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Mapping the territories around Design Research: A four-layer analysis

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ABSTRACT: Despite great progress in the last five decades, Design Research still reveals fragilities in comparison with other academic fields. To avoid stagnation and lack of impact, it needs to strengthen its theoretical and methodological foundations. Following previous work aiming to contribute to Design Research consolidation, we propose in this paper a Map where four categories of Design Research are positioned in relation to territories of Design Research, Education and Practice. The Map also supports the examination of those four Design Research categories based on a four-layer analysis resulting from the conference title keywords: Processes, Philosophy, People and Products. The Map intends to help design researchers, especially inexperienced ones, like PhD students, to visualise where their own research is located within the Design universe and, by that, understand the ontological, epistemological and methodological implications.

1 INTRODUCTION

Design Research was defined by Archer (1981) as a "systematic inquiry whose goal is knowledge of, or in, the embodiment of configurations, composition, structure, purpose, value, and meaning in man-made things" (p. 30). Since the first steps of Design Research in the 60' and 70's, the ambition to provide a strong and coherent basis for Design Research has been pursued. However, as is recognised within its own community, Design Research still remains scattered and confused with some well-known weaknesses (Margolin, 2010; Dorst, 2016).

Within universities, Design Research faces theoretical, methodological, and scientific challenges with consequences on its impact and relevance. According to Cash (2018, p. 97), "lack of methodological development, validation and standardisation limits design researchers' ability to provide convincing evidence to researchers in related fields where such standards are common". The result is, that while Design draws extensively on related fields, "the reverse does not occur" and the more pessimistic believe that "Design risks being superseded by other fields eager to include Design Science in their portfolios".

At the level of PhD Design Courses, which are the origin of academic Design Research, as they educate future professional researchers, the immaturity of Design Research is commonly revealed in poor research orientation, sometimes provided by educators who "are indifferent, if not antipathetic to research, some of them some resentful of their colleagues who involve themselves in research and publishing" (Er & Bayazit, 1999, p. 41).

At the same time, Design Research seems to be disconnected from the day-to-day reality of designers, not only due to weak communication between universities and practitioners, but also because decisions about what to investigate are not always directed at improving design practice (Dorst, 2016).

In previous works (Clemente, Tschimmel & Pombo, 2017), we intended to contribute to the field of Design Research theory, with a special focus on doctoral research, by examining the boundaries between Design Research and Design Practice. We started by synthesising the contributions from authors such as Frayling (1994), Cross (2007), Friedman (2008), Findeli, Brouillet, Martin, Moineau & Tarrago (2008) on a three-category Design Research taxonomy. Following that, we conducted an empirical analysis from which a fourth category emerged, resulting on a four-category Design Research Classification Model that includes research ABOUT, THROUGH, FROM and FOR Design. In the resultant work, we moved to the paradigm level, explaining the ontological, epistemological and methodological differences between the four previously presented categories (Clemente, Tschimmel & Pombo, 2018). REDES 19 conference provided us with the opportunity to go further with the discussion and extend our reflection to Design Education.

Through the Map presented in the next section, we clarify the relative positions between the different places and agents around Design Research, aiming to find a consensual, common-ground language to include all kinds of research around design and its relations, at the same time providing the opportunity to find occasions to bring different parties together and enhance fruitful connections between them.

2 A 4-LAYER MAP OF DESIGN RESEARCH, EDUCATION AND PRACTICE TERRITORIES

The Map (Figure 1) is organised around the four design research categories and their positions in relation with Design Research, Practice and Education. Our reflection was guided by the keywords that compose the conference's thematic: Processes, Philosophy, Products and People, which constitute four different layers of analysis, as described next.

2.1 *Processes*

The Map presents three main processes within the Design field, identified at the bottom, in the darker area: Design Academic Research, Design Higher Education and Design Professional Practice (Figure 2).

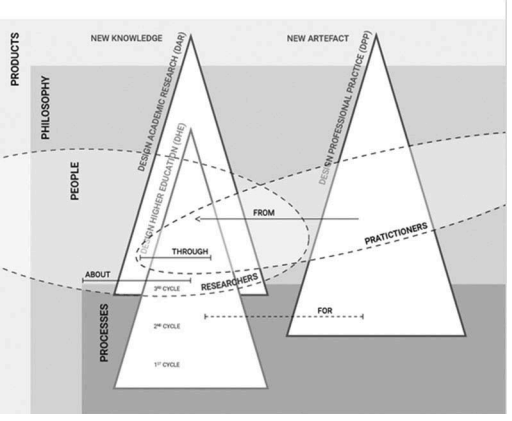

Figure 1. Design research processes, people, philosophy and products map (paper authors).

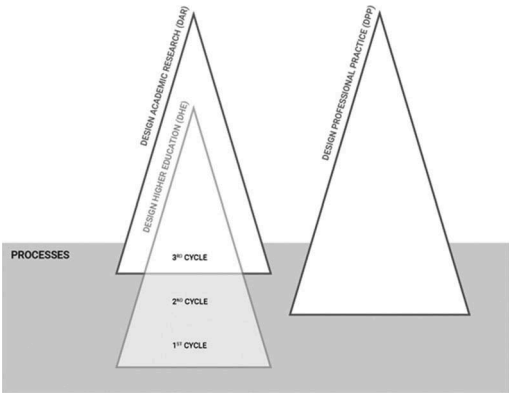

Figure 2. Design research processes partial map.

These processes can also be seen as personal trajectories that an individual undergoes as design student, researcher and practitioner. Although we recognise the three processes are interrelated, we chose to represent them by three different pyramids to clearly identify the singularities of each of them and the interconnection between them.

At the centre of the Map, the Design Academic Research (DAC) pyramid represents acceptable research in the academic design field – which is the core of our discussion. The pyramid below, Design Higher Education (DHE), refers to the typical hierarchical organisation of academic design education starting with the 1st cycle level (Bachelor) at the base, followed by 2nd (Master) and 3rd cycles (PhD) above.

Since the PhD is recognised worldwide as the pinnacle qualification for scholarly endeavour, we obviously locate it near the top of the DHE pyramid. At the same time, "a PhD is awarded on the basis of good practice in research" (Pedgley & Wormald, 2007, p. 71). Er & Bayazit (1999, p. 35 – 36, 39-40) describe a PhD in Design as a certificate or licence that states that "this person has successfully demonstrated the ability to undertake independent research that contributed to knowledge" and not that he or she is "able to design a better product". In accordance with those authors view, PhD, 3rd cycle Design Education, is simultaneously located at the top of the DHE pyramid and at the bottom of the DAR.

PhD research can't be seen as just another, bigger, longer and more complex, design project similar to those conducted at 1st or even 2nd cycle studies. This position is not acceptable within the vision of doctoral research as producing new knowledge and contributing to educate future independent design researchers (Findeli & Coste, 2007). To that end, 3rd cycle education must provide structured and explicit "training in research skills, such as literature review", research proposal writing and theoretical basis grounding of knowledge about different research paradigms and methodology. PhD students must learn about a variety of research methods, adequate to address different kinds of research questions. Even if they are not going to use all the learned methods, the exposure to different approaches will help students to develop research skills and promote research methodological reflexivity, avoiding "mistakes in methodology that are seen in the design area" (Melles, 2009, p. 256, 262).

At the right side of the Map, and outside 'university walls', is the Design Professional Practice (DPP) pyramid, representing the design professional activity. The pyramid shape was also chosen, in this case to represent the personal growth of a design practitioner.

2.2 *Philosophy*

Going up to the Map's Philosophy area (Figure 3), we find the four categories of Design Research presented and discussed previously (Clemente, Tschimmel & Pombo 2017, 2018): Research ABOUT Design, Research THROUGH Design, Research FROM Design, and

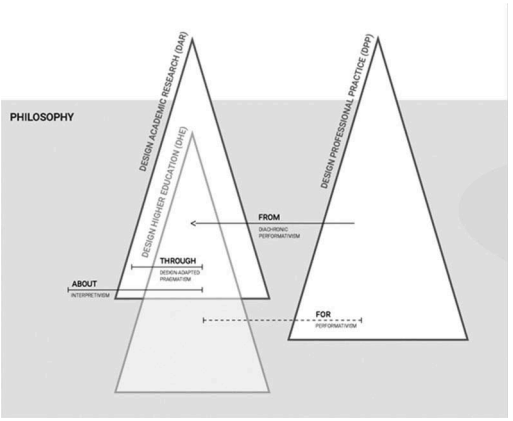

Figure 3. Design research philosophy partial map.

Research FOR Design. The horizontal lines are positioned to show the relations between each category and the pyramids described above.

Research ABOUT Design is usually performed by disciplines outside the design field, following scientific standards already well established in the academic community. The issue about Research ABOUT Design is on its relevance for the design field. Frequently conducted by other disciplines' scientists, its main goal is to contribute to the advancement of such disciplines, and not necessarily to Design. It should be the design community which decides if such knowledge is relevant for designers and, if such is the case, how the new knowledge may be implemented in their respective practices (Findeli et al., 2008).

On the extreme bottom right of the Map, and clearly out of the range of the academic realm, is Research FOR Design which is the same as project research and is mainly associated with "information-gathering activities" required by design projects (Pedgley & Wormald, 2007, p. 74). The main outcome of Research FOR Design is a product, service or process, and even producing some new tacit knowledge, it does not necessarily create new communicable and explicit knowledge, and it does not follow rigorous scientific standards. Frayling (1994), Friedman (2008) and Findeli et. al. (2008) all agree that this kind of research is not considered scientifically acceptable.

However, it is recognised that design practice produces tacit knowledge that, if made explicit and communicable, contributes to the advancement of the design field. As stated by Cross (2007), for practice work to qualify as research, "there must be a reflection by the practitioner on the work, and the communication of some re-usable results from that reflection" (p. 126). That leads to Research THROUGH Design and Research FROM Design. The difference between these two categories lies in the time and context in which that reflection takes place. Table 1 summarises the relation between Design Project and Research ABOUT, THROUGH, FROM and FOR Design.

Research THROUGH Design, which according to Pedgley & Wormald (2007) would be more appropriately termed "Research through Designing", explicitly refers to "research with a practical design element" or "research incorporating a design project". That means that "selected periods of a research study are occupied by a design project carried out by the researcher" since "integration of design activity must be a means to an end, and not and end in itself" (p. 72-73).

The Research FROM Design category was introduced by Clemente et. al. (2017, 2018) and refers to research that results from the diachronic study of one's own relevant and professionally validated design activity. Therefore, in both categories, design projects assume a central role. However, they differ on the place where the design project is developed and when the author's reflection and analysis occur. Research THROUGH Design involves design projects developed inside universities. In this kind of research, author's reflection, research project and

Table 1. Characterisation of the four design research categories.

Acceptable academic design research			Non-acceptable academic design research
Research ABOUT Design	Research THROUGH Design	Research FROM design	Research FOR design
No researcher own design projects involved	Design project developed ***inside*** the academy	Design project developed ***outside*** the academy	
	Theory produced ***inside*** the academy		No ***explicit*** theory production
	Researcher reflection and analysis as design author occur ***in parallel*** with the design project	Researcher reflection and analysis as design author occur after market's validation of design project(s) outputs	No ***structured*** reflection and analysis from the designer as author
	Theory precedes practice (practice being an application, illustration or validation of a previously developed theoretical intentionality)	Practice precedes theory (theory resulting from the translation of implicit knowledge embodied in the products and process)	Theory embodied in the process and final products but not made explicit or communicable

design project, all occur in parallel, at the same place and within the same period of time. In Research FROM Design, on the contrary, the studied design project(s) belong to the researcher's past professional activity, developed outside the academy. The author's reflection and analysis is diachronic because it only happens after the output of the studied project(s) have been validated by the market. Research THROUGH and Research FROM Design also differ in the way theory and practice are related. In Research THROUGH Design, theory precedes practice, practice being an application, an illustration or a validation of a previously developed theoretical intention. In Research FROM Design, practice precedes theory, theory resulting from the translation of implicit knowledge embodied in the design products and processes. That is the reason why the solid line representing Research THROUGH Design is fully contained inside the DAR pyramid, while the line representing Research FROM Design is positioned between DAR and DPP and oriented from knowledge origin towards knowledge theory production.

This Philosophy layer also provides the opportunity to reinforce our argument that a coherent theory for Design Research needs to be supported by a consensual and widely spread discourse about Research Paradigms. The fact that a great part of published design research misrepresents paradigmatic assumptions, reveals that researchers are frequently unconscious of those "silent, implicit or even hidden, but fundamental" philosophical assumptions underlying their own research and their consequences and implications (Lukka, 2010). In spite of some voices claiming "aparadigmatic" approaches (Shannon-Baker, 2016, p. 320), we argue that any research is always conducted under a certain system of beliefs about how the research problem should be addressed, including what is to be studied, what kind of research questions are supposed to be asked and how they should be formulated, with which methods these studies should be conducted, and how their results should be interpreted. That means "aparadigmatic" research doesn't really exist. It is probably just a "shortcut" to avoid the paradigmatic question. However, usually shortcuts come with pitfalls. It is not uncommon to see inexperienced researchers, especially, PhD students, already at an advanced stage of the research, rambling and struggling with methodological questions which should have been addressed earlier. A clear establishment of the research paradigm is not a waste of time but, on the contrary, a strong basis to guide research. Even when unforeseen obstacles emerge during the investigation, it becomes easier to find an alternative way to address the research problem respecting the same belief system. Beyond this utilitarian perspective, the explicit

identification of the paradigm that has been followed is a requirement of honest research, informing the audience about the values underlying and influencing the investigation, also contributing to the legitimation of Design Research by other academic disciplines.

Because, as was explained above, Research ABOUT Design can be performed by disciplines outside of the design field, it is natural that it follows research paradigms inherited by those well-established disciplines. When Research ABOUT Design consists of descriptive, historical and phenomenological studies, it is considered to follow an Interpretative (or Constructive) paradigm. Interpretive research methods are usually qualitative, including Case Studies, Phenomenology, Hermeneutics and Ethnography. Interpretive theory is usually grounded (inductive). The applied techniques include, for example, Open-ended Interviews, Focus Groups or Think Aloud Protocols. When Research ABOUT Design involves researchers' values, their critical position, their intention to change, their agenda, it can also be conducted under the Critical paradigm. Socio-critical methods include, for example, Critical Ethnography and Action Research. Applied techniques can include Open-ended Interviews, Focus Groups, Open-ended Questionnaires, resulting usually in qualitative data, similar to Interpretivism, but the data analysis is influenced by the researcher's explicit intention to change reality, instead of just describing it (Guba, 1994, Scotland, 2012).

Design Research resulting from design projects, however, seems to "not easily fit within existing paradigms" (Isley & Rider, 2018, p. 359), with some arguing the value of pre-existing paradigms and others claiming the need of a totally new, specially fitted, paradigm. Melles (2008), Morgan (2007, 2014) and Rylander (2012) are among those defending the virtues of enlarged or adapted versions of classical Pragmatism, because it accepts both objective and subjective ontological orientation, moving back and forth between inductive and deductive epistemological approaches. For these same reasons, we agree that Pragmatism is appropriated to Research THROUGH Design, where the 'rigorous' research project is punctuated by periods of design project, where creativity, intuition and nonconformist thinking takes place. We go further in suggesting Design Thinking as a research method that perfectly fits into the methodological pluralism that characterises Pragmatism. Under this paradigm, that we would designate as Design-Adapted Pragmatism, Design Thinking techniques must follow academic standards as much as possible (for example when applying Surveys, Interview or Focus Groups). At the same time, space for intuition and imagination is also permitted and material and visual elements of design such as Sketching and Prototyping are accepted.

Among the arguments of those defending a disruptive paradigm to accommodate Design Research is "The manifesto for the Performative Paradigm", by Haseman (2006). The first peculiarity of this paradigm is the fact that research is not led by one problem or research question, but instead by practice itself. The author argues that while conventional problem-led research flows from a central research question, practice-led research does "not commence with a sense of a problem" but, instead, with an "enthusiasm of practice" from which the problem emerges. This description is aligned with Rosenberg's (2000) concept of Poetic Research that also isn't "channeled by a research problem" because "the focal territory is found through the process", emerging "from a questioning of practice" (p. 2). A second peculiarity of the Performative Paradigm is related with research outputs. It is stated that embodied knowledge, resulting from practice, doesn't need to be translated into numbers and words as in traditional research paradigms, because performativity is not primarily about artefacts' meaning, but rather about their effect on the world (Bolt, 2009).

Following that, and because academic "good research" needs to be purposeful, based on the identification of an issue or problem worthy and capable of investigation, and communicable, generating and reporting results which are testable and accessible by others (Cross, 2007), we clearly oppose the idea that academic research can be addressed by the Performative Paradigm. However, we accept that Performative Paradigm is suited for non-academic design research, conducted in a professional context, of which the main outcome is a product, service or process. Even though it may produce some new tacit knowledge, it does not necessarily create new communicable and explicit knowledge. It doesn't follow rigorous scientific standards (and it doesn't have to) and that's why it is not scientifically acceptable (Clemente et. al, 2018).

However, because Research FROM Design arises from tacit knowledge resulting from professional practice once it is made explicit and communicable, we accept it could be framed by a modified version of the Performative Paradigm, that we would name Diachronic-Performative Paradigm. In this modified version, ontology remains the same (knowledge and the research question itself are embedded in practical results), however, epistemology and methodology are modified because it is recognised that this knowledge, to be academically acceptable, needs to be translated and transferred by its author (epistemology), through a diachronic and idiosyncratic reflection process (methodology).

2.3 *People*

Although people moving around the three universes of Design Education, Research and Practice include students, professors, users, among others, the core of this discussion is Design Research, so we focused our discussion on those who conduct research. In the middle of the Map (Figure 4) we find Research FROM Design and Research THROUGH Design both developed by those who are, at the same time, design researchers and practitioners and their research involve their own design project(s).

Research FROM Design occurs inside the academy but deals with data coming from a designer's own projects developed previously, as design practitioner, and already validated by the clients and the market. For that reason, the line representing Research FROM Design is placed between the DAR and the DPP pyramid, because it lies on this connection between Design Practice and Research. It is also intentionally positioned at the top of the DPP pyramid because research FROM Design should be conducted only by experienced professional designers with a relevant history of already validated design projects.

On the contrary, Research THROUGH Design is well centred within the DAR pyramid because even when the design project (which is only part of a bigger project of research) is not just an academic exercise but, instead, a "real" project asked for by the market, the main goal of the researcher is to provide an answer to the research question. For that reason, project methodology, procedures and decisions are governed by academy research rules. Some had argued that to became an academic design researcher, which involves being familiar with academic research rules, and formulating and approaching problems according to the rules of a well-established scientific discipline, a designer almost needs to "forget" what is to be a designer (Findeli & Coste, 2007). In fact, until recently, people with this dualistic profile of researcher and practitioner were mostly professional designers or graduates seeking an academic career, for which holding a PhD is a precondition. However, as it is described by Dorst (2016), "with more and more design researchers working in companies, design research has already found multiple homes. A good deal of the best academic design takes place in

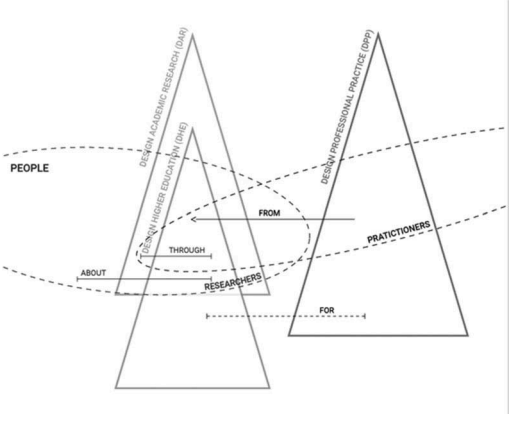

Figure 4. Design research people partial map.

companies like IDEO", (p. 7). He claims the distance between academic design research and professional day-to-day design reality can be reduced by increasing people with a "nomadic" profile, with a "foot in practice as well as in universities".

Moving to the left, we find Research ABOUT Design which is done by academic researchers but not necessarily designers since it does not include researcher's personal design activity. It can be, for example, about "other people's designing, artefacts", or about "people who use artefacts" (Pedgley & Wormald, 2007, p. 71). This means that academic researchers without a design background can conduct Research ABOUT Design. That's why the line representing Research ABOUT Design extends to the left of the DAR pyramid. Because Research ABOUT Design welcomes research done by people from other academic fields such as psychology, education, sociology, engineering, with the proviso that the produced knowledge contributes to the advancement of design knowledge.

On the right side, we find Research FOR Design which is carried by design practitioners who are not necessarily design researchers, in the academic sense of research, because design projects usually don't have to (and should not) follow academic rules. However, it is possible to connect People from ABOUT and FOR territories through research. Although a designer "practicing activities when creating work (...) cannot be considered research, it is possible for an external observer to do research into how", a designer "is working on his or her work (...) to make a contribution to common knowledge" (Bayazit, 2004, p. 16). Although it is also possible to connect Design students at 1st and 2nd cycle levels with professional designers/researchers, for example, by including "real market" problems within academic courses, that possibility is not represented on the Map because it is not directly related with the discussion core which is academic research.

2.4 *Products*

In the Map, products from Design Research and Design Practice are positioned at the top of the DAR and DPP pyramids, respectively (Figure 5).

The main products of Design Practice, and for that reason, of Research FOR Design are artefacts (products, services, spaces, images, etc.) including outcome such as design registrations, patents, sales, global recognition, between others. On the other hand, new knowledge, and only in a communicable form, is the main output of academic Design Research, including Research ABOUT, THROUGH and FROM Design (Pedgley & Wormald, 2007).

New knowledge resulting from Design Research may be focused on the designer/design team, design outputs, design processe(s), design management, creativity, cognition, innovation, users/customers, cultural issues, emotional responses and there are infinite possibilities to add to this list (McMahon, 2012).

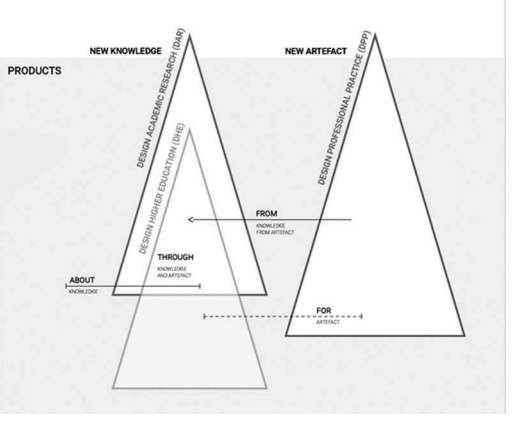

Figure 5. Design research products partial map.

In Research ABOUT Design, new knowledge is the only expected output. In Research THROUGH Design, (although it is not its main objective), designed outputs coexist with knowledge as research outputs. In Research FROM Design, the research product is the explicit and communicable translation of knowledge embodied in designed outputs of previous practice projects, of which the legitimacy and appropriateness was already appreciated and demonstrated in the professional universe.

3 CONCLUSIONS

With this paper, we intend to provide a visual conceptualisation about Design Research and its adjacent and sometimes intersecting areas. The analysis is based upon the four sources of design knowledge which constitute the REDES 19 Conference themes: Processes, Philosophy, People and Products. The resulting Map, and its partial versions, allows a better understanding of the four categories of Design Research.

The Map visually shows where Design Research is situated in relation with design professional activity, design doctoral education and academic research outside design. Additionally, it clarifies the characteristics of each Design Research category by indicating their distinct outputs and the different profiles of involved researchers, enabling a deeper understanding of the underlying philosophical assumptions. Ultimately, it contributes to the epistemological basis required to academically legitimate design knowledge by providing a common shared discourse facilitated by a common visualisation of all the places and agents around Design Research.

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