



## DOCTORAL PROGRAM IN DESIGN

Chair:  
**Prof. Francesco Trabucco**

### Field of study

Held at Politecnico di Milano university, the Doctorate in Design Research is created and managed by Design Department, in cooperation with the Department of Mechanics and the Department of Chemistry, Materials and Chemical Engineering. Politecnico di Milano research doctorate courses aim to build the skills needed to perform highly qualified research jobs in manufacturing and service enterprises, the public sector, and the university.

The scientific field to which this course belongs is industrial design. Its interdisciplinary relationships include the philosophy and theory of language, art history, design, science of materials and technology, industrial engineering, decision making, and computer science.

Industrial design, following the meaning adopted within this doctorate, is intended as a discipline acting within the industrial culture and accompanying its transformations. Among its main tasks is to deal with processes and products configuration. In this sense, this school specific meaning goes to use, function, social and individual consumption of the products (the functional, symbolical and cultural factors) as to manufacturing (techno-economical, techno-systemically, techno-productive and techno-distributive factors). All these themes are expected to be faced with the support of the conceptual tools of research in its theoretical, critical, historical and methodological articulations.

The complex of the issues investing the theme of innovation will represent the conceptual trajectory of the whole program. The attention to innovation-related phenomena are due to various factors, partly internal to the dynamics of the discipline of industrial design, partly motivated by the perception of the growing complexity of the innovative process, thus fostering in-depth analysis and new approaches which can legitimately be faced within the doctoral programme. Whatever the motivations for the analysis of technological change and innovation, this trajectory of enquiry highlights the factors and fundamental ingredients of the process of development, transition and transformation of industrial products, services and systems. As a starting point a broad view of innovation is assumed, being a dynamic process involving the development or improvement of new products, services, technologies, processes, institutions, systems, strategies. Such an extended view of innovation includes the range of economic and social activities

- in areas such as communications, corporate strategies, market dynamics, education, public institutions - so relevant for design action as product design in its strict sense.

### Professional qualifications

The Doctorate in Design aims to train a designer/researcher with malleable qualifications. For the professionals produced by this programme are both designers who know how to do research and researchers skilled in using design tools. At the same time they are experts in managing awareness, in constructive interaction among various players, and in the communication of ideas and concrete proposals.

This skill set finds application in a variety of work environments. It is particularly in demand in organizations explicitly devoted to developing design research, such as universities and research centres, design agencies, and companies that are attuned to social and technological innovation. It is also sought out by public-sector organizations, by service enterprises, and by local development organizations, which are increasingly faced with complex planning problems that the designer/researcher can effectively deal with, analyze, and find solutions for.

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# A PROBLEM SOLVING METHODOLOGY FOR THE DEVELOPMENT OF BIO-INSPIRED PRODUCTS

**Alessandro Baldussu** - Supervisor: **Prof. Gaetano Cascini**

*Systematic use of "Natural Design Principles" for designers without Biological Knowledge*  
The observation of Nature to learn how to solve technical problems has been something that has characterized all the history of the humankind. In the XIX century, the new possibilities given by the latest technologies i.e. production systems, materials etc. allowed scientists using Nature as a model to realize technical reproductions of Nature's solutions.

Nowadays, the use of Nature as a Source of Inspiration for the development of new solutions cannot be left to the "chance". In the last decades, the Bio-Inspired Design (BID) research has been focused on the development of methods and tools for the systematic use of natural information. Accepting the hypothesis that Nature's solutions can be a source of innovation in the product development process, the main research question is the following: *How to systematically conceive a new Bio-Inspired Product?*

The scientific community has developed several tools for the BID tasks. Unfortunately, despite that, these are singularly effective it has not been developed a methodology that groups them and allows a systematic use. The present research has been

aimed at the integration of the most appropriate BID tools into a Problem-Solving Methodology that can be used by designers without Biological knowledge. The methodology's target are the SMEs and the young designers that are at their first Design experiences and that do not have any specific expertise in biology. At last, the methodology proposed is suitable for the development of technical products.

## Methodology & Validation

Figure 1 shows an overview of the methodology with all the adopted tools in order to carry on each step, starting from the technical problem in order to develop Bio-Inspired Conceptual Solutions. Among the proposed tools, some of them have been simply selected or improved and others have been specifically developed for the methodology, such as the NIST-BT correlation matrix that allows translating the technical problem in biological terms. The methodology's validation has been obtained by combining two validation approaches:

- Usability of the "Nature's Solution(s)" during the Design Phase
- Multiple requirements satisfaction approach

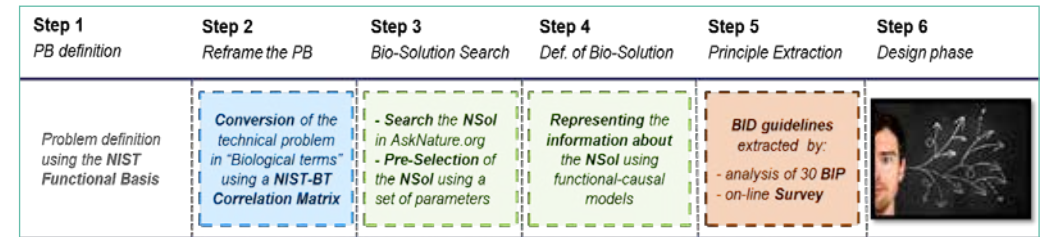
## iii. Effectiveness of the methodology

B. Fulfilment of the project requirements by the developed Bio-Inspired Conceptual Solution  
Three designers from the Institute of Product Development of the TU München have individually applied the full methodology on a set of four Test Cases.

The tools' use validation has been obtained by a set of experiments carried out by two Control Groups corresponding to the target designers.

## Results

As an output of the research, it has been obtained a methodology that collects the most appropriate tools in order to carry out the necessary BID tasks to systematically conceive a new Bio-Inspired Product. The most relevant aspect of the methodology is that no *Biological Knowledge* is necessary to perform the BID. This result has been obtained by the use of the correlation matrix and the approach adopted to perform the search in the database of Natural Phenomena. Furthermore, no knowledge about *Biological Keywords* or *Natural Phenomena* is needed to perform the search. The tool has been validated showing that the problem reframing in Biological terms is robust in terms of output quality.



**1. The Problem-Solving methodology for BID and the adopted tools i.e. The NIST: a standardized set of function-related terminology, the Biomimicry Taxonomy (BT): the classification system used by the Biomimicry 3.8 Institute to organize the information about the Natural Sources of Inspiration (NSol). It is considered a Bio-Inspired Product (BIP) a technical systems that is developed using a certain amount of Natural Information.**

In order to improve the capability of the models used for BID tasks, it has been proposed a SAPPHIRE-DANE integrated model. The new model has been used to describe all the 13 Natural Sources of Inspiration (NSol) individuated. Thanks to the structured description of the *Natural Information*, the designers have been able to solve singularly each problem and no compromise solutions have been adopted. With the extraction of the natural information represented in the items of the models, it has been possible to individuate a specific solution for each technical problem. The methodology has been effective both in terms of time and in the number of Bio-Inspired Conceptual Solutions developed i.e. four out of four, which satisfy all the correspondent requirement lists. Moreover, it is suitable for supporting the solution of both

ordinary and inventive problems. At last, the method can be inserted in the standard Product Development Processes in order to systematically use nature as a source of inspiration. The methodology has shown some limitations. For example for the designers: no mental inertia and a basic knowledge on functional modelling are required. Besides, the search can be done into a limited number of natural phenomena i.e.  $\approx 2000$ .

## Discussion & Future Developments

With the aim of reducing the gap between academic research and industry, stringent constraints have been imposed to the methodology. First, the methodology has to be able to support individuating the correct NSol also without Biological Knowledge. In fact, the use of the BT-NIST correlation matrix allows the creation of direct link between the design

problems expressed in technical terms and the correspondent class of "Nature's Solutions". Furthermore, the methodology can be adoptable by the SMEs that usually have low budgets, that imply no possibility to hire consultants, or biologists specialized in solving technical problems and, have free or low budget tools. At the moment, the methodology is paper based and the logical future development is the implementation of the methodology in an IT tool.

## URBAN SOCIAL LIGHTING

### Exploring the social dimension of urban lighting for more sustainable urban nightscapes

Daria Casciani - Supervisor: Prof. Maurizio Rossi

The traditional idea of urban public lighting is based on a double approach: on one side, economical savings and technical performances based on quantitative data, on the other side, the creative contribution of lighting practitioners focuses on enhancing urban amenity and strengthening the night-time experience of the city. This dual position is also well represented, on one side, by lighting regulations and public administrations focusing on energetic savings and functional needs. Conversely, several guides of practice supported by the lighting design practice agree that urban lighting is aimed at providing good quality lighting and social experiences. Functional needs of urban lighting, such as visibility at night and security from traffic, have been extensively investigated in the literature review with a major focus around the car users. In addition to this, the technological evolution in terms of LEDs lighting and control systems is promising new possible intelligent applications for urban lighting and it is also changing the practice, the design parameters and competences of lighting designers. All these technological improvements can be useful for radically and meaningfully transforming the contemporary cities at night when related to social transformations and

if adding a social value to the urban experience. An inquiry about good quality urban lighting, as primarily intended for people, was undertaken by investigating visual performances, visual comfort, visual ambiance and social experiences enabled by urban lighting. A small but consistent group of lighting designers is shifting its practice from the architectural to the social and experiential layer of the city. In this regard, a social oriented lighting design has emerged as an interesting approach aimed at providing more accessible and sociable cities but also contributing to a deeper sustainable urban lighting. In comparison to energetic, technical and economic issues, the human, experiential and social values of urban lighting represent a relatively young topic of investigation which is more difficult to estimate. In addition to this, the available researches around this topic are mainly focused on indoor environments, meanwhile researches in outdoor urban context are lacking comprehensive insights and a shared methodology. In this PhD dissertation, the evaluation of urban luminous experiences by people is hypothesized to be determinant for designing sustainable and social oriented nighttime experiences to benefit the social use of the public

realm. Aiming at defining the phenomena of Urban Social Lighting, the research was based on a multidisciplinary and multiple qualitative and quantitative approach. In order to verify the research hypothesis, both secondary and experimental research were elaborated by analyzing, simulating, designing and testing lighting scenarios and performances toward an in depth understanding of the social and human influence of urban lighting. A first general desk research was performed through the collection, selection and categorization of case studies in order to gather a preliminary descriptive theoretical framework from the lighting design perspective. The second phase was aimed at collecting raw but focused insights about outdoor lighting influence from people point of view: quantitative surveys based on images and videos followed by a qualitative analysis were exploited. A third phase was performed as a "unit of environmental experience" study, by designing lighting scenarios and performances in a real context. The exploration was focused on people appraisal with both controlled and uncontrolled behaviours in the natural context: the influence of variables such as lighting colours, lighting spatial distribution

and lighting behaviours, both dynamic and re-active, were investigated. As a conclusion, the interpretation and discussion of the insights were presented by comparing the findings of the experiments with the preliminary assumptions derived both from the literature review and case studies research. An overview both from the lighting design practice perspective and from people evaluative point of view was gathered. Findings were focused on further extending knowledge about people spatial experience of lighting from indoor to outdoor applications. In this regard, qualitative insights that could contribute to inform the lighting research field about a more user centred design (UCD) approach in the urban lighting domain were elaborated. The research stressed that, focusing on people, more sustainable lighting scenarios can be implemented: social oriented lighting seems to find a way to conciliate environmental, social and energetic scopes through responsive scenarios that could transform the urban space with an evocative power and, in the same time, re-establishing a trust relationship between inhabitants and the nocturnal city. Certain lighting variables were found to contribute both to social enhancement, luminous positive atmosphere

impression and social eco-responsible behaviours. In particular colours of lighting, lighting distribution and lighting proximity were found highly correlated to visual comfort, impressions of a hospitable, accessible and more personalized environment. In addition to this, lighting re-active and interactive performances were found to positively influence the impression of the night in evocative and entertaining ways. More than this, interactive lighting performances were found to increase people control in defining actively the urban lighting atmosphere. In this regard, this dissertation examined, the different levels of social inclusion considering the whole process of urban lighting planning: positive outcomes were found in terms of education and critical responsibility about urban lighting, for building a strong sense of belonging in the participatory definition of the lighting atmosphere, in relation to the evaluation of the project as an ethical commitment of the lighting designer and for a deeper and rediscovered reconciliation of people with the city. More than this, this PhD dissertation reflects on the lighting design practice and on the methodological process for knowledge acquisition when tackling with complex



1. Good quality urban lighting inquiry: visual performances, visual comfort, visual ambiance and social experiences enabled by urban lighting

issues about the relationship of lighting, people and city with the advent of new lighting technologies. The role of the lighting designer, its new competences and the trans-disciplinary way of collaborating with different disciplines are discussed. In addition to this, the research provides a complete overview of the methodology and the tools that were elaborated and tested during the research both for designing, collecting and interpreting research results. By explaining the problems and discussing the research limits, this dissertation aims at stressing findings and insights for the lighting design field also outlining future steps in terms of new topics of interest and applications.

## DESIGNING FOR SOCIABILITY: A relational aesthetic approach to service interaction

Eun Ji Cho - Supervisor: Prof. Ezio Manzini

Collaborative services, which have drawn attention as ‘a driver in the transition towards a more sustainable society’ (Jégou & Manzini, 2008), are characterized by a high level of user participation, and the role of users as ‘co-designer’ or ‘partner’ in service production. The high level of commitment required to the participants has been pointed out as a major limit to the diffusion of collaborative services, thus scholars (e.g. Manzini, 2011) underlined the need to make collaborative services more accessible, effective, and more attractive. This research puts a particular focus on the last point – how to make collaborative services more ‘attractive’. Making a service more ‘attractive’ can be interpreted in many different ways. It may include designing visible parts of a service more appealing: or developing service offering to provide more benefits to participants: or making user experience more enjoyable. This dissertation argues that ‘pleasurability’ - *how pleasurable the interaction is at the emotional level* (Clatworthy, 2011) - can be a key element to make services more attractive.

Service interactions include two types of interaction; human-service interface interactions, and human-to-human interactions. Although both types of interaction have an important role in user

experience, the distinctive characteristics of collaborative services make the latter (human-to-human interactions) play a particularly crucial role in the user experience. The essential role of interpersonal interaction in collaborative services has been explored in early studies in the field of service design, but most of the studies paid attention on collaborative services rooted in local communities. In these cases, the services are performed between community members who have a sense of solidarity, and good relations with each other from daily life. However, nowadays a growing number of collaborative services are based on the Internet, which enables anyone connected to the Internet to collaborate beyond geographical and social boundaries. In these cases, collaborative services are performed between participants who do not have pre-existing relationship, and service encounters tend to be ephemeral. While design research based on the studies of the former type of collaborative services have provided design approaches emphasizing highly intensive relational qualities, there has been little research about how to design interpersonal service interactions of the latter type of collaborative services, which often include interactions between strangers.

While there exist studies on interpersonal service interaction that occurs between strangers, existing approaches tend to focus on task-based interactions. Such approaches are useful in understanding and designing goal-oriented interactions from a perspective of efficacy, but overlook ‘fun-based modes of behaviors’ driven by enjoyment and emotions. This dissertation assumes the latter plays a significant role in making service experience more pleasurable, thus need to be taken into account in the design of service interactions.

Existing approaches to interpersonal service interactions rely on various theoretical foundations, ranging from cognitive psychology to activity theory, but the topic ‘pleasurability’ is rarely explored as a central subject. To seek a potential theoretical foundation to explore human interaction from the perspective of pleasurability, this dissertation pays attention on ‘Relational Aesthetics (Bourriaud, 2002)’ as the theoretical foundation for service designers. Relational Aesthetics advocates the value of ‘sociability’, beyond commodified human relations that we are surrounded by in daily life. The sociability manifested in Relational Aesthetics shows some differences from the concept of sociability in the design

literature. While sociability in the design literature is often considered as a means to support other goals (e.g. Computer-Supported Cooperative Work, online learning) or an added value, sociability in the theory of Relational Aesthetics is per se an end to pursue. Producing – or constructing- sociability is considered as a way to provoke and experiment ‘micro-utopia’ of human relations.

To exemplify the potential of the relational aesthetics approach for the design of interpersonal interactions in collaborative services, an ethnographic case study was carried out. The examined case ‘Scarsellini- vicini più vicini’ is a service design project that commenced in 2010 to foster collaborative ways of living among residents of an apartment block accommodating around one hundred apartments in Milan, Italy. Over three years, a series of design actions were carried out to facilitate interactions and collaboration among the residents who did not know each other in the beginning of the project. The project was studied for 30 months (from 2011 to 2013) with a focus on the design interventions intended to facilitate convivial relations between the residents, ranging from the creation of online social platform to social gatherings and meetings. For instance, the online platform which was created to support communication and collaboration among participants was designed with social features like ‘conosciamoci (let’s get to know each other)’, ‘birthday of this week’. Even meetings to discuss particular issues (e.g. choosing a farmer from whom the residents buy vegetables

collectively) or perform tasks (e.g. furnishing common spaces of the apartment block) were prepared to serve as sociable occasions (e.g. a party for furniture assembly).

Data gathered from in-depth unstructured interviews with the designer of the project, and non-intrusive observations on the (online and offline) interactions among participants were examined. Besides a number of collaborative activities - ranging from babysitting exchange to collective purchasing - initiated by the residents, a distinctive outcome of this project was that the sociability has been reproduced by the participants. In the beginning of the project, sociability was prompted solely by the effort of the designer, but gradually the residents became the actors of facilitating social interactions, and creating opportunities for convivial encounters. Although the intervention of the designer has been lessened throughout the project, sociability has been produced in various ways (e.g. ranging from ‘movie night’ to ‘soccer game’) by the residents. The role of ‘facilitator’ that the designer used to play (e.g. posting friendly welcome messages to new members who introduce himself/herself on the ‘conosciamoci’ page of the website) also moved to the residents spontaneously.

The design approach of Scarsellini project showed distinctive characteristics compared to other prevailing approaches. It was different from ‘scripting’ approach in the sense that non-scripted, spontaneous interactions were prompted. It is similar to the ‘meta-design’

approach (Cipolla, 2007) in the sense that the interpersonal relations were ‘meta-designed’ by creating conditions (e.g. online social platform, social drinks) which enable people to enter into interpersonal relations autonomously. Yet, unlike the meta-design approach, the encounters of Scarsellini project were not directed to deepen the relations over time. While the meta-design approach directs interpersonal encounters to evolve progressively (through three phases of acceptance, affirmation, and confirmation), design interventions of Scarsellini project were simply to prompt moments of sociability, and ‘arenas of exchange’. The design approach of this project was also different from user-centered or participatory design approach as advocated in the contextual approach, as design interventions were driven by the vision of the designers, rather than the needs, goals, or contexts of the participants.

Based on a critical review on existing approaches and an ethnographic case study, this research argues to take sociability as the object of design for service interaction. In particular, drawing upon the theory of Relational Aesthetics, it suggests an open-ended, experimental and vision-driven way of designing for sociability. Moving from goal-oriented perspectives on interpersonal service interactions, the role of sociability in making service experience more pleasurable, and more importantly in catalyzing ‘meaningful bonds between individuals (Jégou & Manzini, 2008)’ is discussed.

## SENSORY EXPERIENCES. INFORMING, ENGAGING AND PERSUADING THROUGH DYNAMIC PRODUCTS

Sara Colombo - Supervisor: Prof. Lucia Rampino

This thesis explores alternative languages for the communication of digital information from products to users. It identifies a new area for Product Design research and practice, that of *dynamic products*, which straddles the virtual and the tangible worlds. The need of conveying information to users is always more compelling in our society, as ICT, sensors and electronics generate a huge amount of data of any sort (from the temperature of a room, to user-generated contents), which have to be communicated to final users. Products often are intermediates between the immaterial data, generated by smart systems, and the information displayed to users, in most cases by relying on screens and displays, and by adopting the verbal or graphical language. However, in this kind of digital interfaces, the richness of the sensory experience with the real world is lost; for this reason, some research strands are trying to reconnect the digital to the physical and tangible reality, looking for more engaging forms of interaction. To overcome this gap between virtual and real in favour of enhanced experiences, the thesis identifies and explores an emergent category of products, *dynamic products*, that are artefacts showing sensory features (visual, tactile, auditory and olfactory) that change in a

proactive and reversible way over time, addressing one or more user's sensory modalities. The thesis investigates how dynamic products can directly display information to users by their changing sensory features (shape, smell, colour, temperature, or sound), instead of relying on "added" digital interfaces. For instance, a change in the surface texture of a product might indicate that the air quality in a room has improved or worsened (Fig.1), or different smells released by an object may convey the emotions of a distant person. The final aim of the study is to understand if this type of communication is practical and how dynamic products can be best designed to convey information to users to an effective and engaging extent. Moreover, the goal is to analyse the potentialities and limitations of this type of communication from both the designer's and the user's perspectives. The research methodology is articulated into a number of different phases of desk research, field research and design experiments. The study can be divided into three main activities. The first one is a preliminary analysis of the area of dynamic products based on case studies, performed in order both to obtain an overview of the existing products and to extract insights about

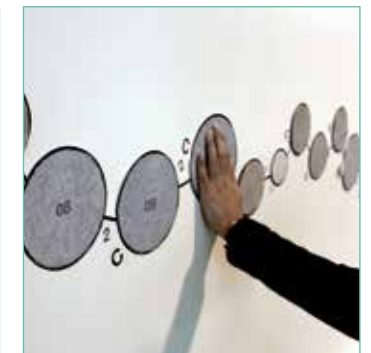
the role of different sensory modality and media in this kind of communication. A sample of 48 dynamic products (concepts, research prototypes, and commercial products) was collected and analysed. A descriptive framework for dynamic products, which examines the input Source, the type of Message, and the output Modality of such products was proposed. The framework was used to describe and analyse the collected case studies (Fig. 1). Moreover, a visual map showing the sensory transformations products can adopt to display information was generated, to be used also as a design tool in subsequent steps of the research. In order to investigate dynamic products by the designer's perspective, two design activities were accomplished: a design workshop with students and a design project in the field of energy saving, following a research-through-design approach (Fig. 2). Finally, qualitative interviews with users have been performed on the collected case studies, to analyse the users' levels of acceptance, their reactions and their overall experience with dynamic products. From the case study analysis, it emerged that all senses (sight, touch, hearing and smell) can be used by dynamic products to convey information, although they seem to have different



1. An example of the 48 dynamic products used as case studies. Case studies were analysed according to the information Source, the type of Message and the sensory Modality adopted in the communication.

meanings and roles according to the source and the type of message displayed. However, sight is definitely the most used modality, even in this new category of products. Moreover, most of the collected products were concepts or research prototypes, meaning that these solutions are still at an embryonic stage of development and implementation. Difficulties connected to the design of dynamic products have been highlighted, among which the lack of background knowledge and the designer's tendency to explore only visual media. From the design activity, it emerged that complex information are difficult to convey by basic sensations, and that the choice of the sensory medium deeply affects the overall experience of users. However, it also emerged that experiences

created by dynamic products are highly engaging and can increase the user's interest towards the product, also affecting his attention and consequent behaviour. Interviews showed that advantages of dynamic products lie mostly in the pleasantness of the experience, in the engagement potential of dynamic products and in the directness and discretion of the communication. Limitations mainly concern the clearance and the effectiveness of the communicative process. The three studies brought to the identifications of four *powers* of dynamic products, which highlight the main advantages of dynamic products compared to interfaces, consisting of their ability to Activate, Engage, Encourage, and Remind. In addition, four *strategies* for



2. The Electricity Wall is a concept developed in collaboration with Interactive Institute (Sweden). It uses hearing and touch to inform the user about high loads on the electricity grid during the day.

designers to map information into sensory transformations are proposed (i.e. Disruption, Reproduction, Translation, and Metaphor). Results suggests that Dynamic Products can be designed as alternative to interfaces in conveying digital information. Potentialities and limitations of this approach are identified, and some design tools are proposed to support the design activity. This thesis opens up new scenario for product design, by triggering the design community to reflect upon the always more compelling need of merging virtual and material in the information society, towards more meaningful and engaging experiences.

## FROM OBJECTS' MUSEUM TO MUSÉE IMAGINAIRE. STUDIES FOR THE (RE)MAKING OF THE MUSEUM OF DECORATIVE AND INDUSTRIAL ARTS OF FRÉDÉRIC SPITZER (1815-1890)

Paola Cordera - Supervisor: Prof. Pietro C. Marani , Prof. Dominique Poulot

This PhD study focus on the reconstruction of the collection of the Austrian art dealer Frédéric Spitzer (1815-1890), by considering his role within the broader 19th century European historical context and its meaning in the present-day culture within contemporary cultural dynamics at a global scale.

The large fortune Spitzer amassed gave rise to an extensive collection of Medieval and Renaissance artworks of such exquisite standards (or what they did look like in those days) that his *musée d'arts industriels* was to be compared to the exclusive club of the major European museums, such as the Musée du Louvre or the South Kensington Museum (now, Victoria & Albert Museum). After his death, his 4000 pieces collection was to be embodied in a state museum by the terms of his will but the project failed. A wholesale acquisition was out of question as well. In the end, the final dispersal of such a legendary collection was by subsequent public auctions in 1893 (the century's sale), in 1895 and finally in 1929.

Decorative and industrial arts have been here reconsidered within the *scenario* of the design's "prehistory" and as a crucial topic well before the industrialization and the

serializing process accomplished in 19th century Europe. The relevance of this research is also confirmed by the new trends in museums (either permanent/ temporary exhibitions or re-arrangement of works of art) and recent art auctions associating Decorative Arts and Design, namely bridging each other by combining the reputation of both the two class of products.

Spitzer's professional biography – in the wake of other famous art dealers and private collectors such as Emile Gavet, Alexander Barker, Stefano Bardini, David and Isaac Falcke, Samson, Charles and Asher Wertheimers and Joseph, Henry, Charles and James Duveen – emerges for his bravery and his audacity in a context marked by professional contacts with curators, *érudits*, collectors, art dealers, and craftsmen/restorers. His storybook career is tied into a European plot marked by changing boundaries and process of states formation and nations building but cultural practices and social rythms were widely shared in a transnational "art system" (Alloway 1972). In this perspective, the private collectors' cosmopolitanism quick turned into a *marchand* cosmopolitanism, as attested by the Spitzer's auctions where artdealership handled business in different cities and as a

multinational corporation. As a matter of fact, Durand Ruel (Paris and London), Brauer (Florence, Paris and Nice) and Duveen (New York, London and Paris) acted as intermediaries though giving rise to a modern international art trade. Despite Spitzer's overwhelming popularity, no comprehensive research have ever been devoted to him, nor to his collections. This amazing gap might be understandable given the poor state of source material and the lack of his personal/ professional archive and above all to the harshness of a thorny subject where issues involving art collecting, history of art and culture intertwine with matters concerning the making of copies, reproductions, forgeries or *mariages* of art works being later fraudulently placed on the antique market. This exclusion from art studies seems totally inappropriate.

Moreover it would be misleading to feature such a *scenario* according to our critical sense (and our quest for authenticity), especially when referred to a context where art works were considered worthy of display unless complete and items were rendered more acceptable by restoration. No doubt those practices were made possible by the craftsmen's remarkable skills. Besides that, these issues are closely interwoven with

the problem of mass-produce objects, modelled after the example of the glorious past. This PhD thesis – mainly conducted in British, French, Italian, German and Austrian archives and on unpublished material – proposes a new methodology and an original conceptual framework for 19th century collections' research by re-establishing the Spitzer's collection within a wider perspective including his biography, his collecting and dwelling style in Paris (namely his apartment in rue Richelieu and his hôtel in rue de Villejust) together with the promotion of his collections in occasion of Decorative and Industrial Arts Exhibitions and Universal Exhibitions (five of them held down in Paris between 1855 and 1900), displaying items according to similar criteria and a classified and scientific notions of order in both the field of art and science.

The overall picture emerging on the basis of this study provides a significant depiction of 19th century collecting practices where the Spitzer's *microstoria* (Ginzburg 2006) combines the social, political and cultural micro-scales where social changes (still) related to the Industrial Revolution, urban projects for a modern society, artistic changes such as the Impressionist revolution, political events for the affirmation of nationhood and economic changes took place in the background.

In such a framework, this research fits like a brand new tile in a multi-facet mosaic – with some blank (in progress) areas – confirming the expected initial

prospective where the study-case viewpoint may be combined into a broader context. Reconsidered according to a multidisciplinary approach (including topics such as museums' studies, history of art, history of decorative arts, history of architecture, history of design, political geography, urban history and social history) and according to a supranational perspective, the Spitzer's epic poem has been retraced in the wake of his multiple identity, his European trips and his art dealings and business strategies with the key figures of the European cultural world, in a time when an enlightened aristocracy and a wealthy middle class gave raise to an unforgettable historical season marked by relevant urban, political and social changes. As a matter of fact, the Spitzer's collection and his *objets d'art* – and the way they have been promoted – have been studied within their architectural frame in his private hôtel where social rites and private life in the reception rooms were extended to the museum, in a sort of *Gesamtkunstwerk* in the spirit of the Italian Renaissance.

Finally, virtual devices have been explored in order to evaluate the "reliability" of visualization of historical data and enhance the knowledge of the Spitzer's museum by providing visual links – generated by open-source platforms such as *View Share* and *Gephi* – between the present location of art works (mainly in public museums) and their original display in the Spitzer's mansion together with the 19th century international art network. Furthermore, a 3D model of the Spitzer's hôtel was designed in order to survey and

visualize the (almost unknown) inner architecture of the museum, by integrating different information dispersed in multiple documents.

Cultural practices based on the growth and diffusion of knowledge of such a collection – by using innovative, creative tools as well as traditional ones – could strenghten the understanding of people's own identity and their own history, by developing a deepest sense of belonging and therefore awareness of their cultural heritage and by linking past and present according to a multi-directional strategy in order to enhance community engagement and participation in cultural processes. Though, the idea of cultural heritage as repository of knowledge might be augmented by the multiple representational possibilities that digital systems offer, as a research support tool, as a device of information and as a learning and educational resource.

## SMART PACKAGING FOR FOOD [Smart Materials And Renewal Technologies]

**Paola Garbagnoli** - Supervisor: **Barbara Del Curto**

### Context and objectives

Food supply chains are complex global networks, creating pathways from farms to consumers, involving production, processing, distribution, and even the disposal of food.

They are increasingly complex and dynamic because of the increasing product proliferation to serve ever diversifying and globalizing markets as a form of mass customization with resulting global flows of raw materials, ingredients and products, and because of the need to satisfy changing and variable consumer and public demands with respect to food safety and environmental impact.

The fundamental difference between food supply chains and other supply chains is the continuous and significant change in the quality of food products throughout the entire supply chain until the points of final consumption. This is especially the case for fresh products supply chains with increasing attention being placed on both freshness and safety. The high perishability of food products has resulted in immense food waste/loss, further stressing food supply chains and the associated quality and profitability. Modern consumers demand products that are safe, healthy and of high and consistent quality.

One of the main external factors, affecting the quality of food, is the temperature, during the entire food supply chain. The cold chain, is a temperature-controlled supply chain, used to help extend and ensure the shelf life of fresh food products. Refrigeration systems guarantee the cold conservation during the storage and the transportation. However, it is proven that sometimes the cold chain stops for a while because of accidental problems or inattention, causing the deterioration of food, the increase of food waste, or the proliferation of bacteria. Within the food supply chain a special role is played by packaging. The history of packaging is a way where various fields are involved. It refers to the evolution of materials, productive processes, communication, iconographic system, productive system, distribution system. These different fields have found in packaging an interesting meeting point.

Packaging can be considered an interface between the content and the external environment. Considering this statement, one of the main innovation of recent years, is represented by active and intelligent packaging. Unlike traditional packaging, which must be totally inert, active packaging is designed to interact with the contents and/

or the surrounding environment. Instead, the purpose of intelligent packaging is to give indication on, and to monitor, the freshness of the food. To date, materials used in food packaging still play a marginal role in controlling temperature variations; in particular they are not able to actively control the undesirable accidental overheating during the distribution phase.

Looking at this scenario, the main objectives of the research were been the development of an innovative active thermal insulation packaging able to delay the overheating at a specific temperature, depending on the content, and moreover the evaluation of the impacts of this active packaging in the food chain, in terms of food safety.

### Methodology and results

The research includes an experimental work, where the active packaging has been developed and tested both in laboratory and in real conditions, and also a theoretical study, where results obtained have been placed in a wider context in order to consider their impacts in the food supply chain. The experimental phase has been focused on the realization of a composite material that combines the structural properties required for secondary packaging with an active heat

control as innovative point. Secondary packaging typically consists in corrugated cardboard boxes, made of secondary row materials. Cardboard is the most common material used for wholesale packaging. The composite material can be based on a cellulose matrix, obtained from recycled paper.

One possible solution to control thermal insulation and to maintain the desired temperature, for a limited period of time, is represented by thermal energy storage approach. Along this direction, large quantity of thermal energy storage/recovery can be achieved in the form of melting/freezing latent heat by using phase change materials, or briefly PCM.

A simple method for a stable dispersion and incorporation of PCM microcapsules into cellulose matrix has been developed. PCMs have been integrated into the cellulose matrix during the recycling process, using an industrial pulper. The composite pulp has been worked in order to obtain a suitable semi-finished product to realize packaging. The productive process has been studied and a sampling of 20 active packaging has been realized for testing, with the same shape and size as standard packaging, in order to compare their properties. Active and standard packaging, filled with fresh food, have been tested inside the cold chain, both in real conditions and simulated in laboratory. The thermal cycle inside each packaging has been recorded during all over the process. Results obtained during tests in real conditions have shown that, when temperature starts to

increase, due to external causes, active packaging is able to delay the rise of temperature for more than 1 hour. Similar results have been obtained also in laboratory. In addition, when food is stored inside a refrigerator, active packaging proves to be able to modulate temperature peaks caused by the common duty cycle of the machine.

After the experimental work, the promising results obtained have been evaluated in a wider context in order to analyze impacts and benefits on the entire food supply chain. A real supply chain of ready-to-eat salads has been considered as case study with the aim to identify the effects of active thermal insulation packaging. Food supply chains are complex phenomena which include many components. Behind each complex system there is a network, that defines the interactions between each components.

Networks science is a recent multidisciplinary science that studies complex systems. It has several implications in everyday life and it is very close to the real world. Through the development of models, networks science understands structure and behavior of the reality and allows to do forecast. The network modeling, combined with the study of the proliferation of bacteria in food (Salmonella, E. Coli, Listeria M.) at different temperatures, has allowed to foresee that active thermal insulation packaging could play a significant role in controlling the spread of epidemics. The development of the food distribution network resulted useful also as a tool to support designers in identifying

critical points of a complex phenomenon in order to intervene with a focused project.

### Conclusions

The research presents various levels of innovation: first of all, the development of an active thermal insulation packaging using PCM, and the network modeling of a food supply chain to support the design process. The continuous contact with the reality, thanks to the collaboration with companies and organizations, has allowed to have reliable feedback and real results.

Moreover, the idea to use networks science as a tool for designers can be a new point of collaboration between designers and physicists or computer scientists.

From a general point of view, what makes the research original and what exalts the central role of the design is the harmonic joint between different disciplines, like materials science, design engineering, packaging design and networks science.

## FEEL AND SENSE THE PRODUCT: AN EXPERIMENTAL BASED OPTIMIZATION METHODOLOGY FOR PRODUCT DESIGN

Elia Gatti - Supervisor: **Monica Bordegoni**

Thus project exposes a methodology aimed in optimizing products by mean of experimental methods. In particular, the methodology for the product design optimization is composed by three different phases (design question, interaction study, and sensory boost), which are supposed to guide the designer to the optimization of the design of the product. The first phase is related to the design question that the designer wishes to answer, that is, in other words, the focus on what the designer wants to optimize in the product. (i.e., does the client want a more efficacious product does the designer wish to communicate feelings with the object he (she) is going to re-create?). There are many reasons that should particularly draw the attention of the designer for understanding the kind of optimization requested by the client. A better understanding of the design question may reduce the number of experiments needed to reach a good optimization, allow an experimental procedure more focused on the problem, and make clear from the beginning of the experimental phases (interaction study, and sensory boost) the variables to inspect in the products. In fact, it is not always easy to understand what the client wants, and often the

client itself cannot be aware of the direction the optimized product have to take. A first step is to understand, in the experience design framework, whether the changes the product is supposed to go through belong to its pragmatic or hedonic characteristics (or even both). The hedonic characteristic of the product relate to intrinsic needs of the user that the interaction with the product is supposed to accomplish. Researchers investigated these needs, and the results of their studies can be useful in case of a hedonic optimization of the product is needed. In particular, autonomy, competence, and relatedness, were found to be among the top 4 of the users' needs. Self-esteem was also found important, whereas self-actualization or meaning, physical thriving, popularity or influence, and money-luxury were less important, but still present. It is advisable then, in the optimization, to look at how a given product is able to satisfy these needs, in order to re-define the design question. At the same time in the pragmatic optimization it could be crucial to understand whether the client is interested in augmenting the performance of the product, augmenting the client perception of the performance of the product, or

maybe keeping the performance of the product constant while diminishing the costs. In some cases the designer cannot improve the performance of the product. In other cases though, a design aid is useful and even necessary. In these cases a pragmatic optimization would be of great use. Once defined the design question, the methodology aims to gather information on the relationship between user and product, in order to better answer the design question, finding which features in the product are considered important and how to work on them in order to subsequently (during the third phase) boost these features by means of a sensorial experiment. It is important to note that the methodology is not restrictive on what methods to use for relating user and product, as far as this relationship is investigated. Hereafter it is reported a list of the tools reviewed by the methodology in this phase. Moreover, to help the designer in choosing the right method for the product optimization, the methods in this phase are grouped according to the perspective they adopt in studying the user-product interaction. This perspective can be, according to my work, either based on self-report (explicit methods) or implicit.

The Explicit methods are likely the most used to study how the sensory features of the product are connected with the communication of a semantic attribute. Explicit methods reviewed by the methodology currently are:

- Paper and pencil tests
- Conjoint analysis
- Multi-Dimensional Scaling for the perceptual space
- Semantic Differentials Method
- Kansei engineering
- Attrakdiff
- Sensory snapshot
- Quality function deployment
- Product Emotion Measurement instrument
- SAM
- Emotion wheel

On the other hand, implicit methods are those methods that connect the user and the product without necessarily ask the user a feedback about the interaction or the product itself. In fact, implicit methods assess the reactions of the consumer to the sensorial features of the product by measuring consumer behavioural changes. The implicit methods taken into account in the methodology are:

- Usability measures
- Tracking experiments
- Implicit association test
- Evaluation of the physiological activation
- Neural activations

A side-aim of my work during the PhD was to spot and catalogue a series of methods to investigate the user-product interaction, and then describe them allowing the designer to use them if selected in the methodology.

The third phase of the methodology is based on the concepts of *crossmodal correspondences* and *psychophysics*. In this phase

(sensory boost), sensory experiments are performed in order to boost the characteristics of the product considered meaningful for a pragmatic or a hedonic optimization spotted by the second phase of the methodology.

The term crossmodal correspondence "...refer to a *compatibility effect between attributes or dimensions of a stimulus (i.e.: an object or event) in different sensory modalities...*" (Charles Spence). Crossmodal correspondences found a large application to product design among years. As it not difficult to imagine, it is a thrilling concept for a designer to suggest experiences to the consumer by mean of "mere" sensory stimulation. In some extent, crossmodal correspondence represents all what design is about, and what the design share with art: To express your own aesthetic sense and elicit in the consumer by mean of a sensoria experience concept and ideas. Studies in crossmodal correspondences are applicable both to the pragmatic and hedonic characteristics of the product. This methodology directs the sensory characteristic of the product on the important features of the product itself, in order to enhance both its pragmatic and hedonic characteristics.

On the other hand, psychophysics focuses on quantitative study of the human perception assessing for the human's perceptive thresholds and on the creation of quantitative scales regarding human sensations. A characteristic of such scales is the fact that they connect a given physical variable to a sensoria or psychological variable.

Psychophysics assumes a great importance when it comes to assess to the pragmatic characteristics of the design product. Especially in cases such as interface and new technology device design, it is important for the designer to be sure that all the feedback are clearly perceivable by the users. On the other hand it might be useful to know the limits of the human perception, in order to avoid to design oversensitive devices. Psychophysics has been used to validate or obtain information able to guide the design of devices and interfaces. The use of psychophysics in the methodology is well defined. Thanks to the interaction study, the designer will be able to find which are the sensorial feedback the user pay more attention at, and in which condition the user will be in need of perceiving them. Subsequently, the threshold measures will serve as concrete guideline to design/optimize, those feedbacks. Two case studies are also exposed in the doctoral dissertation, involving a crossmodal experiment to optimize the packaging of a liquid soap, and a psychophysics study optimizing the performance of a new device for virtual prototyping. The whole research exposed in this dissertation arose from a multidisciplinary environment, involving knowledge from the fields of design, psychology, neuroscience, and engineering.



# VISUALIZING THE USER GENERATED CITY

## Exploring the potentiality of emergent geo-social media applications as a novel source of urban knowledge

Giorgia Lupi - Supervisor: Paolo Ciuccarelli

There is growing interest across a wide range of subfields of urban studies in understanding the role played by location-based Social Media and the impact of increasing availability of urban digital data from different sources.

The way people experience the city is affected by a complex, dense, reactive information landscape: the data city presents itself with an unprecedented quantity of information such as geo-located comments from Twitter, reviews from Pickles, check-ins from Foursquare. This fragmented proliferation of information generated by inhabitants and city users offers potential benefits both for the research community and the urban decision makers, who can use the data to generate broad and analytical visions of urban spaces uses.

**This research explores and presents methods and tools to collect, analyze, and represent time-based geo-located Social Media data at the urban scale. The general aim is to investigate possible perspectives for the use of these data for urban planning and city management processes.**

The research mainly question whether geo-located Social Media data can be useful in the creation of indicators of urban life, as it is perceived and

communicated by the city users. In fact, although traditional data collection methods such as surveys, interviews, questionnaires, and, more recently, data harvesting and analysis techniques (e.g. using geographical location data from mobile devices) have provided interesting insights into the social life of urban spaces, they can be nowadays complemented using geo-located Social Media data.

On one side, the research reviews **the existing literature, projects, approaches related to data-visualization and geo-located social mining techniques** used to investigated topics of urban interests and presents **new interpretative frameworks** to share this very knowledge through.

On the other side, the research presents several **design experiments** that have been conducted in collaboration with urban stakeholders at different levels and in multiple US and European cities.

Also reflecting upon these delicate issues, the research tries to maintain a critical position, exploring if and how geo-located social mining techniques can still constitute a sustainable (in the wider sense, including societal sustainability) new perspective for planning and decision-making processes and practices.

**As a conclusion, some final considerations on the contribution that design, especially information and interface design, can bring to the very field are presented. Here, visualizations and interfaces are not conceived only as final outputs, but rather as pivotal points of the interpretative processes and discussion with practitioners that define new ways of understanding complex systems of information.**

### A research approach merging the academy and the industry

The present research aims at understanding the contribution that design can bring to the research and practice within the urban field through gathering, interpreting and representing geo-localized Social Media data. Since its very beginning, the research undertook an explicit approach towards the professional fields of design, with the goal of **bridging the divide between professionals and the academy.**

In a context where experimenting represents an essential condition for theory production and scholars are assuming the role of new reflective practitioners, **design can indeed provide essential theoretical and methodological contributions to the definition of new**

### urban research practices.

The collaborations with professionals and practitioners, and the participation in not-strictly academic research contexts have therefore paved the basis for this dissertation, with the attempt to undertake city and urban studies in a real multidisciplinary fashion. Thus, **the research draws upon several design experiments** that have been conducted with urban stakeholders at different levels and in multiple US and European cities, not only inside the framework and the connections provided by Politecnico di Milano, but taking a further advantage of the active professional role I have in the information design company (Accurat) I co-founded in 2011 for research purposes.

Within the research process the **collaboration between computer sciences, social and urban studies and design disciplines** have been leveraged; knowledge and expertise in the professional field have served the purpose of the generation of new academic knowledge.

As a result, I truly believe that a deep and constant relationship between critical analysis and practice, and between academy and the professional world should be encouraged in any doctoral design research. As a demonstration of the particular approach that would benefit the generation of new knowledge I included some of the original contributions from the various projects I took part in. Specifically I wish to acknowledge and thanks the contributors for the literature produced within the **Telltale** and the **\*UrbanSensing**

projects, and the research stimuli and insights provided within the experience of the start-up **Pleens**.

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## DESIGN + ENTREPRENEURSHIP. CREATING ENTERPRISE THROUGH DESIGN CULTURE

Laura Mata García - Supervisor: Prof. Alessandro Deserti , Carlos Teixeira

Entrepreneurship has gained a lot of attention in recent times, in which the economic crises has reflected severely in massive unemployment – particularly among young people in Southern Europe. It has become the focus of attention of governments and private sector alike particularly because it has been positively correlated to job creation. Today, many young graduates, including designers, find themselves without many opportunities of formal employment since traditionally this meant working either for a large company as an in-house designer or as an external consultant. Today, the offer of design graduates largely exceeds demand by these traditional employers.

Because of this, the relationship between design and entrepreneurship has become the focus of many studies and many universities have started to encourage design students to become entrepreneurs. However, the relationship between design and entrepreneurship is mostly approached and understood as either designers who design and produce their own products or sell professional design services. Thus, in this perspective design is confined to the shaping of the business offering.

In the last decade, the idea that design can be focused not only on physical products but also

on intangible artefacts such as signs, interactions, processes, and services represented the first important development of the concept. Starting from this idea, during the 2000s a considerable expansion of its scope took place, particularly the idea that design, and more specifically design thinking, could be applied to managerial problems and fit the unpredictability of current markets to address ill-defined problems adopting a qualitative rather than a quantitative approach. Therefore, the idea that design could shape business strategy became mainstream. However, this work postulates that design can influence an even earlier phase of the business process. A central construct and fundamental pillar of business ventures is the entrepreneurial opportunity. Although it has been widely acknowledged that the discovery (or creation) of entrepreneurial opportunities is a crucial starting point of the entrepreneurial process, reliable and replicable methods for systematically searching, framing, developing and assessing opportunities are still undeveloped. Consequently, entrepreneurs waste their limited resources (talent and time) in inefficient activities aiming at developing new business ventures. Identifying entrepreneurial

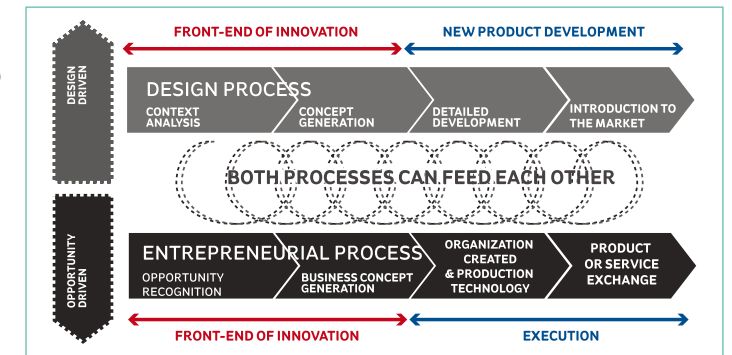
opportunities and transforming them into successful ventures is particularly relevant in the current economic recession, especially in southern European countries where unemployment rates are particularly high and entrepreneurship has the potential to boost employment. Thus aspiring entrepreneurs need more than ever reliable framing techniques because they need to be more assertive of their options and choices, avoiding wasting valuable resources in the opportunity identification phase. While the front end of entrepreneurial and new product development process have many similarities, such as the “open-ended” of modeling multiple options, supporting tools and techniques for framing and assessing ideas are seldom shared by these two processes (image 1). This work explored the applicability of design expertise from the process of developing new products in the early stages of the entrepreneurial process, more specifically in the business identification phase.

While some authors already elaborated on the importance of systematizing the creative process and applying creative methods and techniques to the opportunity generation process, none of them acknowledges

any potential contribution from design, which for most scholars still remains a practice difficult to observe, measure and analyze. The hypothesis of this work is that the design discipline possesses tools, methodologies, frameworks and a “designerly mindset” that makes the creation, framing, positioning, development and assessment of business ideas more reliable and efficient when exploring entrepreneurial opportunities. These toolsets could be transferred from the field of design to that of business to support the construction of new entrepreneurial ventures. The word “construction” is used since some of these tools are a step ahead of prefiguring: they are not just meant to design, but to dialogue, convince, construct, assess, and build a working prototype. Service design tools were chosen because they enable the framing, design, prototyping and assessment of complex intangible artifacts that require developing networks of actors and partners that support execution.

One of the main objectives of this study was to identify design strategies, tools or methodologies that could enable framing, structuring, assessing, developing and evaluating business ideas in the earliest stages of the front-end of innovation (FEI) of the entrepreneurial process, analogously to how its done in new product development processes.

A small scale experiment was designed in which a set of service design tools was produced and then tested in an intensive 2-day, 100 participants, business idea



2. The design process and the entrepreneurial process shown in parallel. They both have a front-end of innovation and could share instruments and methodologies.

generation workshop in Beijing, China in the context of the Dream:in project (which will be subsequently described). The toolkit included 10 design tools that could be used by non-professional designers. The tools were then used by a group of ten people, whilst the remaining 90 people used the standard Dream:in methodology. The output of all teams was carefully labelled, photographed and videotaped. Both sets of outputs were then compared and differences could be attributed to the use of the toolkit. The results from the experiment provide promising evidence that design expertise can bring efficiency and reliability to the front-end of the entrepreneurial process. This work also explored an overall perspective of the relationship between design and entrepreneurship. It is divided in six parts. The first one provides a literature review of the definitions and building blocks of the entrepreneurial opportunity construct. The second one elaborates on the relationship between design and business models, their relevance

and how design has provided instruments to frame, design and assess business models. The third part presents two sets of case studies of designers or architects who became entrepreneurs in different periods and different contexts, trying to provide meaningful insights of the phenomenon. The fourth part presents case studies of support systems for design-led entrepreneurship and maps their common features as well as opportunity areas. Finally, the fifth part presents the hypothesis and the sixth one, the above-mentioned experiment.

## METAFARMING

### Design as a tool, to address new spaces for a sustainable food production in developed cities.

**Giacomo Miola** - Supervisor: **Luca Guerrini**

In 2009 the World food Summit had estimated that in 2050 the 70% of the world population would have lived in cities and urban areas. Today's figures show that urban population has already incremented compared to rural population and that ongoing migration from the country to the city has never stopped. This phenomenon brings ever changing scenarios, that require to urgently rethink over process systems and food supply in metropolitan areas. Reflections and interventions over these matters are based on the following factors: Size growth: "the challenge will be to satisfy the world food demand by 2050 when it will be twice as the population" Sonnino 2011. Sales control: "today 5 companies control 48% of the world total retail", mostly producing through intensive farming which "contributes to massively deteriorate ecosystems, that are important for the future of farming" De la Torre Ugarte 2009. Hungry cities: urban growth and population bring to the creation of "hungry cities" in which cities there is no possibility of access to any direct production. The World Food Summit in 1996 (about 13 years before estimating the figures about people migration), had already highlighted the problem of physical, social

and financial access to security and safety food" that could guarantee the needs and the food preferences for an active and healthy life. The project and the new spaces for the urban food production, beyond reflecting the fact that "the link between the town and food is fundamental for our life" Steel 2009, new tendencies of food production and distribution are the expression of a new economic and organizational model, based on prudence and on the awareness of the available resources. German economist Ernst Friedrich Shumacher, believed since the sixties that little systems had a better functioning compared to the management of finance and big companies. Today, since the capitalistic system is showing its weakness and the majority of the so called advanced world is living, during the last years, into a state of permanent financial crisis, it seems more and more necessary to apply new systems that can generate new developments. For Carlo Petrini (Slow Food founder), this crisis is mainly a food crisis that can be solved only by creating a new system that would be able to "outplace food as the heart of our existence". Design and research are today able to provide us various useful competences for the developing

of new urban spatial scenarios for food production. Reversibility, flexibility, adaptability, reuse, sustainability appear to represent the planning methods that are more adapt to the times and spaces of transformation. Lotus International, on July 2012, has dedicated an entire issue to the urban farming phenomenon, underlining the necessity of rethinking certain urban spaces, also from the esthetic point of view. To the expressed necessity of transforming the urban realities into productive food realities, the design is able to supply a relevant support through research. The experimental soul of design put the designer into a position of mediator between the town made of spaces and the beneficiary communities of a project made by people. As Pierluigi Nicolini has underlined in his "Il bello dell'agricoltura urbana" (The beauty of urban agriculture), the designer is an esthete but also a therapist. His role is undoubtedly esthetic in the will of bringing the productive green into the urban contemporary esthetic, but it also therapeutic in the awareness that more and more communities need this kind of operation, communities that need and /or choose to undertake this sort of activity. The researching and projecting designer methodology,

could be summarized in five steps : problem finding, problem setting, problem solving, spreading and feedback. In these phases are gathered four fundamental attitudes : the contextual/ ethno-methodological research (anthropological phase), the esthetic evaluation (morphological phase), the evaluation regarding the technologies that ought to be used (technological phase), the project (meta-planning phase), the final evaluation of the project and the contingent reprogramming of the action (verifying phase). Here are reported a series of little basics examples of how the designer could interpret the project basing on his sensibility, starting from some referential urban spatial categories. The ground, for example, is one of the less explored urban category, probably for the simple fact that the available urban grounds (public ones) are all already addressed to other usages. These grounds, which are roads, squares, parks, interstice spaces, they first should be inserted into a new functioning plan that would foresee a different destination, predicting for example the complete exclusion of the vehicular traffic from secondary roads, offering to those spaces a new possible employment. Quintessentially the roof, expression of private space, it's the space that more than others applied to the pioneering productive experimentation based on horticultural activities. The façade as productive space is the one that has been more subjected to the esthetic rules of the contemporary pictorial

landscape, but it is indeed one of the potentially most productive urban spaces. Considering for example the favorable conditions due to the direct radiation of light and the expansion possibilities. It also represent one of the most examined and utilized spaces as support for the so-called decorative green though. The perimeter represent a category able to evoke situations that overturn the perception of spaces, sometimes by overturning the role of the exterior and the interior. Contemporary Art has extensively explored the perimeter theme suggesting highly efficient solutions, for example the long artificial high walls built by Christ and Jean Claude. On the other hand, an endless number of urban spaces belong to the interstice, urban spaces included and sometimes constricted by two other volumes or spatial entities. The interstice is so far the most experimented spatial category concerning the reality of urban vegetable gardens. interstice spaces, little sections of cities are often dismissed, they often are vital space for the guerriglia gardeners. The Interior, as a spatial category for food production has begun to be part of projects thanks to the development of technologies that have allowed to cultivate also in nontraditional ways, without using the plot. Hydroponic systems, combined with the use of low consumption light technology, like the led, but also combined with the endless universe of computerized sensors for the regulation of light intensity, humidity, ventilation. The use

of interior spaces represent the heart of the research for the project of sustainable food productive spaces into the advanced contemporary metropolis. To these research template the interior landscape is able to provide others referential parameters and new useful tools to the designer for the construction of new scenarios. The designer has now the possibility of creating and imagining new interior spaces as creation of open spaces or vice-versa, inspiring himself with the experiences of the New York's greenhouses or of the Pasona Urban Farm in Tokyo; or he can imagine those spaces as a new independent category, able to surprise us, just as it often happens when we look at a spot of our under transformation towns.

## A DESIGN PILOT PROJECT AS A BOUNDARY OBJECT: A STRATEGY TO FOSTER SUSTAINABLE DESIGN POLICIES FOR BRAZILIAN MSEs

**Viviane dos Guimarães Alvim Nunes** - Supervisor: **Prof Francesco Zurlo**

Systemic changes aiming at more sustainable patterns of production and consumption demand a collaborative Design approach. Indeed, collaboration, and the resulting exchange of knowledge, is a key pillar to effectively develop and implement strategic innovative solutions. Collaborative networks can be a valuable approach to induce improvement of competencies of individuals and organizations as well as sustainable Design policies to support local development. In this context, this thesis was based on the assumption that a strategic Design Pilot Project (named MODU.Lares Project), developed in a collaborative way, can trigger the beginning of an evolution towards sustainability of a fragmented local system with a poor record in the sustainability dimensions. This Design Pilot Project contributes to create appropriate conditions for sustainable endeavors, fostering a collaborative network of local stakeholders that share resources, knowledge and information. The present thesis has tackled the issue through an action research method, using the inter-organizational collaborative network conceptual model (ICoN). The research adopted an assessment tool (MP tool) that included five indicators (environmental,



1. Meetings with different partners to discuss the MODU.Lares Project development

technological, economic, socio-cultural, and organizational), conceived to identify emergent patterns in the local context derived from the Design Pilot Project. The field study focused on Brazilian Micro and Small Enterprises (MSEs) of the furniture sector, mainly working with handcrafted made-to-order production. This complex and integrated collaborative network system engaged actors of different typologies – eight wood furniture MSEs, the Federal University of Uberlândia/ MG (Design School), two Support Institutions (SEBRAE and SENAI), the Union of Furniture Manufacturers (SINDMOB) and the Local Government.

The Design Pilot Project in this field study aimed to stimulate the emergence of

new relationship modalities (mainly collaborative) among the referred actors, that could result in new ways of thinking and acting, in order to improve the environmental, sociocultural and economic aspects of the region as a whole. The main idea of the MODU.Lares Project was that knowledge and know-how can lead to individual competencies when articulated into practice. The Project started with the creation of consensual goals among participants, stimulating synergy and encouraging commitment among participants. Four elements catalyzed the flow of knowledge in the collaborative network: Prototypes, Meetings, Exhibitions and the Pilot Project (as a complete process). A furniture collection was developed by the present author within the



2. Discussion of prototypes with MSE partners in the Project



3. Prototypes Exhibition, a planned step of the thesis

scope of the MODU.Lares Project, integrating principles of Sustainable Design. These artifacts were addressed to the Brazilian C and D classes, a target market for the companies involved in the project. Prototypes were produced by the eight MSE partners, and due to their tangibility, they presented effectiveness for both testing a new manner of producing (minimizing waste, optimizing assembling, reducing the lead time) and facilitating the development of a common “language”.

Having been evolved

throughout the Meetings, this common language stimulated communication among participants based on focal points (*i.e.*, actions and activities proposed along the project’s development). From another perspective, however, it also highlighted differences (*i.e.*, divergent points of view), which, at times, prevented the flow of knowledge itself. The Exhibitions, used as a means to interact with the large public by using tangible objects such as the common language, functioned as an efficient channel, stimulating the exchange of knowledge

and information mainly among visitors, students and the researcher.

The results obtained by the research demonstrate that a Design Pilot Project can be considered a valid instrument to stimulate a collaborative environment towards sustainability, in particular in contexts with poor associative culture or absent Design policies. Such a project can constitute the first step of a design policy cycle in developing countries, thus contributing to define ideas and objectives among local stakeholders in a collaborative fashion, minimizing risks for failure and increase the chance of governmental support. Therefore, the thesis indicates the use of a collaborative project with the characteristics assumed by the MODU.Lares Project as a broad strategy tool to induce local Design policies. In the field study, this approach has effectively fostered inter-organizational collaboration among enterprises and support institutions, under the leadership of the local university. Moreover, it represents an important element of connection, since it was the first time in the region that a group of organizations (whether businesses or not) were involved in a collective project with a collective objective bringing mutual benefits.

## RITUAL, LOCUS AND HABITUS

### Community-based rituals as a tool to envision scenarios for the multicultural societies

Giulia Pils - Supervisor: Raffaella Trocchianesi

As designers we have come full circle in our quest to address issues such as identity and memory especially in social contexts defined by migration, multiculturalism and cultural frictions. This research aims at describing the power of rituals as a driving force of cultural identity for a specific community and the capacity of design thinking in improving this potential through a process of enhancement of the cultural, social and economic value of the community.

Today the use -and abuse- of terms such as «rite» and «ritual» turn on again the attention on a practice whose presence seems to have become pervasive both on the private and the public sphere. We observe a proliferation of a wide repertoire of contemporary rituals that emphasize the actuality of ritual and its capacity to update in different cultural backgrounds so that Pierre Legendre gets to define it a *social must*. Despite the increasing interest on ritual it is difficult to acknowledge it a defined status and nobody can agree on what exactly it is to be a ritual. To deal with ritual and give a precise definition -or at least to mark off its boundaries- is therefore very complex and invariably leads to an *aporia*. On one side the difficulty is due to the fact that the first formalizations of the concept

arose from the analysis of society where the social, religious and political aspects were closely linked. On the other side there is no canonical definition of ritual because anthropologists have from time to time adhered to different paradigms originating interpretations that appear to be more complementary than contradictory.

Despite the difficulty to acknowledge a widely shared definition it is undisputed to consider rituals both as founding moments for the construction and maintenance of social harmony and tools to enable the important exchange between uniqueness and universality that is so fundamental to build connections between diversities. To recognize such importance and complexity to the ritual identifies a field of exploration of great interest for the design discipline and highlight the need to refine tools and practices in order to decode the ritual genome and give meaning to otherwise fragmented and heterogeneous elements. The research is originated from an analysis on the interplay between the design culture and the field of humanities, in particular anthropology. It is observed that on one side the contribution of the humanities is considered fundamental and foundational to the design process because the traditional

humanistic knowledge is an essential reservoir of know-how from which to draw in order to address the various design issues. On the other side the designers' dowsy in the anthropological investigation is not bounded in a defined way even though design by its very nature is key player in the process of interaction between different disciplinary fields and is capable of triggering responses to new emergencies and critical thresholds generating innovative scenarios. The basic hypothesis is that, under the design ability to work outside the rigid logic of fields and by its very nature of boundary discipline, it is possible to work for and with anthropology identifying a set of tools that bring added value to the process of identification, interpretation and reinvention of contemporary rituals.

All rituals -also those most institutionalized- are malleable, there is the possibility of introducing a variable and produce a change. Generally the social actors themselves are the ones who claim this urgency of transformation because not always recognize themselves in the role of exegete of the tradition. Just this flexibility allows the ritual to reinvent and survive in different contexts and to become an

opportunity of comparison for a specific community to reaffirm the legitimacy of its values or to establish new ones. The value of rite as a fundamental moment for the negotiation of the cultural and social value between individuals and communities is a topic of great interest for the current research because identifies a range of **markers of identity** in the form of objects, places and ritual behaviors. In fact when we analyze a ritual with the design tools we observe that possess some morphological peculiarities, needs a specific context in terms of both time and space and encourage a collective dimension because it produces meaning for a specific group of people. All these elements -**locus, habitus, repertoire**- contribute to social cohesion and encourage a sense of identity and responsibility which helps individuals to feel part of a community and enable important dynamics of dialogue with other communities and even the society at large. Within the ritual narration performers and audience are moving in a real theatre scene (**locus**) with costumes and props (**habitus**) and according to a determined script and (**repertoire**). Locus circumscribes a significant area for the practice of ritual and make it a constitutive element of

specific identifying characteristics related to the community and to the physical space which is part of the ritual. *Habitus* is an element which enters into combination with the body becoming its communicating extension that amplifies and encodes the celebratory nature of the ritual: objects, garments, food become link-elements between the performers and the community. *Repertoire* is the set of behaviors, movements, actions performed by the community during the ritual. This process of disembodiment of the constituent elements of the ritual is operated not in order to isolate its individual components rather with the intention to propose them as key elements of the ritual without which the ritual itself has no meaning. This is the general problematic area within this research intends to propose a reflection. The beneficial relationship between design and anthropology working on contemporary rituals is seen as having significant potential for innovation and for bridging individuals, communities and society. The complexity and richness -both social and cultural- of the frameworks in which design and anthropology take part call for a humanistic approach capable to give quality to the form of artefacts, spaces, services and



1. Thesis Cover

connections and to preserve diversity understood as a cultural value.

The research seeks to explore and activate design experiences that work on community-based rituals and their set of tools - such as ritual behaviors, ritual objects and food, ritual spaces,... - in order to enhance and negotiate the cultural and social value of a specific community through the creation of multicultural narratives and intercultural dialogues.

## DESIGNING FOR PARTICIPATION WITHIN CULTURAL HERITAGE.

### Participatory practices and audience engagement in heritage experience processes

Sara Radice - Supervisor: Prof. Raffaella Trocchianesi

The research has the overall aim to envision novel paradigms for audience engagement within cultural heritage, starting from the assumption that the emergence of new patterns for culture transmission opened to new possibilities for participatory approaches in the design of heritage experiences.

Concepts such as public access, public participation, sharing, interactivity, culture as entertainment, and participatory design are not new within museums and cultural institutions at large. On the contrary, many of the assumptions that shape most of the contemporary cultural programs are rooted in the last century. It is thus noteworthy not the novelty of the idea of public participation within the museum studies domain, rather the fact that it is not yet structurally integrated in the contemporary approaches of exhibition design practices in museums, although an extensive bibliography is available and several best practices have been developed in recent years.

Within the contemporary socio-cultural context, in which—also thanks to the current development of the participatory web with its fundamental characteristics of interactivity, sharing, and common authorship—the traditional portrait of the public as a passive

spectator is inapplicable to the contemporary user and the relation between audiences and cultural institutions needs to be reconsidered. In fact, with the emergence of the notion of a participatory public, the traditional top-down model of knowledge transmission from an authoritative source to a passive audience has moved toward a transactional model based on multidirectional flows of information between the cultural institutions and its visitors, which are increasingly regarded as cultural producers. The research investigates the emerging role of cultural institutions, which are shifting from being provider of content and designer of experience, to becoming facilitator of experiences around content. This approach is often enabled by the enormous potential that the digital technologies have in allowing novel practices of engagement within heritage. The adoption of digital technologies in the design of cultural experiences have in fact become emblematic of the development of novel communication models focused on providing multiple interpretations of physical and digital cultural collections, and the abundance of international conferences and research projects that have emerged in recent years investigating the

impact of digital technologies within museums is evidence of the strategic importance of the theme. However, even when digital media replace traditional ways of conveying meanings, often the modalities by which visitors might engage with heritage remains essentially the same. There is therefore the need for a greater understanding of the relationships, differences, and possible synergies between the different emerging technologies in order to meet visitors' expectations of experiencing heritage in an active way, integrating diverse media in a continuum of actual and virtual spaces.

The outlined scenario requires a new characterization of the cultural spaces, which opposes the terms "physical," "fixed", and "closed," to the terms "virtual," "mobile", and "open," as well as a redefinition of the role of museums, libraries and cultural centers as facilitators of dialogue among diverse audiences through heritage interpretation. Letting visitor actively participate in cultural programs, in fact, does not imply that the skills of the specialists are no longer important in establishing the authority of a museum's program or exhibition, but rather, as museums give more credence to the diversity of

ideas, cultures, and values in contemporary society, museum professionals are becoming increasingly conscious of the need to presenting offerings that incorporates both the perspective of stakeholders and current and potential visitors and involve choice, personal reflection, interaction and customized elements.

The research stems from the theoretical assumptions aforementioned and relies upon the main hypothesis that, although through diverse participatory modalities and design approaches, visitors' active engagement in cultural programs and exhibitions might enhance the experience of heritage and respond to the emerging expectations of contemporary audiences. From this main hypothesis derive the main research questions that guide the research discussion:

1. What are the possible roles that visitors could assume while experiencing heritage in a participatory way? And what level of social engagement can be pursued? Do diverse participatory models influence it?
2. Are digital technology effective tools in enabling and mediating participatory experiences of heritage? Which technologies should be preferred? And in what contexts?
3. Can audience participation in cultural programs foster intercultural dialogue among participants?
4. How multiple personal interpretations of heritage could not imply an abdication of curatorial, educational or design responsibility?
5. Are participatory design

methods and tools needed if designing *for* participation?

6. What process could best support the design of a participatory experience of heritage? And which competences are required? Secondary research and case study - relying on literature search, interviewing, observation, and document analysis - are the research strategies chosen to address these issues with the goal of mapping diverse approaches to participation within cultural institutions and outlining current tendencies for what concern methods and tools that enable audience participation in diverse cultural contexts.

The main outcome of the study of cases is the identification of operative insights drawn upon the analysis of projects in which audience participation is the final outcome of the design process (design *for* participation), as well as projects bases on participatory design methods and techniques, in which audience participation occurs during the design process. In both cases the discussion is aimed at identifying and assessing novel design approaches that might support a process of heritage valorization that is socially sustainable for the community that might benefit of that heritage.

Design is therefore the point of view that informs the approach of the entire research and bridges the instances of the other domains that the research intersects: cultural learning, digital technologies, and social issues related to community engagement, empowerment, and development within cultural institutions. Without excluding the technical competencies

distinctive of the discipline of exhibition design, this approach underpins a more comprehensive notion of heritage valorization design oriented, in which the exhibition designer assumes the strategic role of mediator among the actors involved in the design process.

Moving from the development of a design-oriented scenario informed by the theoretical assumptions discussed in the earlier research phases and the operative insights drawn upon the study of cases, the final output of the research is the definition of a general framework for the design of effective participatory experiences of heritage. The participatory pilot project *Everyday History*—developed at the Santa Cruz Museum of Art and History—has been structured following the proposed design framework in order to test its usefulness, feasibility and efficacy in supporting and facilitating the work of exhibition designers and museums professionals within a design process that is capable of catalyzing the multiplicity of the voices involved in the project, including those of institutional staff, external stakeholders, and visitors.

## DESIGNING PLAYFUL ARTIFACTS

### The exploration of play as a process and the limited role of the designer

**Pietro Righi Riva** - Supervisor: **Prof. Margherita Pillan**

The entertainment industry as a whole is going through enormous changes: partly because of the disappearance of physical media, partly because of the way cultural content is consumed in our contemporary lifestyles. The rise of digital delivery and content narrowcasting, crowd sourcing, and crowd funding has changed not just business models, but the design principles behind content creation as well. Designers face new challenges in catering to groups with specific tastes. At the same time, gender, nationality, education, and age are no longer the common traits that identify niches, audiences, or customers. Discovering groups' subcultures and degree of digital immersion is key to creating new, catered entertainment content.

The video game industry has certainly evolved – from producing niche content for young males to catering to wide audiences that span ages and gender. This evolution was achieved through technological innovation and design approaches aimed at usability, simplification, cost reduction, and embedding in open and pervasive technologies, such as social networks and mobile phones.

On the other hand, success has generally been exclusively tied to pop and fantastical themes,

limiting the impact of the medium on audiences' lives and culture.

A new generation of content creators, who do not fit in the traditional professions of the game industry, is fighting to find a design language that accommodates a new range of fluid media, tackles themes specific to fragmented subcultures, and shares a common interaction model: play. As games have shifted in themes and focus, the rise of independent games has changed the panorama of game design. Today, successful games are made in genres and about topics that defy traditions of an industry rooted in action and fantasy settings. Contemporary game designers, outside of the major companies that traditionally lead the industry, have tackled the evolution of games as a communication medium in an interesting way and have demonstrated that it is commercially viable to create subversive games.

This dissertation argues that many of these games share common elements – namely, the absence of stated objectives, and the presence of interaction that is not task or objective-driven. There is a void in game literature and academia about this approach to game design and my thesis aims to fill that gap by providing a framework

for creating games that rely on player initiative in a way that is not objective-driven.

In the first part of the dissertation, a new paradigm is introduced for thinking about how games work that is not directly focused on the process by which the game takes place, instead relying on the minute elements that make playing the game possible. These elements, including visual and audio assets, actors, rules, narrative, spaces, and interactions, are discussed from the point of view of game affordance, meaning how they evoke and inspire games in players. It is then described what meaningful games are and how the model presented in this dissertation is capable of representing them. Based on this paradigm, a design philosophy is presented that focuses on managing player expectations by handling and embracing limitations in technology, design, and style, with a focus on graphic fidelity. Using the themes of virtuality and potential, it is explained how this approach fosters the design of games as a tool for communication and understanding. To illustrate how to drive behavior in games without resorting to tasks and rewards, knowledge is drawn from cognitive science and psychological phenomena. These ideas are put to a test in

a game design workshop as a demonstration of the design approach's applicability and transferability.

In the second part of the thesis, experiments that apply the described design approach are presented and its efficacy is discussed with regard to the success and failure of the results. In the experiments, the importance of managing player expectations in relation to their previous play experiences is evaluated, both in terms of inducing emotions, such as fear and surprise, and in enabling a wide range of play based on a theme. It is shown how the absence of explicit instructions and indications of success can help players find their own narratives and meaning in a game, favoring a more creative and inspiring way of play. It is concluded that play should be understood as a process over which designers renounce complete and direct control. Instead, by focusing on enabling games through affordances, inspiring a mood within a theme, and allowing for an array of different kinds of play to take place, games can be designed in a novel way as powerful tools for communication. These conclusions are significant, as traditional product categories fail to describe the latest successes in the entertainment ecosystem. Layers of multimedia interactivity enhance magazines, comics, video delivery services, advertising, and more, allowing for seamless, complementary experiences across Intellectual Properties (or IPs). Interactive content for entertainment, such as social applications, creative applications and video games blend with

other media organically, in themes, interaction models, and technologies. Transmedia ceased to be a buzzword, having become an intrinsically essential technique to the development of IPs.

To adapt, designers need to develop a common language for entertaining interactions, capable of capturing feelings and emotions that transcend those expressed in the traditional interactive entertainment industry. This is why the concept of designing play is more interesting than that of designing a game, because it's based on player behavior rather than on the game as the final product. Play design, as a research field, investigates the reasons behind play and how they apply to creating content that is playful and that inspires play.

The aim of the research is to innovate the process behind the design of games and playful activities, defining the role of the designer in successful play products, and broadening the appeal of play as a meaningful medium to convey information, emotion, and art. Methodologically, it consists of a collection of experiments that apply this play design approach to new and diverse themes and formats, to demonstrate effectiveness and measure challenges, limits, and risks. The themes tackled include politics and bias, parody, orienteering and space interpretation, fear, sensuality, and music. The exploration of these themes spawned research in technology, virtuality, playfulness, behavior, and of course game development and distribution that come together

as a body of knowledge dedicated to achieve eliciting the desired aesthetic experience, while adapting their design to the uniqueness of players' identities, cultures and desires. A number considerations can be drawn from the premises and the experiments described in the dissertation, including how games may not exist in reality as objects or artifacts and are, instead, systems enacted through designed elements during play; how the degree of playability of a specific game is not absolute, but strictly dependent on the player's biological, cultural and personal background; how visual fidelity and affordance are not directly proportional; how technology participates in the aesthetic experience and not just by limiting it, as technology limitations can be a resource for design; how there is no difference between games and toys, since both can be designed as artifacts that inspire a behavior: play. These contributions to knowledge are discussed and framed within the field of reference, concluding with a consideration on how they can contribute to the design discipline as a whole.

## HOUSINGLAB: A LABORATORY FOR COLLABORATIVE INNOVATION IN URBAN HOUSING

Liat Rogel - Supervisor: Anna Meroni

This research describes a new model for a living-lab for housing: HousingLab. I began to work on housing and their collaborative aspects after realizing how much potential collaborative services have in improving our every-day life in an urban environment. I realized that those services often need proximity (between people) and that this proximity is to be found in urban dwellings. The same urban dwellings that are well known for being places of isolation and segregation could become urban welfare hubs. I discovered this was not a new idea at all and was asking myself how come collaborative housing forms are not so common. There began my trip through existing best practices, meeting with international experts, many books and articles and mostly people living in the city that joined me on that trip and shared their experiences with me. My design background has brought me to explorations of co-creation with and for citizens. I was curious how design can infiltrate in the housing field, not only in terms of interiors and product design, but also by improving housing qualities and experiences through relationships and collaborations. The city is a wonderful place to live in. The density of people makes it rich and diverse. The development and growth of



1. Co-design session with a group of people interested in a cohousing solution

smart cities is very similar to the growth of the brain through evolutionary phases; it evolves, not only grows, it becomes more complex and exiting. The outcome and the source of a smart development is a collective intelligence: a kind of smartness made from networks and connections. Absurdly, the design of city dwellings to host so many diverse people and cultures remains traditional and old; it does not take advantage of the great potential of the social capital that will be brought-in when people will move into the house. The house remains home for individualism and isolation, a castle of privacy and security that ignores its surrounding. Why is it? Bottom-up and Top down barriers are holding back a new way of thinking about the house. From the top-down:



2. A group of neighbors collaborate to build together their shared rooms.

public administrations, private constructors, cooperative consortiums and others fear to make radical innovation in housing design. They often poorly understand the overall benefits of collaborative housing, and most of all, they do not think of the long term benefits. From the bottom up (citizens, groups of citizens) there is not enough information and availability of best practices, hence it is difficult to understand the process to take and the idea itself. The thought about losing a part of privacy is very frequent in not wanting to approach collaborative housing.

How could we encourage radical, collaborative and open innovation in Housing? The hypothesis brought by my thesis is that there is a need for a special form of laboratory

in cities in order to bring innovation to the housing field. The laboratory should be able to apply change management methods and co-design tools in order to create and enable a community of people towards

one of the methodology basics. The actions were used for the development of the design project and of this written final dissertation. The different actions I have implemented had the following aim:

housing. It is offering research and experimentation for the development of sustainable housing across 3 main areas: information, coaching and small-scale experiments. The HousingLab structure aims at

### EXPERIMENTCITY EUROPE

- Define the area of interest.
- Verify the topic relevancy and the use of a European network of support.
- Verify the local interest
- Create a local network of experts.

### VICINI PER CASA

- Verify if a coaching program can assist a group bring their dream project to reality.
- Understand what are the steps needed and which tools to use.

### SCARSELLINI-VICINI PIÙ VICINI

- Explore the use of digital tools for the creation of an active community.
- Understand of pre-housing intervention are useful for the community life.
- Explore both top down and bottom up interventions.

changing the concept of housing. It will be a living lab for housing where people, assisted by designers and architects will be able to improve their existing buildings, and better design their new ones. It is a place for private and public constructors to get a coaching plan towards the creation of new housing models.

I chose a participatory action research (PAR) to be the main leading line of my activities. This has meant that together with an overall understanding of the literature and the theoretical background, I have developed several actions that were important for understanding the main features of HousingLab. The differences in context, culture and time factors, made me decide to operate in small-scale experiments verifying the hypothesis constantly. Also, since user participation is one of the main issues to evolve in housing innovation, using PAR I am able to test this point right away since community participation is

The results from the first actions were mostly a confirmation of the need for a living-lab in housing. This has come from the confrontation with other stakeholders. This action has also made available many best practices from which to learn. The second and the third actions were more specifically a prototype of actions that HousingLab can create in the future. 'Vicini per Casa' created a model for a specific tool for coaching groups, with sub-tools for each step of the way (figure 1: codesign activity: moodboard of the future cohousing). Scarsellini is a specific tool and process for enhancing community in new buildings. (figure 2: Assembling together the furniture for the shared spaces in Scarsellini street)

The specific results from all actions has brought to the design of HousingLab: HousingLab is an innovative service design laboratory for

working with all stakeholders on a local scale by involving them in different initiatives. This participative community centered approach applies the principles expressed by the change management theories throughout the activities of the laboratory. HousingLab is thought as a living lab, a physical space supported by a virtual one that could be recognized as a collaborative environment for innovation in housing. In the last part of my dissertation I describe the service model, the offering map and the scenarios for the implementation of such Lab.



## NEW CONTENTS IN MUSEUM'S NARRATIVES. THE ROLE OF DESIGN IN THE INTERPRETATION OF ART'S COLLECTIONS

Francesco Virtuani - Supervisor: Pietro C. Marani

The work aims first to analyze the narratives – crucial dimension in the interpretation of a museum collection – adopted by art museums in the latest years, in order to understand recent trends and future evolutions, second to reflect on the potential role of design in the whole process of interpretation.

The research is divided in three parts. The first one wants to give a theoretical frame to the question of museum innovation, on the basis of the most recent studies. In order to maintain his important educative role in the society, the museum should well understand the transformations happening in social context and if necessary upgrade, in order to be a place for the present. Learning theories and communication theories play an important role in the innovation process. These reflection are very important for art museum, more conservative compared with other kind of institution, like history museums, science museums, archaeology museum, and so one.

The second part of the research focuses on the interpretation process of a collection of art, in particular on the role of the narratives. The subject is introduced by an historical frame, explaining the evolution

of the narratives from the birth of the modern museum to the end of twentieth century. The question is that traditional approach to narratives is nowadays considered no more able to answer to contemporary society needs, and for this reason art museum should improve new interpretative strategies. Some case studies in Europe has been selected in order to understand how museums are trying to propose new ways of communicating their cultural contents. Chosen museums are medium sized – considered more free and flexible to propose innovation – and dynamic institutions. Most of them are contemporary art museums, but in some cases they own also modern or ancient works of art: as the research underlines the distinction between “contemporary”, “modern” or “ancient” art tends to lose importance, in favor of the appreciation of universal values. On the basis of the analysis, the main dimensions of innovations seems to be:

- *Temporary exhibition.* Museums tends to abandon permanent exhibition of their collection in favor of temporary exhibition. We can notice a continuum between the situation in which only a few works of art turn around an almost fixed exhibition of the

collection, and the situation in which there's a continuous rotations of all the objects.

- *The narratives.* In almost all the institutions we notice a mix between several kind of approach to the order of works of art (chronological, thematic), but we can notice frequent interventions trying to break the predominant narrative. In some cases, experimental strategies try to propose a completely new approach to the order of the works of art.
- *New voices from the community.* The voice of the curator, traditionally the only responsible for the interpretation of the collection, is no longer the only one on hand in the museum. Some institutions try to improve their social role, asking to other subjects form the community - foreign communities, students, other kind of groups – to give their point of view on the collection. The role of the curator is evolving, from a situation in which he was the only owner of an objective knowledge to be communicated to the public, to a situation in which he is a sort of coordinator, a “mediator” of interpretative choices made by other subjects.
- *Intervention of artists.* Another threat to the traditional role

of the curator comes from artists, who nowadays are frequently asked to give their interpretation to the collection, sometimes performing with their works of art.

- *Pedagogical or aesthetic experience.* Museums can chose two different way to communicate the cultural values of the collection: some of them tends to follow a pedagogical/educational approach – trying to offer an easy explanation of art - others seems to prefer an aesthetic approach – trying to offer an aesthetic experience to the visitor. Both of the approaches can be an answer to the need of the renewal of exhibitions criteria.

The third part of the research wants to reflect on the potential function of *design* in the art museum's exhibition. In a traditional approach, the interpretational role is in charge of the curator. Once he decided the contents to be transmitted to the visitor, he asks to the designer to work on the spaces in order to help to communicate the message of the collection, using lights, colors, materials and so one. What we want to understand is how the work of the designer can become more significant, how he can participate more incisively to the interpretation process, working in very close contact with the

curator. This already happens in other kind of museums, but not it art museums, where – considering the peculiarity of the subject - opposition to innovation is stronger. So, looking at experiences in history museums, design museums, anthropological museums, we want to propose some innovative exhibition's strategy for art collection:

- *Storytelling.* Art museum can try to tell story using his object. This approach is considered very useful for learning.
- *Mix of different categories of objects and original combination.* Different kinds of object can be shown together with works of art, in order to help to create more exciting exhibitions: photos, documents, models, pieces of furniture, but also simple objects from every days life, able to let the visitor feel closer to the collection. Then, surprising combination between object can help the visitors to live a stimulating experience.
- *Arrangement of the object in the space: grouping and isolation.* Usually, in an art exhibition, works of art are too many and they are disposed in a regular way, causing often a sense of monotony in the visitor. The designer can help the curator to create a more stimulating exhibition. For

example, some works of art can be isolated, so that they become able to communicate their whole “aura”. Other works of art and other objects can be grouped in order to give a sense of surprise.

- *The environment.* Obviously the designer plays an important role in the creation of a striking atmosphere, using lights, sounds, materials, colors, texts, technologies and so one.
- *The question of technologies.* Technological innovation is nowadays frequently used in order to communicate and spread cultural contents. It can reinforce the mediation role of the museum and take in charge the task to facilitate the relationship between the heritage and the public, but it is important to avoid a pure technological exhibition, mainly in art museum, where works of art should be able to talk to the visitor. To conclude, technologies can be used to support the comprehension of art, but moderately and prudently.

The final part of the work proposes a project brief, in order to test concretely the role of the designer in an art museum. The museum chosen is Museo Diocesano di Milano, and the project wants to show how it is possible to exhibit in a innovative way part of its collection.

## “S&D” INTEGRATION OF SPORT AND DESIGN FOR INNOVATIVE SYSTEMS.

### Application to a Swimmer Wearable Integrated Monitoring System For Innovative Training

**Izabela Witkowska** - Supervisor: **Prof Giuseppe Andreoni**

The swimsuit project aims to designed innovative textile solutions to create a sensorized and functional swimwear for athletes who engage in amateur swimming or racing. This allows both to optimize the performance and training methods, and to monitor health conditions. Moreover, with some simplifications, the system can be used in different areas: in addition to other sports, telemedicine and safety at work. For example, in a clinical setting it may be useful to monitor cardio-respiratory diseases, which include a wide range of diseases and affect a significant percentage of the population with major impact on health spending. The wearable monitor is offered as a solution to reduce these costs as part of the expansion of telemedicine services. The new generation of sensors costume will monitor in real time during training in water: Heart rate; Breathing rate; 3-D Accelerations; Stroke number (hands & feet); Poolside timing.

Design was done in four phases: textile electrode performance validation; motion and style detection validation; swimsuit design and experimental validation.

The validation of textile electrode was performed to verify the correspondence in terms of amplitude and shape

between signal acquired with textile electrodes and the generated one. Even after varying amplitude and frequency of the generated signal, no differences were encountered (average  $R2 = 0.9988 \pm 0.00041$ ), both in the pattern and in the amplitude of the measured signal. Thus this demonstrates the theoretical reliability of the textile electrodes.

Taking into account the movements of swimmer, for validation of motion and style detection have been selected four positions of the body: on the central axis of the body just below the chest; on the central axis of the body in the middle of the back; on the central axis of the body in the lumbar region of the back; in correspondence with the right or left hip. After analyzing the obtained results was chosen the best locations for placing the accelerometer (in the lumbar region of the back). Swimsuit was designed for all, in a simple way so that everyone can to use, athletes as well as lovers of swimming. The experimental validation of prototyping product showed the correctness of obtained results.