



Renewing Design Teaching: Learning from an Innovative Graduate Programme

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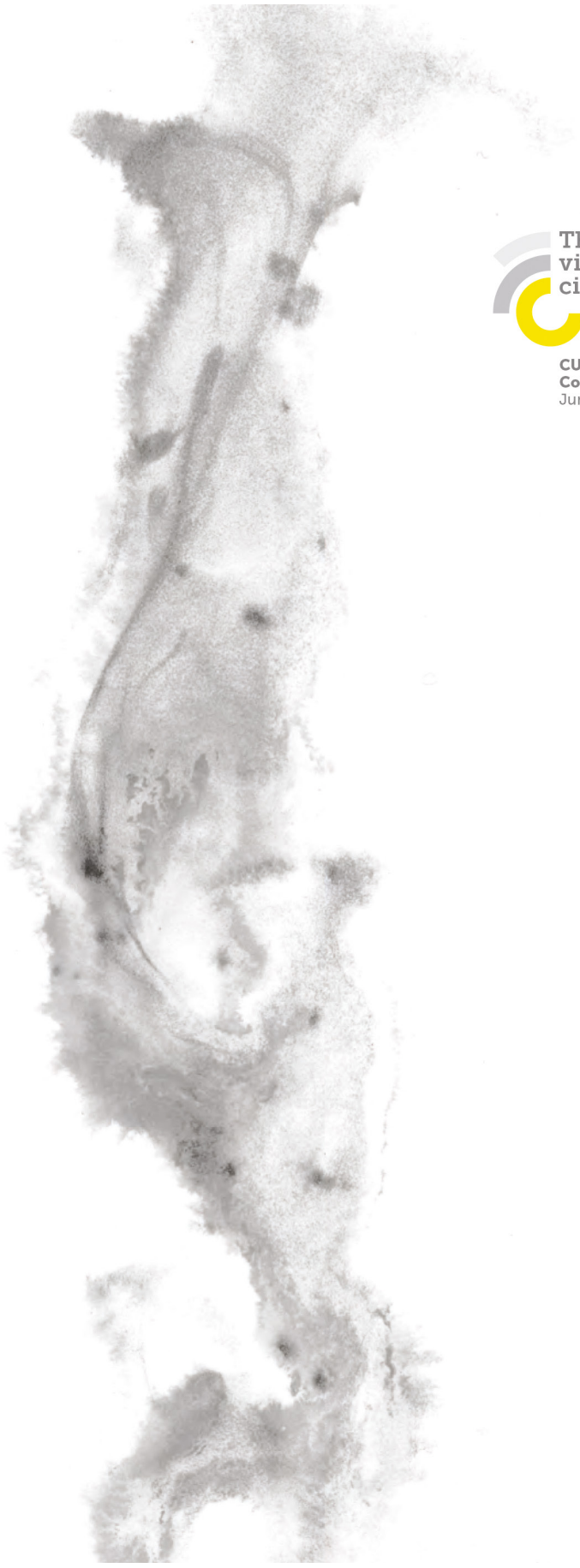
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Renewing Design Teaching: Learning from an Innovative Graduate Programme

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While innovation is currently perceived as the response to economic crises and societal issues, its processes as well as the know-how to apply it are at least a field where many things are to establish. Hence, management practices and engineering approaches currently call for a renewal in their education and their training. This renewal is often based on the integration of practices inherited from design more or less deeply in the curriculum. Yet, designers have to face more and more complex problems, which span over products and services and address social stakes and organization systems.

Designers have to face increasingly complex problems existing in dynamic socio-economic contexts, dealing with technological complexity induced by pervasive embedded systems and new wireless distributed paradigms, and deployed in financial and managerial dimensions and social and human stakes.

This paper explains how Design Thinking, developed as a project management framework integrating entrepreneurship dimension as well as actor network theory can be a way to enhance training in design.

Keywords

Design thinking, Entrepreneurship, Effectuation, Actor network theory, Education.

INTRODUCTION

While innovation regularly appears at the top of CEOs agenda, it is still a challenging task for organizations. Some researchers have proposed that the creative industries (CI) could be a source of innovative management practices because the dilemmas experienced by managers in cultural industries are also to be found in a growing number of other industries where knowledge and creativity are key to sustaining competitive advantage. According to Howkins (Howkins, 2001), the success of creative industries reflects the growing power of ideas

- and how people make money from ideas. According to Landry and Bianchini (1995), twenty-first century industries will depend increasingly on the generation of knowledge through creativity and innovation. It is in this context that the importance of design in management and engineering develops (Brown, 2009).

Already, Simon had called for the establishment of a rigorous body of knowledge about the design process as a means of approaching managerial problems.

If training of managers and engineers require a strong renewal, training of designers is equally in mutation. Indeed, designers are increasingly addressing more complex problems. Björgvinsson et al (Björgvinsson, Ehn, & Hillgren, 2013) argue that « a fundamental challenge for designers and the design community is to move from designing “things” (objects) to designing Things (socio-material assemblies). [They] also argue that this movement involves not only the challenges of engaging stakeholders as designers in the design process [...] but also the challenges of designing beyond the specific project and toward future stakeholders as designers ».

Design should now be considered as a global approach that can be deployed on several levels. According to The NextDesign Leadership Institute of G.K. Van Patter (Van Patter, 2009), design can be divided in four levels :

- Traditional design (Design 1.0)
- Product and service design (Design 2.0)
- Organizational transformation design (Design 3.0)
- Social transformation design (Design 4.0)

Every designer is nowadays supposed to be able to evolve through these 4 levels.

Yet the traditional vision of design still differs from this global formalization. Two conceptions of design can be identified: the first (Alexander, 1971) is part of the tradition of craft that aims at creating specific kinds of object from furniture to building to structures. The second approach considers design as a set of methods and processes: as specified by Simon (Simon, 1996) « To design is to devise courses of action aimed at changing existing situations into preferred ones ».

Design Thinking is the term that can regroup these both design conception. As defined by Lucy Kimbell (Kimbell, 2011) « Design Thinking has been used to characterize what individual designers know, and how they approach and make sense of their own work, as well as how they actually do it. In addition to describing the practices of designers, the term also offers a theory of design that extends Herbert Simon's ideas. In this context, design does give form to things; instead, it concerns action and the artificial ». The state of the art established on Design Thinking by Lucy Kimbell (Kimbell, 2011) defines three ways of describing design thinking :

- i. As a cognitive style (Cross, 2006; Lawson, 2005) aiming at solving problems ill-structured in nature
- ii. As a general theory of design (Buchanan, 1992) aiming at taming wicked problems

- iii. As an organizational resource for businesses and organizations looking for innovation (Brown, 2009; Dunne & Martin, 2006)

The authors do believe that design thinking is a global approach as developed in the model of D. Fallman (Fallman, 2008) that can be effectively used to train managers and engineers but also used to train designers to deal with the complexity of problems they will have to face during their professional life. Design Thinking can be a natural way of integrating socio-economic context, technological complexity induced by pervasive embedded systems and new wireless distributed paradigms, financial and managerial dimensions and social and human stakes. The design thinking as developed by the authors corresponds with a constructionist epistemology as found in the approach of Nigel Cross (Cross, 2006), is formalized as a process (Findeli, 2001), is used as a teaching strategy that enables understandings and innovation through interactive engagement with both the process of designing and design from multiple perspectives so as to melt unlike things together to generate new insights (Peirce, 1998) and is finally deployed in firms as an methodological and organizational resource (Brown, 2009).

A pedagogical experience is currently led in France, driven by an engineering school and a business school, aiming at training entrepreneurs and intrapreneurs for innovation through a 2-years post-bachelor degree designed for and by design thinking. Results from this experience give several insights on how the training of designers can be altered to face the new challenges of complexity.

This paper is organized in four parts: first we describe the I.D.E.A. Programme and its pedagogical structure and approaches. Second, we develop the way design thinking is taught and used in this curriculum in conjunction with entrepreneurship. We put a particular emphasis on the links that academic courses and project-based learning practices create between design thinking and entrepreneurship. The third part is dedicated to the actor network theory as developed in the program from transdisciplinary practices resulting from the synthesis of disciplinary fields of design, management and human sciences. We then conclude and develop perspectives.

THE I.D.E.A. PROGRAMME

The I.D.E.A. Programme (Innovation, Design, Entrepreneurship and Arts) is a two-year graduate degree jointly created by an engineering school and a business school. With IDEA, design as a set of principles forms the foundation of the whole curriculum in an integrated way.

THE PRINCIPLES

The objective of the program is to train future managers by breaking the existing silos between design, the arts, technology and business as per Dunne and Martin (Dunne & Martin, 2006). The program aims at educating students able to

create new firms or to manage innovation departments in existing firms. Teaching design to managers is not new, however (Glen, Suci, & Baughn, 2014). It was pioneered at the London Business School in 1976, and the first program of design management at a design school was started in the 1980s at the Royal College of Art (RCA) in the UK. Results were disappointing, however (Wastell, 2014). Often considered as a packaging of creativity in a process, one of the reasons is that design was taught as an addition to other subjects such as marketing or strategy instead of design as a set of principles forming the foundation of an integrated curriculum (Beckman & Barry, 2007; Dunne & Martin, 2006; Stevens, Moultrie, & Crilly, 2008). To address this issue, programs combining design thinking and business thinking (so-called 'd-schools') were launched in recent years at Stanford in the US, Aalto University in Finland, Imperial College in London, and other institutions across the world (Melles, Howard, & Thompson-Whiteside, 2012). They constitute a new attempt at a holistic approach to create a management curriculum based on design from the ground up.

The model we developed takes its roots in the triad developed by Tim Brown (Brown, 2009). According to Brown, innovation is the conjunction of three elements: feasibility, viability, and desirability. Feasibility is covered by courses delivered by the engineering school. Viability is covered by courses given by the business school. Desirability, which includes design, creative and cultural aspects, is covered by a diverse, ad-hoc faculty from both schools and external lecturers. The program is not aimed at teaching Design Thinking as a discipline to existing students of the two institutions, but at educating bachelor students on the basis of Design Thinking from the ground up, in conformity with the objective of renewing innovation practice. Accordingly, the program has its own recruitment process and criteria.

As such, I.D.E.A. is representative of the new generation innovation programs based on design thinking aimed at future managers and entrepreneurs, and can be considered an exemplary case (Yin, 2009) in pedagogy research. Unlike the majority of similar attempt, our program is a graduating master degree focused on two years of intensive design thinking practice combined with entrepreneurship mindset. An important difference with existing programs, however, is the emphasis that the program places on the actual production of artifacts early in the process. I.D.E.A. was granted an IDEFI funding by the French government and was recently recognized by the International Council of Society of Industrial Design.

PROBLEM-BASED LEARNING STANCES NESTED IN A PROJECT-BASED LEARNING APPROACH.

In line with the principles of Design Thinking, real life projects form the cornerstone of the curriculum. Design Thinking seen as project management integrates both with Problem-Based Learning and Project Based Learning. Problem-Based Learning is an instructional learner-centered approach that gives students responsibility for problem definition, research conduct and theory and practice

integration. Each phase of the Design Thinking as project management offers by itself a natural problem-based learning situation. Problem-Based Learning uses design and project experiences to transfer and integrate learning, thus amplifying the experiential learning as described by Kolb (Kolb, 1976). Furthermore, using these two nested approaches enables to profit from their complementarity as described by Perrenet et al (Perrenet, Bouhuijs, & Smits, 2000). First project tasks are closer to professional context and cover longer time periods, and project work is more dedicated to the application of the knowledge when problem-based learning is more directed to the acquisition of the knowledge. In Project-Based Learning, the management of time, resources and task allocation is very important. Hence the approach can be described as small “project-oriented studies” gradually switching to “project-oriented curriculum” (Heitman, 1996) to implement the principles of Design Thinking.

The first year of the program is articulated around four projects, P0 to P3.

Project P0 is the first step of the project-based learning methodology based on the realization of a “simple” object (glasses) starting from typography bases.

Project P1 is the first project where multidisciplinary groups are composed by the IDEA Programme. Starting from given objects, students have to develop an interactive exhibition around a given theme for the annual Festival of Lights in Lyon, France (which has millions of visitors). With this project students have two objectives: 1) To integrate arts and creativity to create aesthetic and interactive artifacts telling a story to the public; and 2) To create, prototype and manufacture the artifacts they have imagined. Compared to P0, the artifact gets more complex as new dimensions are added (aesthetics, storification, etc.) The solidification of the design thinking approach is focused on this project on establishing a meaningful product through a broad (arts, culture, literature and technology) state of the art exploration. The artifact produced is complex since students go beyond the prototyping stage to the product stage with full meaning. Interaction with the public visiting the exhibition is introduced, providing an increased social dimension.

Project P2 is a proposition that could be issued to any design agency. Students experiment the whole Design Thinking process (including problem definition) and address Brown’s (2009) three elements of design: feasibility, viability, and desirability. In 2013, the brief was to “Imagine a product or service that takes inspiration from bees as a society and as dissemination vectors in the context of Big Data and Urban Mobility” and the event concluding the project was held in conjunction with Biennale Internationale Design Saint-Étienne and received 15,000 visitors. Six out of seven projects were viable enough to eventually be exposed, and two of them moved to startup phase.

Project P3 has a different nature. It is a three-month internship abroad in an NGO designed to develop students’ intercultural and anthropological awareness in innovation processes.

The second year of the program focuses on the viability of the Design Thinking triad with a strong emphasis on entrepreneurship. The project called “Grand IDEA” begins in Project-Based Learning mode from September to January

before becoming either an internship within an existing company or a startup within the associated incubator of IDEA for the following six months. The aim is to significantly increase the ambition of the project along the two dimensions of social and artefact complexity.

DESIGNERS AND ENTREPRENEURS: TWO COMPLEMENTARY APPROACHES

In this program, a strong emphasis is put on design thinking during the first year, and on entrepreneurship during the second year. Science and technology are taught from the “making” and “producing” points of view: students learn the basics in mechanics, energy, material sciences and electronics to be able to make and the basics in industrial engineering for the aspects of production and processes. Social and Human Sciences are taught with a strong emphasis on the weight of anthropological dimensions of any innovation process, material and immaterial, and the central question of actors playing in innovation, with Actor Network Theory that will be developed later.

DESIGN THINKING AND EFFECTUATION COMBINED IN A PROCESS OF TRANSFORMATION OF IDEAS TO SOCIAL ARTEFACT.

One of the main difficulty in the program's approach is to merge those different fields in a transdisciplinary way. The project-based learning approach facilitates this but we had to develop a conceptual formalization of our approach. The main bottleneck in this formalization lies in the apparent difference of objectives between design and entrepreneurship and particularly effectuation. Indeed, designers focus on the product or services they are developing whereas entrepreneurs are focusing on the creation of a market. The way to combine these two apparently divergent aspects had be found in the definition of innovation (Schumpeter, 1934), as a novel combination of resources carried out in practice, i.e. subject to attempts at commercialization. Behind this definition lies the idea that newness is socialized through the process of diffusion and/or adoption. Building on this and based on Sarasvathy (Sarasvathy, 2001), we then define innovation as *the successful transformation of ideas into social artefacts* such as products, firms or markets and then find a way to articulate design and entrepreneurship. Hence in innovation, two important dimensions must be taken into account: the degree of complexity of the artefact created, and their social dimension (in the sense of commitment) as shown figure 1. The degree of complexity of an artefact, in the context of design thinking, is the number of dimensions introduced into it. It can range from a simple product that is redesigned, such as an eyeglass frame, to a software application and to a firm. Hence the success of the resulting artefact, particularly for complex ones, can be directly linked to the ability of people committed in its building to interact through silos and to mix from multidisciplinarity to transdisciplinarity. The social dimension ranges

from simple, passive interaction (e.g. market research) to getting user insights (design thinking and empathy) to social commitments. By social commitment, we mean the active involvement of a stakeholder in the project evidenced by the supply of resources (tangible or intangible). Examples of commitments include an acceptance into an incubator, a pre-order by a customer, etc.

This integration of social commitment and taking into account of stakeholders to go beyond the notion of object/product/service to deal with the notion of social artifact has been the keystone of the merging of entrepreneurship, social sciences and design thinking. From the complexity of the artifact and the commitment dimension, it is then possible to infer the value generated and associated to the social artifact. The I.D.E.A. Programme is young (three years of existence) and we chose to focus on the evaluation of the process in a first step and then on the evaluation of the results in the second step. That's why the value generated has not been fully explored yet but will be developed in a near future according to the works of T. Lockwood (Lockwood, 2007, 2009), T. Woodall (Woodall, 2003) or J. Schmiedgen (Schmiedgen, 2011).

DESIGN THINKING IN I.D.E.A. PROGRAMME

Design thinking is actually an expanded practice of design project that has proven for the last 150 years its relevance in shaping the production of our industries, changes in our society, while incorporating the man in his process; not only by the practices and uses but also by the imaginary.

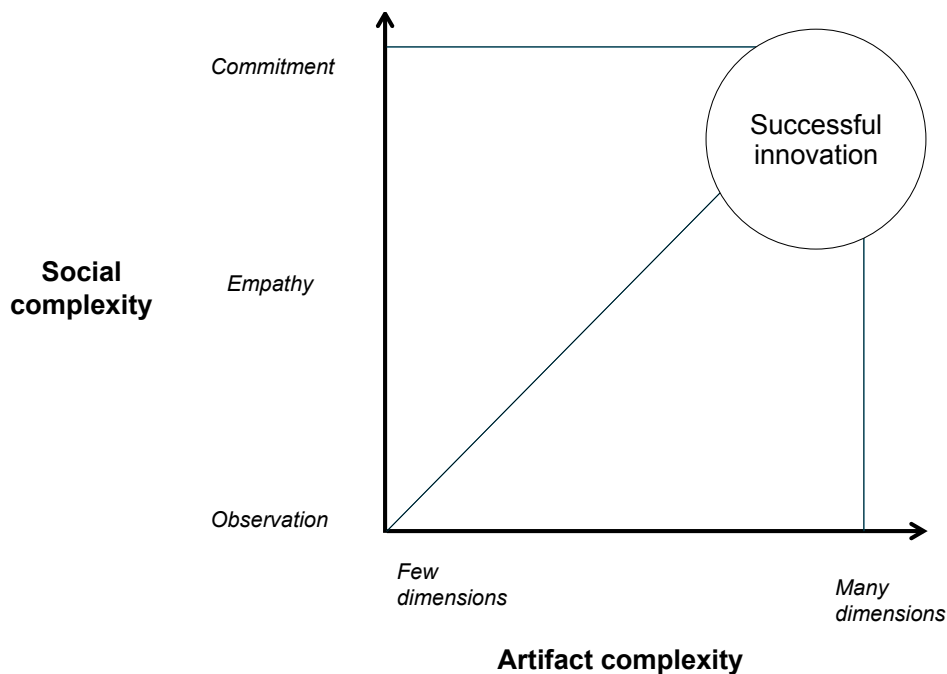


FIGURE 1 - Social artifacts or how to integrate social commitment in artefacto complexity

Design thinking is relevant when it deals with an open question, not a "market driven expectation" that would have been predetermined. "With design thinking, instead of wondering how to solve a problem, we wonder why we have this problem. Just this change in approach is enough to find new ideas," says Mikko Kämäräinen CEO of Infinity (previously Provoke), one of the world's top-ranking innovation and design consultancies.

Contrary to conventional design (qualified of D1.0 or D2.0 cf. section INTRODUCTION) aiming at solving problem in silo mode, the practice of design thinking seems to bring the design in the sphere of general management of the company and its strategic thinking.

On the other hand, from a design training point of view, the practice of design thinking often leads the designer to gain a rigorous method based on a systematic use of socio-economic, cultural, artistic and technological dimension, intellectual, especially during the initial phases of research.

Design thinking in the IDEA programme is practiced by students coming from very diverse academic backgrounds, including some design schools. From our two years of experience, we can make some observations.

If the project management driven by Design Thinking facilitates the mutual knowledge, sensitivity, depending on the academic provenance of the students, we have noticed some behavioral characteristics in the integration within teams, particularly with regard to the design schools.

Students from design schools take some time to understand the importance of transferring the recognition of their practice not on the notion of authorship, which in fact is not shareable, but on the value of their specific know-how.

They do not easily foresee the managerial dimension, even possibly the leadership position, that their job allows them to glimpse. As to the entrepreneurial dimension, it is usually limited to the creation of a design agency. This is all the more surprising as many new concepts are produced each year in the schools of design without creating activity of their development. This certainly is a vision of design professions limited in their sole creative dimension sometimes reduced to craft (design D1.0 according to Van Patter), and too often turned to the ego of the creator.

On the other hand, one can easily make the observation that design schools create few academic content and produce little research articles. This may explain a lack of intellectual rigor in the development of assumptions and concepts. IDEA Students from design schools estimate the end of their first year that they have re-learned their craft, and have taken the strategic dimension that their activity can create within the company. They realize that "giving a shape" is to create a language that is both emotional and rational that deeply impacts business success, whether to give shape to a use, to build brand values or to give substance to a significant innovation. These actions are directly related to the success of the business, so they have a strategic dimension... Beyond the recognition of the "creator" (but there are still many projects you are not the result of a team multidisciplinary), design thinking is then the language of project and innovation.

ENTREPRENEURSHIP IN I.D.E.A. PROGRAMME: EFFECTUATION

Consistent with the view of innovation as the successful transformation of ideas into social artefacts, the I.D.E.A. Programme relies on Effectuation (Sarasvathy, 2001) as the cornerstone of its entrepreneurship dimension. Effectuation is the logic of entrepreneurs thinking and acting in conditions of uncertainty. Effectuation posits that entrepreneurs (and by extension innovators) bind with other actors to decide what to do. The growing network of actors (or committed stakeholders) constitutes an emerging artifact, i.e. through this operation of design, entrepreneurs create an artificial separation between the committed stakeholders and the exterior (Simon, 1969). Accordingly, Entrepreneurship is seen as the process by which individuals design new artifacts through a process of social transformation, i.e. by working with others. It is important because by viewing entrepreneurship as a science of the artificial (Sarasvathy, 2001), Effectuation links entrepreneurship to theories of design. More globally, effectuation shares with design thinking (as developed in I.D.E.A. Programme) both its roots in pragmatism and constructionism and its focus on human. Indeed, similarly to design thinking, opportunities in effectuation are not discovered but imagined and built (Dew, Read, Sarasvathy, & Wiltbank, 2011). As well as design thinking is centered on the use, effectuation focuses on human action. Hence Entrepreneurship becomes another field where design theories apply, with the same epistemological foundations, but with an added social dimension, which brings about the importance of the network of actors.

THE ACTOR NETWORK THEORY

The importance of the network of actors has long been highlighted by the research on innovation. Actor-network theory (ANT) is a constructivist approach to social theory and research, originating in the field of science studies, which treats objects as part of social networks. The way we use ANT in IDEA program is derived from studies on controversies in science and technology (Akrich, Callon, & Latour, 1988; Callon, Law, & Rip, 1986) combined with tools from methods of collaborative work (mind mapping, visualmapping...). ANT enables the mapping of relations simultaneously material (between objects and actors) and semiotic (between concepts). ANT is a key tool in Programme I.D.E.A. since it helps to understand the way that different actors seize a "problem" (seeing the background emerges and defines it as such) and position themselves on the chessboard of constraints, stakes, resources and opportunities.

ANT can be found in disciplinary fields of social sciences, design and business and management. We integrate those different practices as part of the design thinking as a strategic tool deployed at two levels. On the first level, at the global scale of the project, it permits the identification of the context and stakes in the associative, mediatic, socio-political and economic dimension. This tool is vital to situate a project in its environment and by caraterization of the links between

every stakeholder, it helps to identify both bottlenecks and dynamic means of leverage. At a second level, on a more individual scale, it helps the project manager to place himself in his environment and in the same manner as on the global scale, gives him tools and means to alleviate bottlenecks and to create dynamics synergy to make the project advance.

This approach has been deployed in I.D.E.A. Programme for two years and has shown its relevance, particularly in the second year project. It has been perceived by entrepreneurs as a fundamental tool of their business building to be placed at the same level as design thinking. For students accomplishing their internship in firms and industrial entities, this tool has been fundamental to insert innovation in their structure and was very well received by industrials.

We believe that this approach should be integrated in any design curriculum for its contribution to the social but also to the economical dimension

CONCLUSIONS AND PERSPECTIVES

In this article, Design Thinking has been presented as a global approach of complex systems and organizations able to give an answer to current social and societal stakes. Mostly deployed in engineering and business curricula, Design Thinking as implemented by the I.D.E.A. Programme could be a way to explore a renewal of design teaching in design school to go beyond the two first levels of design thinking as stated by VanPatter.

So as to deepen the formalization of the design thinking as developed in this work, further works will be developed to describe more precisely the blending of entrepreneurship, design and social sciences and the links created. Furthermore, a more detailed framework is currently under process to link the evaluation of the process as presented here (complexity vs commitment of the social artifact) to the generated value.

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DESIGN CULTURE AND EXPERIMENTATION

Design comes out of the interaction between a practice, which seeks to change the state of things, and a culture, which makes sense of this change. The way this happens evolves with time: practices and cultures evolve and so do the ways they interact; and the attention that is paid at different moments to one or other of these interacting polarities also evolves. In the current period of turbulent transformation of society and the economy, it is important to go back and reflect on the cultural dimension of design, its capacity to produce not only solutions but also meanings, and its relations with pragmatic aspects. Good design does not limit itself to tackling functional and technological questions, but it also always adopts a specific cultural approach that emerges, takes shape and changes direction through a continuous circle of experimenting and reflecting. Because the dimension and complexity of the problems is growing, it is becoming evident that to overcome them it is, above all, necessary to bring new sense systems into play. This is ground on which design, by its very nature, can do much. Indeed, the ability to create a virtuous circle between culture and practical experimentation is, or should be, its main and distinctive characteristic. However, for this really to happen it is necessary to trigger new discussion and reflection about the nature and purpose of design practice and culture.