the suspension of the most important newspapers for about four months. In the aftermath of this strike, the newspapers of the Portuguese capital became extreme and aggressive, seeking to exercise a more independent social intervention (Matos, 2018). This extreme rail journalism leads the government to gradually take control of the media.

In 1926 a new regime of censorship appeared printed in the pages of the newspapers with the title The new regime of the Press, restricting the autonomy of the social communication. In fact, since the previous period of the Liberal revolutions that freedom of the press was more or less volatile and it was in 1916, with the First World War, that censorship was established as a necessity to defend the interests of the nation (Ribeiro, 2015). But it was from 1926 that the Preliminary Censorship was assumed and all the newspapers were inscribed: This number was endorsed by the Committee of Censorship, a process that lasted until the Carnation Revolution in 1974 that implemented the Democracy in Portugal.

In this censorship clearly and publicly assumed – although the public would remain unaware of the quantity of news that was being suppressed – no news or publicity could

come to the world through the newspapers without the Preliminary Censorship. As the dictator Salazar said at the time, "politically, there is only what the public knows that exists" (Salazar apud Caldeira, 2008).

Almada and the Newspaper Diário de Notícias

In the 1940s, Diário de Noticias was undoubtedly the most important newspaper, with half of the total Portuguese print media – around 300,000 daily copies, where the second best had less than 50,000 copies (Ribeiro, 2015). Almada collaborated with several newspapers and in particular with Diário de Notícias since his youth, with articles and studies from 1919 to 1924 and later, after 1939, already in the Estado-Novo regime. In the space of the new headquarters inaugurated in 1940, Almada also carried out several public events and conferences.

The new building was the work of the architect Pardal Monteiro (1897-1957) with whom Almada collaborated several times, an innovative project that in the same year won the Valmor architecture prize. The project was built from scratch to house not only the newspaper's journalists and workers but also the entire production chain including the giant printing presses occupying two underground floors.

To Almada was commissioned the decoration of the ground floor, areas that regular people could visit and see and “the murals of Almada were always the pieces of great interest in the public reception hall at the main entrance, which dominate the whole area and formed the backdrop behind the large balcony that stretched along the vast space” (Paraschiv, 2016).

The works commissioned were four and without briefing, which highlights the confidence in the creativity and aesthetics of Almada, and ended up being: (i) a mural in the entrance hall with Renaissance aspect and, in the annexed hall, (ii) two murals of great size, one with allegories in cartographic style referring to the period of the Portuguese discoveries and another with allegories to Portugal with their professions, costumes and cultures, and finally, (iii) two friezes at more than seven meters high that refer to a sequential and narrative allegory of the journal's production chain.

The Mural inspired by Camões

We will focus only in the existing mural on the access hall, without name, that has an inscription from the Portuguese poetic epic Lusíadas (1572) from Luiz Vaz de Camões: Quem não sabe arte não-na estima (Who does not know of art does not esteem it).

***Mural “Quem não sabe Arte não na estima”* – 388x188 cm.**
(copyright Rui Coutinho)

For the analysis of the work we used the principles of the Panofsky Method of Iconology without however being guided by its formal descriptive rigor given the compulsory limits of this document, but without loss of objectivity. As so, we present a resumed approach to the work and the supported deductions. The existing literature on the artwork is scarce and only José-Augusto França gives it a more consistent attention, describing it as follows (França, 1986):

> The mural painted in the lobby, an allegory to the Press treated less directly and within a formal tradition that lies in the Italian *Quattrocento*. Almost for the first time, he looks over a formal past for which the investigated technique [mural painting] pushes him. A background of a red-gray wall with two classic back arcs, imposes a figure of woman sitting and writing, and at her feet, a naked child plays with a press. In the opening of the symmetrically arranged arches, two knights enrich the composition (...) Two naked men hold the horses, one forcing the bridle, the other ready to ride, feet already on the stirrup and one hand raised. The horse is mottled and entangled. Attached to the rump a drum, and to the back of the rider a tuba: they will be the news to spread by the world.

In short, J-Augusto França gives a brief analysis of the protagonists and a direct relation between meaning and signifier. Fit the style in a fourteenth-century universe that Almada studied to conclude that it is an Allegory to the Press.

It is possible to create a narrative sequence in three phases in this allegory: (i) the left rider – stripped of symbolic codes – has just arrived and delivers Information and both the movement and the gaze converge to the central figures. (ii) In the centre, the female figure writes the information on a physical medium. Because of its greater size and because it is flanked by two branches of olive tree that represents Wisdom, it is perceived that it is the Press. The innocent child who plays with a press in his lap and under his protection represents the Production of News, which is either pure and undefiled, or exempt - hence it has to be protected by the maternal figure of the Press. (iii) On the right side, the information received is now News contained in the parchment that the knight holds in the left hand. The knight carries two instruments of communication: the drum which, in the Middle Ages, could be used to draw attention to the royal edicts or events in a public square and another instrument, a natural horn – not a tuba as França has mentioned since it has no pistons for sound modulation – an archetype of alert, information and warning.

In conclusion, we consider that Almada represented an allegory to the Social Communication and not only to the Press as mentioned by J-Augusto França. The Press is part of the whole, the Social Communication, which includes other means such as telegraph, radio, television, etc., already existing and which Almada was careful to represent in the aforementioned friezes with the allegory to the news production.

The exotic horse in blue

In the chromatic composition, the horse on the right stands out, painted in an overall dull blue with pure blue-stained decoration. This exotic horse, an almost Fauvist representation due to the independence of color in relation to the represented object, is very atypical in the work of Almada and does not even fit the stylized representation of the Italian Quattrocento period on the mural.

The color palette used was restricted: in one of the walls was recently found a test zone used by Almada where the primaries are: (i) yellow and ochre, (ii) four saturated blues, (iii) several magenta tones from pink to salmon, (iv) two gray tones and (v) three green

tones. We thus have a set of primary colors very similar to the primordial ones of the Modernist movement and that power the recreation of a wide tonal range. In sum, there are no technical chromatic constraints to paint another color on the blue horse. In addition, the blue used is not in the primary blue set of the Almada test nor visible in the other murals – this matte blue was purposely made and used mainly in the horse.

The hidden message on the blue horse

Almada, the writer, essayist and contributor to newspaper columns, has always felt the weight of SPN censorship ruled by his former colleague Futurist Ferro. In the writing of news, two colors on the ready-to-leave articles represented the Prior Censorship: Red was related to the text, news or area to be removed, but the recommendations to rewrite an article or even the censor modified text were in a Blue pencil that no one else in a newspaper publication could use; the Blue, in pencil, was the censorship.

Normally it was a specific blue, the lapis lazuli – in Portuguese lapis means pencil and the lapis lazuli color is very similar to the one Almada used on the mural to paint the knight's blue horse that will spread the news to the world.

In the late 1930s, Almada developed a metaphysical, esoteric side, a Pythagorean research between the universal and a metaphysical reality. The painter Lima de Freitas (1927-1998) wrote in a collection of Almada's texts (Freitas, 1982) that Almada wanted to "open the foundations of a knowledge by the visible signs, at a semiotic time of the visual (...) the preview of despised forms of thought or forgotten by the majority."

In the Middle Ages, the workers of the Guilds and Guilds of Masons, a theme of great interest for Almada, signed the stones of the cathedrals they built, including the passage of a hidden and hermetic knowledge, understandable only to the initiates of the art.

Likewise, perhaps Almada wanted to leave his message hidden in the stone of the new building, the cathedral of journalism, a hermetic knowledge to the initiates, with the horse carrying the news represented has contaminated by the lapis-lazuli of censorship.

And it will be this chromatic hidden message that leads to understand the enigmatic quote on the mural: Quem não sabe arte não-na estima (Who does not know of art does not esteem it). Here, the word art can be interpreted in the sense of métier, the knowledge of the profession, whose ultimate mission in journalism is to protect the news, a daily reminder of the duty of each individual journalist against censorship.

CONCLUSION

The Estado-Novo in Portugal was inspired by Mussolini fascism that embraced some of the ideals for a new social order of the artistic vanguard Futurism. In the early days of Portuguese Modernism, Almada and Ferro were connected to the Futurist movement. Between them, the transformation of the Futurist idealism had two paths: António Ferro's political pragmatism mimicked parts of the Futurist Italian fascism to implement a tight control over culture, art and the media organs. On the other hand, we have a dichotomous Futurist Almada, admirer of the dictator Salazar but resistant to regime policy and critic of the lack of freedom in art, culture and social media that were under the control of Ferro trough the SPN.

The transformation of the Futurist ideals via Ferro helped to consolidate the Estado-Novo, but it always had detractors between the artists. The relations of Almada with the

political regime were always ruled by irreverence and criticism, but also necessarily subordinated to him to access state-sponsored projects.

And it was in the defense of the same Futurist ideals that Almada faced the censorship machine of the Estado-Novo with a personal message, hidden in the color of the blue horse, the lapis-lazuli color that represents the censorship in Portugal. This occult act of resistance imprinted on the walls of a newspaper prevails to this day, a reminder of the importance of the free press, a message as important then as it is today.

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