Design and Knowledge: Creative Thinking for a Knowledge-Based Society and Policy

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Abstract Based on the importance of knowledge and with focus on the contribution that Design and Research in Design intend to provide for the development of a more informed society with better, but also sustainable, quality of life, this paper propose to collect the theoretical framework regarding juxtaposition of the agents University (Knowledge) and Governments (Policy), mediated by Design. The ongoing research in Design for the Territory, which this reflection is part, identified in the critical and creative nature of thinking in Design, a clear opportunity to support the creation of a knowledge-based society and knowledge-based policy. The evidence of the strategic nature of Design and the mediation operated by Design, place the discipline as an urgent partner of decision-making bodies in Universities and Governments.

Keywords Design knowledge · Knowledge-based society · Knowledge-based policy · Knowledge-based political decision-making · Creative thinking · Design cultural mediator

1 Introduction

Design plays a fundamental role in the transformation and development of a world environmentally sustainable, economically viable, socially equitable and culturally diverse. We can systematize in this way, the enormous challenge released by 2030 Agenda (United Nations General Assembly 2015), without precedent in research on a global scale. Challenge that the first World Design Declaration (World Design Summit Organization Inc 2017) brought to the interior of the discipline of Design.

This paper, analyze public policy documents, with focus on Research and Design, and it seems relevant for us, in its condition as a theoretical device for the perception and enunciation of policies aligned with the European Government that can be

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understood in the field of Design Management to center Design into the strategic discussion about territory.

Regarding the structure, this paper is developed in two parts justified by the two agents (University and Governments) under discussion, proceeded by the introduction and proceeded by the conclusion. We note that a third agent of territory, Industry (Economy), the topic of Knowledge-based Economy and the University-Industry collaboration is not object of analysis in this paper, even though it is mentioned.

First, knowledge is presented in general, not specifically in Design, as a basis for the development of society and political strategy. The evolution of the role of the University for the democratization of knowledge "belongs to all and for all", an objective of open science (Ministry of Science, Technology and Higher Education, Portugal 2016), is here suggested from key moments. Cooperation between Science and Policy also deserve attention. This first part ends with the identification of problems of communication and knowledge transfer, resulting from the differentiating nature of the agents University (Knowledge) and Governments (Policy).

In the second part, the focus move on the challenges and opportunities that this University—Government relationship brings to Design, we identified the nature of critical and creative thinking as privileged tools for communication between stakeholders, and in this alignment, the condition of Design as a cultural mediator, it presents itself as a resource for the creation of new knowledge.

2 Knowledge-Based Society and Policy

2.1 University: Cooperation and Knowledge Sharing in the Interdisciplinarity Time

Universities plays a central role to the creation of a knowledge-based society, policy and economy. Historically, the evolution of the academic mission, summarized by Etzkowitz (2013), focused at first on the conservation of knowledge (education), then moving on to the creation of knowledge (research) to arrive at the application of knowledge (entrepreneurship). Thus, after the moment when the University exist as a kind of safe box of eternal, definitive and finished knowledge and, because not being enough systematize the constant production of new knowledge through research, the transition to an entrepreneurial culture with intellectual and commercial potential, brought new social and economic development challenges for universities, with partnerships with the public and private sector that engines for the development of new areas of knowledge (biotechnology, biomaterials, and a lot of others). It is, therefore, in this environment of interdisciplinarity and knowledge sharing that the universities affirms its social, political and economic importance.

More than 20 years have passed since European Education Ministers from twenty-nine countries gathered in Bologna to sign a joint declaration that came to affirm the objectives for the creation of a European system of Higher Education. The Bologna

Declaration (1999) constitutes an intergovernmental and interinstitutional cooperation effort that has come, among others, to promote the mobility of students, teachers, researchers and administrative staff and to guarantee quality and evaluation systems.

It was also around this time (2000), that the European Research Area gained a physical space, identified as essential for the cooperation resulting from the mobility of researchers who, in the opinion of Carlos Moedas (European Commissioner for Research, Innovation and Science between 2014–2019) encourage the "flow of knowledge across national borders" (Directorate-General for Research and Innovation of European Commission 2016). Aligned with this idea of opening borders, the Portuguese commissioner led the program "Open Innovation, Open Science, Open to the World—a vision for Europe" (Directorate-General for Research and Innovation of European Commission 2016).

In Portugal, the Government and the Ministry of Science, Technology and Higher Education have defined as a priority the commitment of the scientific community, to the principles and practices of Open Science, launched in 2016, with the support of Foundation for Science and Technology of Portugal. The program foresees the elaboration and implementation of a National Open Science Policy, that allows the transfer of scientific knowledge to the scientific community, society and companies, thus making it possible to increase the recognition and social and economic impact of science (Ministry of Science, Technology and Higher Education, Portugal 2016).

It is in this context of cooperation and openness of science that, the strategic plan (2019–2022) of the University of Aveiro emphasizes that "knowledge creation is increasingly a collective, collaborative, inter and transdisciplinary, which requires articulation and new dynamics to address the complex problems of contemporary society" (Reitoria da Universidade de Aveiro [Rectory of the University of Aveiro] 2019). Paulo Jorge Ferreira (current rector of University of Aveiro) presents the new challenges, described in his rector application "the University of Aveiro will have to help define a smart and winning growth strategy for the region, working with municipalities, companies, business associations and civil society, seeking internationalization and innovative, mobilizing projects with strong and dynamic leaders", adding the imperative to grow with the region, looking at the world for the "urgency of Aveiro to accelerate its trajectory towards the knowledge society" (Ferreira 2018). Regarding the challenge of teaching in the era of interdisciplinarity, the rector notes very encouraging preliminary results for the development of Shared Curricular Units, with the areas of Management, Marketing, Engineering and Design, being the best positioned (Ferreira 2018).

After identifying cooperation measures at different levels (here oriented from the global to the local dimension), as challenges for science and knowledge sharing between governments, institutions and disciplinary areas, next point propose for reflection, the dialogue challenges and opportunities between Science and Policy.

2.2 Science and Policy Communication

Communication between Science and Policy, both areas of public domain, seems to be doomed from the start by the nature of opposition that characterizes the root of their thinking. While Science is guided by constant questioning, in a posture that is always critical to the existing results, therefore restless and open, the Policy, acts through, in the need to reach consensus, which is the same as saying narrowing.

It is true that the differences are many, but Science and Policy are clearly linked by dependency relations. In its most basic dimension, research is financed by the political sector and the results of Science is used in the design of policies. Thus, the collaborative idea is inevitable as stated by Bocher and Krott (2016) because the only strategy that can make a difference is that both areas of knowledge join efforts.

This communication between Science and Policy, where policymakers frequently encounter complex issues, and the role of scientists as policy advisers on these issues is not always clearly defined was reviewed (Spruijt 2014) using scientometrics analyzes for 267 publications, that is a clear demonstration of the pertinence and interest about this linked area. Similar work of overview and classification to identify the Knowledge Communication problems between experts and decision makers was done by Eppler (2007) that affirm:

> "the process of knowledge communication hence requires more reciprocal interaction between decision makers and experts because both sides only have a fragmented understanding of an issue and consequently can only gain a complete comprehension by iteratively aligning their mental models".

Based on the acceptance of the fundamental differences between science and policy, and with the propose of be a bridge for the transfer of knowledge, the model RIU—Research-Integration-Utilization (Eppler 2007), is based on four main premises:

- Building trust in encounters;
- Exchanging a maximum of information;
- Accepting limits of mutual understanding;
- Looking for allies of science.

The three components of this model can be systematized by the usual knowledge transfer path. The first component—Research, part of the academy's independence in identifying research questions, focused on problem solving. The second component—Integration, oriented the research towards practical issues and needs in two directions: specific issues provide guidance for the formulation of scientific questions and scientific results provide guidance for solutions in practice. Finally, the third component—Utilization, is where scientific results are used to solve problems in practice (Bocher 2016). We see, by the characteristics of each component, a clear transfer from Science for the Policy and it is precisely in this transfer that Design is mediator and can be a wise ally, as we will see later in this text.

3 Challenges and Opportunities for Design

3.1 Design, Cooperation and Knowledge Sharing

In Sect. 2.1, we presented examples of cooperation generally intended for Teaching and Research configured in Intergovernmental Declarations, European Programs, and in the strategy and Action Plan of our University. Once here, it is important to move the focus to international cooperation aimed at the unequivocal affirmation of the economic value of Design and its instrumental role for the creation of innovative products and services, which favor the competitiveness of territories and the quality of life of citizens. In the following documents (Ribeiro and Providência 2019), the authors give visibility to these objectives, further reinforcing the imperative of research and the adoption of Design methodologies to increase productivity, improve the user experience and guarantee diversity, thus being considered as an instrument of guarantee of European sovereignty.

The first World Design Declaration, "Montréal Design Declaration", reflects the common goal of developing an international action plan that leverages the power of Design to address the pressing global economic, social, environmental and cultural challenges (World Design Summit Organization Inc 2017). In this document, the need for strategic Design leadership at the local, regional, national and international level is recognized and thus the need for models of governance and integration of policies based on Design in the local, regional, national and international agendas. This Worldwide Design Statement confirms Design's intrinsic capacity as an agent of change and a source of creative transformation (design) and the critical role of Design (reflection) as fundamental to the creation of an world environmentally sustainable, economically viable, socially equitable and culturally diverse and still the value of working in a collaborative, holistic and integrated way to promote Design as a common benefit.

With a focus on data dissemination, the report "The Design Economy: The value of Design to the UK", published in 2015 (updated in 2018) by the Design Council presents itself as the largest study on the contribution of Design to the United Kingdom economy. The document places Design in a different way of thinking, making it responsible for the ability to help large organizations, Small and Medium Enterprises, companies in the social assistance sector and charity organizations, to change the way they work. It is, in defense of the contribution and importance of Design that, since 1944 the Design Council has operated, namely as a government advisor. More than the data compiled here, which are not the focus of this reflection, it is important to underline the conclusions of the Design Council that assigns Design a central role to generate growth, efficiency, quality, sustainability, better quality of life and stronger communities. As the latest projection notes for the future, The Design Economy says: "as we face up to new global economic realities, Design will play an ever more important role in ensuring our economy remains competitive" (Design Council 2015).

The "Europe 2020" strategy established the guidelines for a decade (2010–2020) of smart growth (economy based on knowledge and innovation), sustainable (economy more resource-efficient, greener and more competitive) and inclusive (economy with high levels of employment that ensures economic, social and territorial cohesion) (European Commission 2010). The "Innovation Union", one of the emblematic initiatives of this strategy, recognizes the importance of taking advantage of the European creative potential, in particular the role of Design to bring innovation to the market (European Commission 2013a). This document specifically refers to the objective of intensifying the role of Design in the innovation policy, a rare centrality in these political documents.

In order to accelerate the integration of Design in innovation policies, the European Commission services prepared the working document "Implementing an Action Plan for Design-Driven Innovation" (European Commission 2013b), focusing on actions in the short and medium term and that establishes as general lines of execution three strategic domains of action: Promote the understanding of the impact of Design on innovation (Design and Knowledge); Promote industrial innovation based on Design to reinforce Europe's competitiveness (Design and Economy); Promote the adoption of Design to foster renewal in the public sector (Design and Policy). Regarding these three domains, it is important to reinforce in the first, what we called Design and Knowledge, the need to educate policy makers right away about the role of Design in innovation; measure the economic impact of Design; see reflected in the research the attribution of a central role to designers and Design methods; integrate the concept of Design-based innovation in the curricula of different disciplines and facilitate permanent dialogue between the main agents of Design-based innovation policy (European Commission, national, regional and local governments, European industries, universities and Design professionals and border areas). In relation to the second domain, Design and Economy, the introduction of Design in Industry as an essential engine for the creation of innovative products that constitute an asset for companies, in the face of competition, is highlighted, however, the lack of Design Management skills, as a significant obstacle to wider adoption for the integration of Design in European companies. Finally, the third domain, Design and Policy, explains the need to reinforce strategic Design for the modernization of public administration and recommends the adoption of Service Design methodologies, to improve productivity in the public sector, and to maintain and improve the experience of the user.

3.2 The Nature of Thinking in Design

Distinguish the way of thinking about Design, from the designer, identifying what may constitute its originality or differentiating factor, both in professional practice and in research, has been the subject of reflection by several authors. Castillo (2018) identifies the contributions of Herbert Simon and Bruce Archer as pioneers for the emergence of Design Thinking.

This proposal served as a starting point, which we decided to develop by introducing and articulating more authors. Admitting as Castillo says that it was Simon (1996) who spoke for the first time of "Design as a way of thinking", the concern to affirm the dimension of reflection, that is Design knowledge production, it may have been opened here.

The first publication, in 1979 of the Journal "Design Studies", introduced Bruce Archer's which in the article "Design Discipline" identifies the important "aim to establish the theoretical bases for treating Design as a coherent discipline of study in its own right". The author (Archer 1979) affirms:

> "exists a designerly way of thinking and communicating that is both different from scientific and scholarly ways of thinking and communicating, and as powerful as scientific and scholarly method of enquiry, when applies to its own kinds of problems".

Cross brings to the present the ideas of Simons and Schön, contributing to clarify the historical framework of the authors that links to their more recent peers, thus defining a state of the art that opens space for their reflection around Design methodologies, focusing "on the designerly ways of knowing, thinking and acting" (Cross 2001).

"Design as a way of Thinking" (Simon 1996), "Designerly way of Thinking and Communicating" (Arber 1979) or "Designerly ways of Knowing, Thinking and Acting" (Cross Cross 2001), are subtle differences to name the common interest in identifying a specific form of thinking, communicating, knowing and acting that seems to characterize Design.

The questioning and reflection as a natural act of the Design activity, brought to scientific production in this area, the concept "reflective practice" of which Donald Schön is an unavoidable reference and therefore regularly revisited. Visser (2010), exposes "for Schön, Design was one of a series of activities in domains that involves reflective practice: city planning, engineering, management and law, but also education, psychotherapy, and medicine".

As Design is an activity based on the project, the positions of connect or disconnect practice and research reality are current. Dorst (2016) proposes solve this with a middle level between Design Practice and Design Research—"Academic Design" as a mean of integrate booth.

Thus, it seems to be this balance between the use of scientific knowledge and unreflected approaches such as intuition and instinct, contemplating uncertain situations in conflict resolution through the project, the element of differentiation in Design. It is also a greater challenge for practice and teaching, the reconciliation in harmony between knowledge and intuition, although there is no doubt that all creative processes require deep prior knowledge (Narváez 2000; Cross 2001). The binomial Reason vs. Intuition is also discussed by Ricard (2008) who, in a diachronic proposal, reflects from objects to establish the foundations of creativity in Design.

However, when admitting intuition to the project in Design, the challenge to identify such a specific way of thinking becomes more complex, justifying publications whose purpose is to question the authors about their creative processes. For proximity to the interests of our research, we highlight the interviews compiled by Millman

(2007) with reference names of Design practice, that intend to decode "how to think like a great graphic designer", or, in a national context, the cycle of conferences "Inside a creative mind", that brought together contemporary portuguese architects and invited them, also through an interview to reflect on the creative process of a selected project (Borges 2016).

The reflection about creative thinking, present in the book "Creative Virus—a book about and for Creative Thinking" (presented as a manifesto and design project itself) coordinated by Tschimmel (2019) is a demonstration of the richness of diversity as a factor of unity. More than 60 authors were invited to present their idea of creativity, preferably in a graphic mode, in a double page. The book aims to infect the reader through information about creativity, fostering it through mind games and inspiring images.

3.3 Design as Cultural Mediator

The name of Archer already mentioned in the previous point is still identified in any chronology of Design Research in Europe, because he founded the important Department of Design Research of the Royal College of Arts, in London, and because he started the idea of Design Research as mediation. Reflecting on the activity of Design, Archer writes: "thus Design activity is not only a distinctive process, comparable with but different from scientific and scholarly processes, but also operate through a medium, called modeling, that is comparable with but different from language and notation" (Archer 1979).

Design as an activity of cultural mediation (through artefacts, devices and services) between the past and the future, between companies and people, between people and others, or even between things is the proposal of the ontological framework of the discipline that Providência (2012), (2017), presents and that is tested in the PhD research about Design for the Territory, that this paper integrate.

Narváez (2000) define Design's own knowledge as the relationship between human being and objects and, in line with this idea, Design is presented as an area of knowledge capable of interpreting the scientific results of the others, translating them into objects (and images) for citizen use (Monat et al. 2008). The authors finally warn of what appears to be a lack of confidence from designers who see their professional activity as less fundamental than other areas of knowledge. Hence the need to reposition and affirm Design among its professionals, civil society, academia, decision makers and industry.

Specifically about the territory, the idea that all Design is political stands out (Pater 2017) and makes visible, the invisibility of the Genius Loci through the brand, which can be the visual representation of the inheritance or the ambition (political decision of strategic positioning of the territory, now subject to the competitive presuppositions of the global market). Integrating the local agents (University, Governments and Industry) in the construction of the brand and corporate strategy, Design acts

as mediator and by Design Management (attribution of holistic coherence) is an instrument to support decision making (Ribeiro and Providência 2018).

4 Conclusions

This paper is presented with the conviction that knowledge must be the basis of social, political and economic development. In this sense, the University, as a home of science and a space for the production of knowledge by excellence (without denying the importance of the knowledge generated in industry and society) should be the predominant organizational format of a society, policy and economy based on the knowledge.

Therefore, the selection and presentation of key moments for Universities and Science in general, aimed to demonstrate their capacity for cooperation, adaptation and repositioning, here first focused on the European context of intergovernmental and interinstitutional commitment that the Bologna process unleashed, then specifying the path to reach the objective of a single European Program for Research and Innovation which, already in a national context, is manifested by the implementation of a National Open Science Policy. Finally, we use the example of the University of Aveiro to demonstrate the application of these strategies.

A similar exercise, identifying moments of cooperation, which result in documents of international commitment on the positioning of the Design activity, was revised and, based on its analysis, we aligned the tripartite proposal Knowledge—Policy—Economy (University—Governments—Industry) that we present here.

Underlining the idea that, citizens have contact with science and scientific knowledge, in general, from tangible products (objects of common use), then Design, by its condition of project activity, has the power to, by drawing, mediate this relationship between Science and People. All Design is a is political act. Shaping the common place, is mediate the relation between Science and Policy.

We affirm the fundamental role of research, particularly in Design, for the importance of a knowledge-based society, policy and economy, and positions Design as a privileged mediator, or wise ally, for the fulfillment of sustainable development goals of the 2030 Agenda.

Consolidating one of the objectives of the PhD research project—to make Design visible and relevant in public policies for the valorization of the territory, and due to the nature of the topics covered, this article reflects the European research strategy on the most recent framework programs, of which we highlight the thematic areas:

- Citizens and governance in a knowledge-based society (Framework Programme 6, 2002–2006) (People);
- Research for the Benefit of SMEs (Framework Programme 7, 2007–2013) (Economy);
- Innovation Union (Framework Programme 8, 2013–2020) (Places).

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