Advanced Design as a paradigm for design education: learning systems within its platforms and practices.

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Abstract: Advanced Design is a systemic practice of continuous innovation, interdisciplinary, capable of undertaking complex projects thanks to its capacity to combine instruments and competencies (Celaschi, 2010) and which acts at the Front Ends of Innovation (Cooper and Kleinschmidt, 1986; Smith and Reinertsen, 1991; Koen, 2002), finding opportunities and pre-configuring products through the use of design tools and processes. The purpose of this paper is to examine the learning systems within the practice of ADD as well as some of the platforms that use this paradigm in education. It will present three educational experiences based on the development of projects: previous stages at New Product Development, multidisciplinary processes and distributed collaboration. The learning experiences offer the opportunity to develop skills in: (1) innovation and social entrepreneurship, (2) the generation of territory innovation paths, and (3) the creation of portfolios of future systems, products and services for global and local organizations.

Keywords: Education. Advanced Design. Systemic Design. Territory.

1. Introduction

Multiple factors have influenced the emergency of different approaches to the processes, praxis and teaching of design. From a general perspective, it is worth noting that during the second half of the 20th century the practice and understanding of design underwent significant change. From definitions such as a body of understanding known as “the science of design” (Gregory, 1966), to those theorists who viewed the discipline as a “third culture” (Archer, 1979, Cross 1982), there arose a plethora of different roles and fields which rapidly modified design activity and ultimately design education. Heskett (2002) at the beginning of this century, opened the door to diversity, otherwise known as the “cultures” of design, many other authors use the concept of diversity in design to approach contemporary definitions and studies, Ackin (2001) for instance, compares engineering and
architecture empirically to demonstrate significant differences between them, both in their strategies and management as in ideation and solution. Diversity as an historical characteristic of design appears to increase in the last decades, increase in the number of roles and “cultures”, in fact some of the contemporary authors recognizes that this phenomenon is in itself not just a definitional attribute of design but a significant strength of the discipline.

Some of the new roles are broader activities with more complexity, referred to by some as “emerging design disciplines” (Sanders and Stappers, 2008). In this context Advanced Design (ADD) appears as a particular design culture, which although consolidated within some sectors of the industry (Celi, 2010), has not been seen to any significant degree in schools of design, despite occurring naturally as part of the activities carried out by practitioners and which is going to be one of the dominant models in the future (Borja de Mozota, 2006). Advanced Design is a systemic practice of continuous innovation, inter-disciplinary, capable of undertaking complex projects thanks to its capacity to combine instruments and competencies (Celaschi, 2010) and which acts principally at the Front Ends of Innovation (Cooper and Kleinschmidt, 1986; Smith and Reinertsen, 1991; Koen, 2002), finding opportunities and pre-configuring products through the use of design tools and processes.

The purpose of this paper is to examine the learning systems within the practice of ADD as well as some of the few platforms and practices that use this paradigm in undergraduate education. It will present three educational experiences based on the development of projects in complex environments: previous stages at New Product Development (NPD), multi-disciplinary processes and distributed collaboration. The learning experiences offer students the opportunity to develop skills in: (1) innovation and social entrepreneurship, (2) the generation of territory-specific innovation paths, and (3) the creation of portfolios of future systems, products and services for global and local organizations, but must of all, this experiences prepare them with competences for the contemporary design praxis.

Concerning this matter, ADD is presented as a practice oriented to the identification and visualization of future intervention opportunities, on different contexts of action: companies, government entities, agencies, educational institutions, among others. This approach is significant to design, and very important for regions that would like to understand the complexity implicit in the contemporary dynamics of action, as well as the new role that the designer has within them; advanced designers work becomes crucial in the early stages of research in which anticipation, strategic design and applied systems are assumed to be elemental in the identification and development of opportunities.

2. Measuring ADD activity

Some authors introduce the concept of complexity as a framework to understand the profound transformation that design is undergoing (Bar-Yam, 1997; Thakara, 2006; Tesler y Saffer, 2007; Norman, 2010), because it is addressing more and more variables in its processes. Brown (2009) describes it as an increasingly broader role that moves design further back to the earliest stages of product design, and later to the stages of its implementation. ADD operates precisely in those extended and complex territories (Celi, 2010; Celaschi, 2011; Íñiguez et al, 2014), and it is characterized by being:
• Visionary and strategic (Borja de Mozota, 2006; Desserti, 2010, DiBartolo, 2014) since it is more oriented to the world of possibilities and creates strategic visions of innovation for companies.

• Anticipatory (Borja de Mozota, 2006; Celi, 2010; Iñiguez et al, 2014), design is naturally oriented towards the future (Holt, 1990), but in ADD the project horizon is broadened, not only months or years but lusters or even decades.

• Exploratory on its approach (Ceppi, 2010; Celi et al 2011), as it addresses non-traditional issues, it develops new processes and the roles of practitioners are transformed.

These mentioned characteristics are very valued in more and more industrial sectors, but it has been barely included in a structured way in the educational undergraduate environment, not to mention its recognition in terms of the particularities and competencies that produces, that is why the authors propose that it could be a interesting new paradigm for contemporary undergraduate design education. Among these characteristics Iñiguez et al (2014) present twelve specific attributes that frame ADD activity, presented as an holistic level in which design brings greater value on companies. Table 1 (below):

**Tabla 1. Advanced Design Attributes**

| No | Attribute | Description |
|----|-----------|-------------|
| 1  | Complex   | Manages complexity and uncertainty |
| 2  | Meta-proyectual | Acts at the first steps of Innovation (Front-End of Innovation) |
| 3  | Systemic - Adaptive | Uses adaptive, unconventional and non-linear methodologies opportunistically. Manages variables with a systemic approach |
| 4  | Multidimensional | Includes broader dimensions to the projects: time, space, culture and markets |
| 5  | Horizontal | Transversal to the organization and its departments |
| 6  | Prospective | Defines future scenarios, visions and proposals |
| 7  | Process-oriented | Understands design more as a process than a final result |
| 8  | Innovation-driven | Does not necessarily offer specific solutions, but guides innovation |
| 9  | Conceptual | Linked to the concepts more than the technical details |
| 10 | Visual/Verbal | Has a higher degree of abstraction and uses different media during its processes |
| 11 | Strategic | Oriented to the company strategy more than the operation or application |
| 12 | Cross Fertilization | Across different industrial sectors, across different knowledge |

These twelve attributes are a reference for understanding the particularities of ADD, the starting-point from which the innovation guided by design is circumscribed by particular methods of operation in this broader culture of design; the different attributes of the lists have proved to be successful to measure the innovation processes in industry, using them as a tool denominated TADDA: Tracking Advanced Design Attributes (Iñiguez et al, 2015).

TADDA is a way to visualize (and ultimately measure) the characteristics of the ADD by seeing them naturally related to the different stages of design process development. The tool can also include the visualization of the competencies that we would like to observe, since the interest is to understand ADD as learning environment. The competencies that we selected have been used by the authors in one of the platforms to be presented later, the POLE platform; this platform has been developed starting from a list of professional innovators competencies (defined by the University of Applied Sciences of Northwestern Switzerland). The list of competencies is mainly subscribed in two areas,
trans-disciplinary and sustainability: disciplinary competences, social competence, competence for implementation, awareness of one’s own limitations, respect of other disciplines, familiarity with and respect for cultural differences, ethical thinking and acting, responsibility for future generations (Holliger, 2012). TADDA model is shown below (Figure 1).

With the two (in horizontal) lists of the tool we are able to measure the ADD frame and the learning environment.

3. Learning within the practice of ADD

The incorporation of an ADD framework for educational experiences provide useful operative tools, tools that boost the contemporary designer performance, new approaches that become fundamental from the formative scope. This idea has been considered in some schools as a starting point in the professional training of students, this is the case of Tecnológico de Monterrey, a university based in Mexico, which with a very broad relationship with different universities in the world carries out actions oriented towards this objective. Three of these experiences will be described below using the TADDA tool; the authors carried out stakeholder surveys, ethnographic observation and action research in order to fill the tool as a conclusion for each of the relationships of the table, the results are expressed in a particular color, where green represents the highest degree of coincidence, yellow represents intermediate degree, and red, negative.

3.1. T.People: Design for Social Innovation + Design Entrepreneurship

The educational platform called T.People is a platform of design for social innovation, yearly creates projects based on the global challenges of the United Nations (for instance: hunger or water, that have been the themes of the last two editions); the platform invites students and teachers from different disciplines, the interdisciplinary environment have included participants from health
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sciences, humanities, engineering and architecture. In addition, the actors are from different cities (Campi) of the country, so they develop the project in specific localities sharing learning between them. During the project, opportunities are identified together with the communities and strategic partners (private and public organizations) and solutions are developed based on entrepreneurial strategies that the students can manage as social enterprises. (Figure2).

Figure 2. TADDA T.People project.

3.2. Glocal-Prefuture: Strategic Design + Design Futures

Glocal-Prefuture is an exercise that aims to create a catalog of innovation possibilities for the "Digital Creative City" (CCD), during the last four years it have created with different groups more than forty projects that add to this portfolio, creating innovation corridors or the future. The CCD is a territorial innovation project located in Guadalajara, Mexico, that got born with two main objectives: the first one is to create a business cluster of creative industries (in particular: digital animation, multimedia, cinema and music) and the second one is to create an urban project that rehabilitates the center of city. CCD’s background is the cluster of the information technology and electronics industry that some decades ago was considered as a project and that today is a reality (60% of the state's exports are products of the cluster and has been denominated the "silicon valley" of Mexico in different means). During the project the students develop future scenarios that include systems, services ans products that in the horizon of ten or fifteen years could be significant for the objectives of the city. (Figure 3)
3.3 POLE (Project Oriented Learning Environment): Multidisciplinary Design + Distributed Innovation.

POLE is a platform with more than fifteen years of existence, it was created by Dr. Christoph Holliger in its transit from Stanford University to the University of Applied Sciences of Northwestern Switzerland, at present it gathers a network of twenty prestigious universities from all over the World. It brings together students and professors from the network that annually develop a project for a specific global partner (some examples are AUDI, United Nations, Continental, etc.). This project is carried out in a multi-disciplinary way where groups of students from different regions intermingle to achieve heterogeneous teams, not only in disciplinary terms but in nationalities and cultures. The project begins attending presently, but then it continues by collaborating from their respective locations through technology platforms, so that they experience multi-disciplinarily and multi-culturally in a distributed way. The project develops designs and solutions of new services and products that could be possible new formulas in the future for its partners. (Figure 4)
design with the educational environments of the future designer, so the students would be able to be change makers that will act as a strategist in the generation of sustainable futures, with broader perspectives and fields of action. The cases that we presented portray this connection, by describing the relationship between the stages of process development and the attributes of ADD as well as the competencies concerned.

On the first case, the focus is about opportunity finding along with the communities and strategic partners, developing solutions to specific community challenges, therefore, the emphasis is determined by Design for Social Innovation + Design Entrepreneurship. In the second case, the approach is totally anticipatory acting from the Strategic Design + Design Futures. For the third case, the focus is on the competencies development for collaborative, multidisciplinary and multicultural work thru technological platforms.

These learning systems that incorporate the fundamentals of ADD are oriented towards the education of a new designer, a new designer profile capable of systemically interrelating variables in increasingly complex environments. This new profiles might be paradigms and agents of change for design education, a design education more collaborative, connected with the community, and responsive for the future.

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