THE CREATIVE COMPETENCIES DICTIONARY, BETWEEN DESIGN PRACTICE AND EDUCATION IN 21ST CENTURY

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ABSTRACT
The rapid speed of technological advances, communication and the current market are constantly questioning the role of designers in society [2]. This context leads to novel questions about design students' curricular profile in the 21st century. Nowadays and following the Bologna Plan, education is changing its focus from acquiring information to learning how to use this information competently, which involves an evolution from "being" and "knowing" to "knowing how to do" [8]. At the same time, competency assessment is becoming increasingly present in the field of design where competencies are considered a differential factor among professionals [7]. One of the most outstanding aspects in the study of competencies is the revaluation of creativity as a key factor in employability and the management of an uncertain future [3].

This article defines the competencies that current and future creative professionals must develop in order to successfully perform the role they play in the design field. Fifteen professionals and design students were interviewed in order to define these creative competencies.

The research concludes with the identification and definition of ten creative competencies, an initial list that shall remain open to constant review. One way to keep it updated is through an online platform created to collect data on an international scale.

The main contribution is to establish a dialogue between the creative competencies in academics and the professional world to ensure design education is constantly updated.

Keywords: Design education, creativity, design methods, creative competencies, design curriculum

1   INTRODUCTION
In the current context, marked by rapid progress in technology, economy, labour and social changes occurring in our society [1][2], many authors position creativity as a key factor for equipping designers with the ability to overcome the challenges of the future [3][4]. According to Williams and Askland, creativity is the means for achieving balance between present realities and 'future opportunities for cultural reproduction, technological advance, innovation and intervention' [5]. This is why analysing creativity has been on the rise in recent decades with authors focusing their studies on how to measure it and indicating that in doing so, it is best not to use a single model but rather a combination of various models [6].

Just as creativity is becoming a key element for employability, competencies are considered a differential factor among professionals [7]. The ease with which a great quantity of knowledge can be accessed using information technologies and the increased average education amongst the population means the current challenge does not lie with acquiring information but rather using it competently and knowing how to look for, select, interrelate and apply the acquired knowledge [8].

After the implementation of the Bologna Declaration throughout Europe [9], in academics context there has been a great deal of research on competencies in various fields in order to reduce the gap between professional practice and education, so students can be trained with the skills, capacities and knowledge demanded in the professional world.

Recently, the Design Council [10] [11] published a report connecting design competencies with the United Kingdom economy. According to the study, people who have competencies inherent to design

are more productive than average. However, there is a competency gap among design professionals which may be caused by the rapid technological progress and the development of new products and services. In order to close this gap, the study highlights the need to research and develop design skills as it considers they are a key factor for innovation and future growth.

This scenario poses questions about 21st century design students' competency profiles which must be approached in academics as well as in companies and institutions considering the current and future social, technological and environmental challenges.

In view of this framework, the decision was made to focus the research on creativity based on competency analysis in the field of design in the understanding that creativity is much like a multidimensional construct [3][5]. This article identifies and defines the competencies found in designers' creative profiles in the belief that creativity is not an autonomous and isolated competency but rather connected to all other competencies which foster its development.

2 RESEARCH METHODOLOGY

The methodology was designed to collect data on different levels. A first list of competencies used as a script to interview design professionals and students was prepared based on literature review. This list was used in the business context to conduct a case study at a SME and in academics by working on a creative challenge suggested by SMEs. The observation carried out provides qualitative data that may be analysed along with the quantitative data collected by an online questionnaire. This methodology enables the identification of ten competencies and their 20 dimensions which were then used to produce a radiograph on the behavioural models related to the creative process. It offers an image of the many ways in which designers and creative people work nowadays in an absolutely dynamic and global market.

2.1 Literature review

The first list of creative competencies was extracted from a literature review of the main authors in the areas of design, creativity and cognitive psychology focused on the study of competencies. This information was viewed in a table to cross-check the lists of competencies created by each author and obtain a map of competencies most often identified by the various authors [9][11][12][13][14][15]. In this table, competences are organised according to the groupings defined by the authors, such as social, cognitive, organisational, executive or managerial competencies. A first list was prepared based on this literature review comprised of 15 competencies and 48 indicators. Each competency has several indicators or behavioural elements to be able to identify to what extent a particular behaviour is reflected. This initial list was used as a script for the interviews.

2.2 Interviews with Design Professionals and Students

Fourteen interviews with design professionals and students were conducted using the Critical Incident Interview (CII). This semi-structured interview model is similar to a conversation where the person being interviewed narrates the design process, emphasising the most critical points thereof. The interviewee is asked to explain a project that they have carried out in the last two years, since it will be recent enough for them to remember the details and to deepen into the processes carried out for the creation of the final product. In this way, the interviewer acts as a narration driver, asking indirect questions that invite the interviewee to explain their professional practice, placing special emphasis on critical points of the process and understanding how the designer solves those conflicting situations. The audio from these interviews was recorded to generate an interview transcript for a later analysis.

The specialised bibliography highlights the need to unify the profession and education in competency analysis. To represent both cases and identify the creative competencies in common, the interviews were conducted with a total of 14 professionals - 7 designers from different fields and 7 engineers. Those interviewed were chosen to represent diverse perspectives of design. The sample was selected considering their professional experience (junior -less than two years of professional experience; intermediate - two to five years of experience; and senior - more than five years of work). It also considered the type of design so it would be as heterogeneous as possible, and the relevance or representation of their work was valued based on any awards received, competitions or academic recognition.

Thus, the research includes data that reflect both profiles -design and engineering professionals and students- thereby blurring the line between professional and academics as concerns competencies.

Once the first interviews had begun, the research method was evaluated to verify its reliability and the script used for them was revised. Afterwards, the interviews were analysed. The procedure consists of distributing a set of interviews, both in recorded audio form and transcriptions, among the research members to firstly evaluate the presence or absence of a particular competency in the interview content and, secondly, to define the competency level reflected in the interviewee's discourse. This process made it possible to redefine and restructure the first list of creative competencies as well as directly approach a description of successful behavioural models in creative professionals, their way of experiencing them and communicating them.

2.3 Case study

A renowned SME in the product design sector with its own design department was selected as a Case Study to validate the identified creative competencies.

Over the period between October 2016 and February 2017, work was done directly with the design team comprising of five members. An in-depth interview was conducted for two hours with the Project Manager with the objective of understanding the standard work process of the company, a CII of approximately one hour and a half was done with each member of the design team and, finally, a 360º test designed in the form of an online survey was distributed. This test provides quantitative data on each team member's perception of themselves and their colleagues. It also gives an understanding of the exact role and competencies of each one according to studying the composition and intensity of the social network that unites them. This study determines the relationship between the different creative competencies identified in relation to the phases of the creative process and the team members.

2.4 Creative Challenge

In order to qualitatively analyse the behavioural elements through which the competencies are reflected, a series of workshops were organised at ELISAVA in January 2018 and later were replicated at FHS –March 2018– and TU/e –April 2018–. In each localisation there were six multidisciplinary teams comprised of a total of 30 designers -bachelor's degree students in their final year of study, master's degree students and young professionals- who worked on challenges proposed by three local companies. At the same time and while the designers were working, a team of researchers -comprised of 9 professors and senior designers from TU/e, FHS and ELISAVA- were observing and taking field notes of how the creative competencies were demonstrated throughout the design process. It is a non-participatory observation where the observer is not involved in the processes undertaken by the students. This observation was done during two days that concluded with a short presentation in front of the companies. During them, the observers collected evidences and identified behaviours that demonstrated the utilisation of the competencies. Those evidences are relevant information to identify and define the Creative Competencies.

2.5 Creative Decoding Tool

To contrast the methodology explained above with qualitative information collected through interviews, the case study and the Creative Challenges, an online tool was also created to collect quantitative data from different design disciplines or countries that will provide us information about design competencies across ages, gender, country, etc. The Creative Decoding Tool (CDT) will allow us to gain information and update the list of creative competencies. This tool provides quantitative data on an international scale through a survey comprised of 50 questions. Each competency is divided into two dimensions and each one is measured using two variables in the form of a question. Moreover, each competency is connected to a question that refers to the professional and academic environment in which the designer works. Thus, we can establish whether the environment stimulates the use of each competency analysed or not. After completing the questionnaire, each participant can download a graphic representation of the results, so they can be aware of their own creative competencies. After testing the Spanish-language version, the English version was launched in March 2018 to reach a broader audience.

3   CREATIVE COMPETENCIES DICTIONARY

After analysing the data obtained with this methodology, a Creative Competencies Dictionary was developed as a document to communicate the results of the research. It is an open document that contains an initial list which will gradually grow and evolve as data is obtained and contrasted against

the CDT. It describes the creative competencies in the field of design -the competencies shared by the creative professionals interviewed. Each one is comprised of two dimensions that reflect the aspects needed to attain such competency yet in different ways. A person is considered to have fully acquired the competency when both dimensions are present. The creative competencies identified up until now are:

1) *Learning (Curiosity + Knowledge internalization)* The capability of acquiring and applying new knowledge, abilities and attitudes efficiently through study or an experience that can arise before, during or after the design process. It has to do with the curiosity that feeds the exploration of new and diverse knowledge sources, as well as the capacity to internalise and practically apply what is learnt.

2) *Aesthetic sensitivity (Aesthetic appreciation + Aesthetic Criteria)* The capability to perceive, value and determine the basis for the formal aspects of a project. It refers to the interest in applying decisions related to aesthetics as a priority as well as the capability to support these decisions with arguments, so they are not arbitrary.

3) *Teamwork (Delegation + Tolerance)* The capability to cooperate when developing a project in which many people are involved. It refers to being able to delegate based on trust and the capacity to tolerate diverse criteria and other opinions.

4) *Critical thinking (Questioning + Improvement proposition)* The capability to inquire and find solutions to improve. It refers to the ability to question certain realities of a project in a constructive way; in other words, with an ability to identify and materialise possibilities for improvement and development.

5) *Oral communication (Planning + Charisma)* The capability to orally transmit a message in a clear and attractive way when presenting or pitching a project. This includes first preparing and structuring the information that needs to be transmitted and the ability to communicate it to generate a positive impact on the receivers.

6) *Social and ecological sensitivity (Awareness + Compromise)* The capability to reflect upon the social and ecological aftermath of a project. It refers to both the interest and respect for others and the capacity to act in consequence creating responsible and ethically sustainable projects.

7) *Autonomy (Self-management + Initiative)* It refers to the individual capability to manage and organise work in an autonomous way as well as to personal initiative when modifying a project.

8) *Leadership (Strategic vision + Coaching)* The capability to detect opportunities and achieve goals through a strategic approach to projects. It refers to a designer's capacity to plan and direct work as well as the ability to motivate colleagues through empathy and enthusiasm.

9) *Research (Search for information + Experimentation)* The capability to enrich the design process with theoretical and practical research. It refers to the capacity of obtaining information on references and users as well as to the ability to experiment through different work tools and materials.

10) *Innovation (Originality + Realization)* The capability to have original feasible ideas. It refers to the tendency of a designer to be creative and open-minded in his/her way of thinking as well as his/her ability to find a functional way to materialise ideas.

The contents of the Dictionary are structured in three blocks. The first block contextualises the conducted research, clarifies objectives and analyses the theoretical framework of the competencies in the design process. It includes a detailed explanation of the research process that has been carried out to identify and define the competencies presented in this article and shows how to make use of the document. The main text defines the competencies with citations of the designers interviewed regarding each one. The document concludes with the transcription of the 14 interviews, including the profile of the designers and engineers interviewed and photographs of the project and its work space, as well as a descriptive map of the creative process of each of the designers.

3.1 Use of the Dictionary

The information contained in this Dictionary opens a number of possibilities for its application and future paths of development. Subjecting it to an evaluation process at a design company through a Case Study and developing the Creative Challenges reflects how the Dictionary can be highly useful when establishing, measuring, analysing and defining how to improve the creative competencies in academics and the professional context. The analysis process and the contents of the Dictionary invite

self-reflection and knowledge about the professional practice of design and the skills used for the development of the creative process.

More specifically, the Dictionary can be used in academics to help students in creative fields to understand and focus their efforts on improving their own creative competencies. The competence analysis obtained with the implementation of the 360º and the CDT, using the Dictionary as a theoretical basis, is useful for teachers to understand the process and work behaviours of students, detecting gaps and strengths in their individual profiles. This information can be used as a basis on which to offer students methods or tools that help them understand and enhance those competencies in which they stand out and be trained to improve those they need to reinforce. Besides, the self-assessment tool can be used to determine the evolution of a student's or a group of students' competencies. This information may be of great use to universities for self-assessing the efficacy of the transfer of the desired competencies and fostering education that boosts these competencies crosswise between subjects. In addition, it makes it easier to detect training shortages with respect to current sector needs.

In the professional context, the Dictionary is a tool that can be useful for independent professionals (freelancers and SMEs) as well as large enterprises. It may be used to detect strengths and weaknesses in workers' competency profiles to foster personal development and enhance creative potential. Knowing this creative profile for every member makes it possible to create flexible and balanced work teams by assigning different roles in order to achieve maximum efficacy and performance. Furthermore, it may be useful for identifying human resources needs and for selecting personnel or partners who fit with the company's structure and goals. Working side by side with the companies involved in the Creative Challenge demonstrates the usefulness of applying the knowledge explained in this Dictionary in the business environment, since developing projects together with designers proves the value that design can bring to their company and processes.

Finally, the Creative Decoding Tool keeps the research updated and allows the detection of new competencies present in creative professionals. This online tool will enable the collection of quantitative data on the way designers create to measure and compare the creative competency profile of design students and professionals on an international scale. Being able to cross-check the data obtained up until now in a qualitative manner with the quantitative data collected by the online platform will enrich the research allowing to contrast the results. Once a significant amount of data has been obtained through the CDT, common patterns on the professional practice of the designers can be defined, as well as identifying gaps or competency needs in their profiles.

In short, this research identifies and defines the current creative competencies in creative profiles and provides for a methodology to gradually evolve this initial Dictionary and keep it updated. A dialogue can be established with this system between the competencies present in the job market and in academics in order to guarantee the constant updating of future professionals' creative competencies.

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