

Is it interesting? Yes. But, is it important? -Identifying fundamental issues to create a good Design PhD proposal

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This paper addresses a methodology created to support students structuring their Design PhD proposal avoiding the usual struggle they face when preparing to present this starting point of their PhD research. The methodology was developed considering different backgrounds of the PhD students as well as distinct themes and research topics, and was tested and optimized for the past five years. It also assumes we are living in a knowledge economy era in which it is important that students understand how knowledge is produced and disseminated. Both the critical abilities of the students and their analytical and synthesis capabilities are trained in ways that enables them to distinguish interesting information from important one. This distinction is essential in terms of the clarity, pertinence and consistency of Design PhD student's proposal enabling their engagement with the research processes with more confidence and openness to explore the potential of their thematic.

Keywords: *Design Education, PhD proposal, Research Methodology*

1 Introduction

Preparing a PhD proposal implies the definition of a problem to be tackled, the formulation of research questions to be answered, the definition of the research territory, the goals to be achieved, the planning of the tasks to be performed, its schedule and the methods used to accomplish it; it might also include already the formulation of a hypothesis or at least a proposition. Bearing this in mind it is essential that PhD students organise themselves in order to be meticulous in the preparation of each of the issues previously indicated, as well as to train the critical capabilities that are needed to achieve the PhD proposal and their aptitude to distinguish what is interesting from what is important.

In a previous study (Author, 2012) we reported on PhD student's difficulties when first starting to structure their PhD proposals; in particular, the students struggled when conducting the literature review. Working closely with the students for several years, it was possible to synthesise their difficulties and identify repeating patterns, namely, the students' problems began with the identification of relevant papers, followed by trouble in selecting relevant information in the chosen papers. From this starting point, we gradually came to understand that students also struggled with articulating the information into a coherent narrative (often the literature review is fragmented with the absence of a common thread). Also, the students had a hard time identifying priorities in the research literature and making synthesis of the gathered contents.

Considering these repeated issues, we gradually developed an approach (within the context of a mandatory *design critique* module in the PhD design course) to provide students with

tools to deal with the complexity of information required to develop a PhD proposal. Our work was predicated on the idea that design students undergoing a PhD could make use of their ability to think visually in order to make sense of complex networks of information. So, we explored a method to operationalise critical thinking when reading a research paper that combined the development of diagrams linked with databases organised in tables; the combination of these two perspectives allowed students to dynamically alternate between analysis and synthesis, and crucially, organise the gathered information so that it could be useful to their own research objectives. Organising the gathered information in this integrated manner also has the additional benefit of making it easier to access and retrieve further down the research path.

A survey conducted after this intervention revealed that students found it a useful tool to apply and were still using the methodology in their research work, in other words, they had integrated it as a tool in their own personal research methodologies. The main benefits of the methodology pointed out by the students included: reduction in the sensation of being lost in complexity; the method facilitates mental organization; an improvement in the ability of synthesis; it relates in a logical and effective way different kinds of information; finally, it is useful in diminishing the risk of losing information as the research progresses.

We were encouraged by the positive effect that the *design critique* module had on student's ability to make progress in their research projects. The approach adopted in the module seems adequate to help students understand an increasingly hyper-complex world. In fact, the changing world that students face nowadays requires unprecedented competencies of flexibility, analysis and intellectual inquiry. To develop in students an inquisitive approach based in research is a challenging task since society nowadays presents itself with super complexity. Thus, as Garrick & Rhodes [1] and Zetter [2] argue, in the knowledge economy era we live in students must possess the analytical ability necessary to contribute to research and to be able to understand how knowledge is developed and disseminated. Also, to consider is the perspective of Jenkins e Zetter [3], who propose that "In a knowledge society, research is context specific and multidisciplinary rather than pure and discipline based; it has social relevance rather than being hypothesis led; it uses fuzzy, rather than empirically based data; it is problem solving rather than deductive. In what might be termed the commodification of knowledge, how knowledge is managed, synthesized and adapted become as important as knowledge itself." (p. 11).

Furthermore, it seems clear that knowledge is replacing traditional goods as the most valuable commodity of the 21st century, as Friedman (2003) points out "[p]hysical artifacts defined the industrial era. These were primarily heavy goods or worked goods in which the value added by knowledge was used at the point of manufacture" (p.21). In other words, during the industrial era the value of information and knowledge was mostly found in the manufacturing process (with a process based on better information resulting in the improvement of produced artefacts), whereas in the shift to the knowledge economy the product is knowledge itself; in other words, knowledge is being produced in unprecedented levels and it is as valuable as commodities were in the 20th Century.

This transition was signalled as early as the 1970s when Bell (1973, 1976) described the transition from industrial to Post-Industrial Age and already suggested that knowledge would be a crucial feature of modern societies, meaning that the importance of knowledge workers for society would rise as the role of knowledge as the primary source for the creation of value stabilized.

Since the purpose of research is the discovery, articulation, and dissemination of new knowledge, design research can occupy a pivotal point in knowledge generation, like Buchanan (1999) argued “[w]e possess great knowledge, but the knowledge is fragmented into so great an array of specializations that we cannot find connections and integrations that serve human beings either in their desire to know and understand the world or in their ability to act knowledgeably and responsibly in practical life” (p.6). Design by its nature is a discipline that operates in the intersection of several threads of human knowledge, in fact, a designed artefact must necessarily connect information from several fields of human activity and integrate it in the development of products or services that have positive impact on human wellbeing.

As such, one of the central challenges a design researcher must face is how to manoeuvre between knowledge areas and gather valuable information that can be analysed, integrated, and synthesised into new and useful knowledge. This activity requires a solid foundation in a research methodology that functions as a roadmap to allow the researcher to fruitfully engage with the research process with confidence.

The previous work conducted during years of the author’s close engagement with the students in the *design critique* module of the PhD in design course laid out the foundation for and gradually shaped the methodology that we will present in this paper. From our experience after years of working with PhD students it is clear that this foundation should be transmitted to students as they begin to draft their research proposals to allow them enough time to critically engage with their research design.

2 The methodology in 4 steps

In what follows we describe the methodology developed to help students advance their PhD research proposals; it is divided in 4 stages and each one was created with the intent to support the students’ in critically engaging with the challenge of a research process.

2.1 What is the problem?

The research problem is the topic of concern that must correspond to a gap in existing knowledge or at least to something that needs further understanding, being crucial that it is significant enough to contribute to the existing body of knowledge.

Defining the problem being addressed by the research should be easy since the world presents an infinity of problems to be solved in every knowledge area. However, that is not the case in PhD research, and in the area of Design there are some criteria one must use to choose the problem and to assume it as something that can give birth to a meaningful and important investigation. Among the criteria we find issues such as the level of complexity of the problem; its depth and extension; its relationship with the scientific area of design etcetera. Moreover, it is relevant to assess the possibility to address the chosen problem within the time frame predicted for a PhD research as well as the probability to complete it given the available resources; the specific process to adopt depend upon the PhD student’s expertise in research methodology, his/her knowledge of the subject area, his/her understanding of the issues to be examined; the extent to which the focus of the study is predetermined (Kumar, 2011). In the area of Design, it is rather useful to support ourselves in the problem’s framing phase, described in the taxonomy of design research proposed by Cross (2007) in which to three different sources of problems – people, processes and objects – we have a corresponding research approach namely – epistemological,

praxiological and phenomenological respectively. This definition of the nature of research predicted to be designed in order to solve the problem is relevant since this way we have a problem linked with a predicted approach. That will allow students to move to the second phase of the methodology.

2.2 Positioning of the research – finding the pertinence of the topic

As Jenkins, et al. [11] (pp.63-64) and Haley e Jenkins [12] propose, students must understand the role of research in design and that implies providing them with the knowledge of current and previous developments in the disciplinary area. But it is also important to situate the proposed research in terms of specific knowledge related with the chosen topic and problem as well as with the predicted approach chosen by the student. Therefore, we established in this second phase of the methodology the creation of a diagram based on a diachronic axis and a synchronic one.

These two elements structure the territory of the proposed research and will support the positioning of the research hence sustaining its pertinence. Similarly, to Saussure (1965; 1st edition 1915) proposal in the area of linguistics one assumes that the diachronic approach considers the development and evolution of the topic through time and the synchronic approach considers the topic in the present. In a brief view of Figure 1 (a draft diagram to help students organise the information to be gathered) one can observe that these two axes have the research problem in the centre. Furthermore, there are two areas with different colours representing two paradigms (1,2,3 events represent research being done nowadays that is aligned with paradigm 1; situations 4,5 and 6 are present research that integrates paradigm 2 – the events must be defined using the name of the research author, the date(s), and the arguments presented), i.e. two different or even contradictory perspectives on the subject; the more the circles are close to the problem the more the identified study is close in time to the present (8 and 12 episodes identified in Fig. 1 are more recent than 7, 9, 10 and 11).

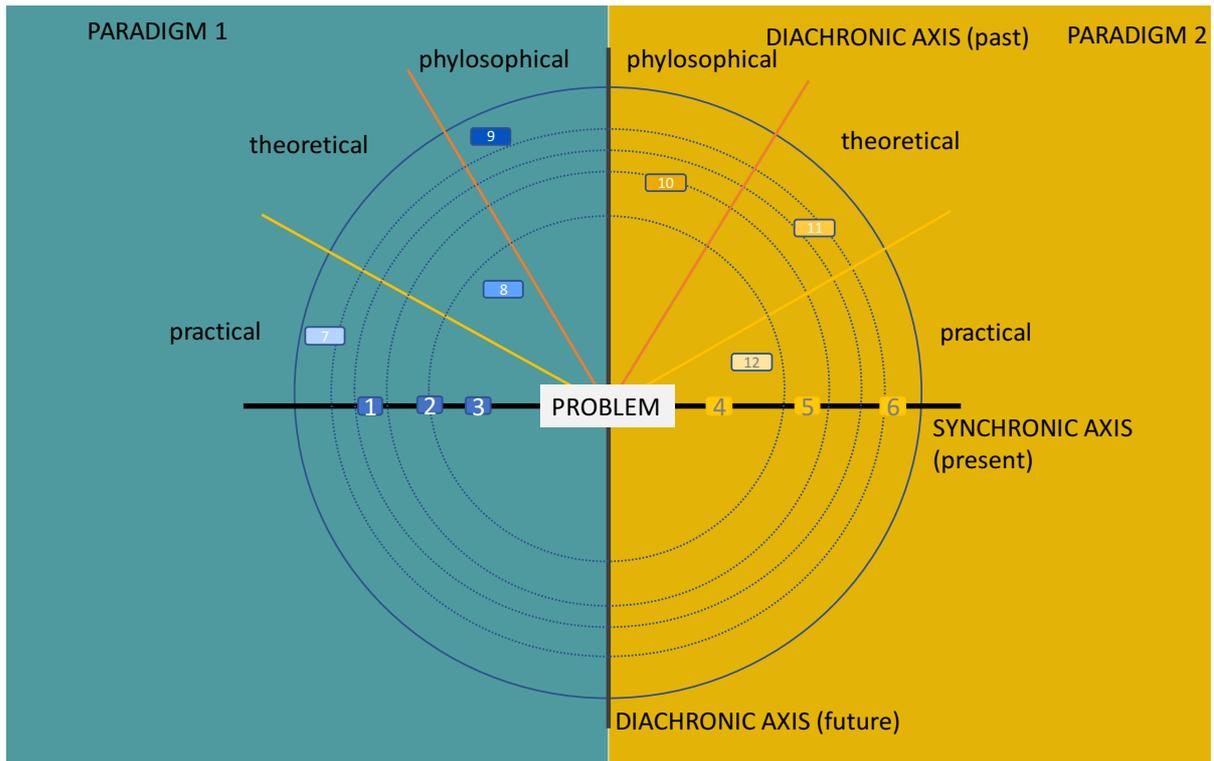


Figure 1 – draft diagram to support diachronic vs synchronic positioning (author, 2012)

The several circles represented are timelines to help position authors and past research either in philosophical (9,10 events), theoretical (8,11) or practical (7,12) terms. With this diagram, it is also conceivable to map future research, that is to say, to predict the evolution of some of the research currently being conducted. It is even possible to consider other paradigms or scientific work that takes into account two apparently opposed viewpoints on subjects that are not mutually exclusive.

Since the diagram of figure 1 is just a draft identifying key elements to be considered students always have the possibility of designing a research positioning in different ways such as the ones presented in figures 2 and 3 in which students take as a research question the one posed by Snodgrass and Coyne in their 1997 article “is designing hermeneutical?” and design their diagrams with two opposed paradigms – the positivistic and the hermeneutical ones.

The result of such mapping activity was assessed by the author in 2012 with highly positive results (author, 2012) and was further refined so the students can have a consistent state of the art to present in their PhD proposal having a rich literature review mapped and critically organised. It follows the third phase in which all the elements of the “research System” must be defined and related with each other.

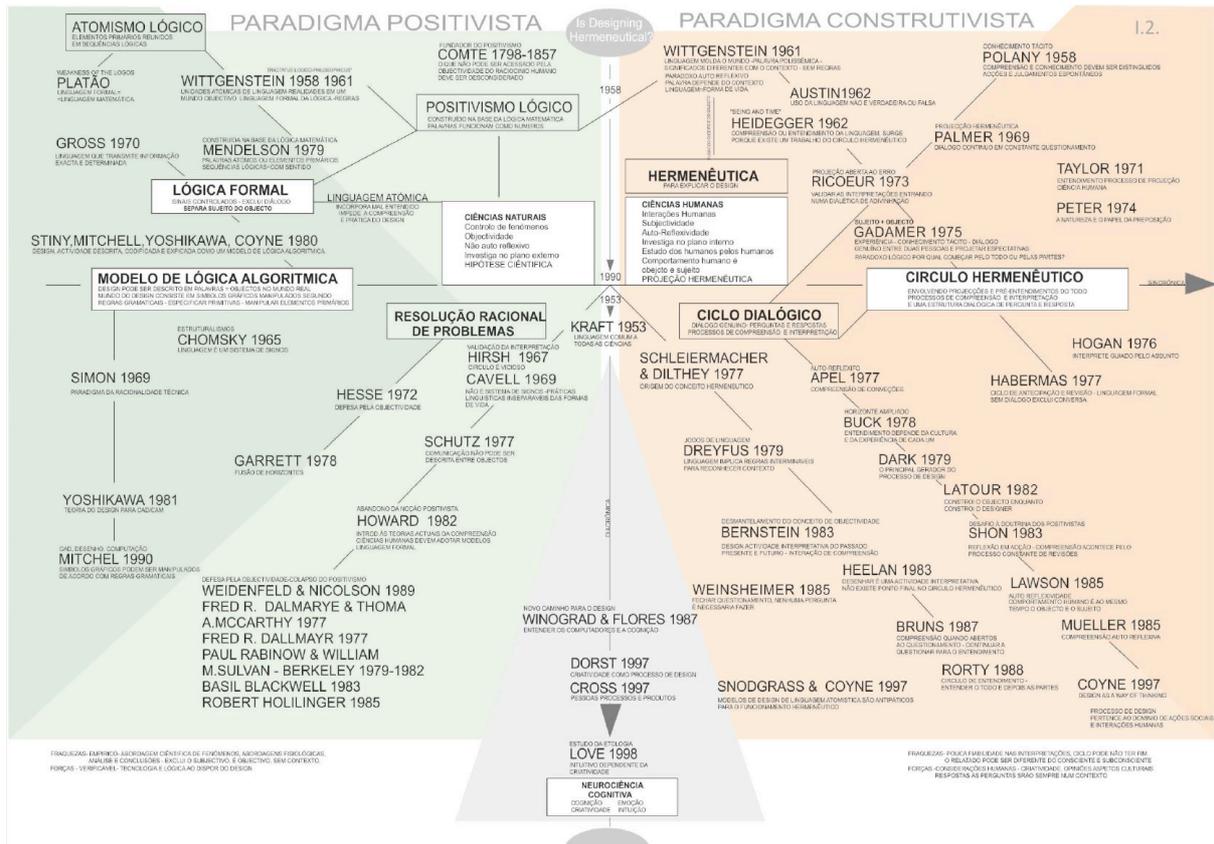


Figure 2 – diachronic vs synchronic positioning diagram exercise (student 1, 2017)

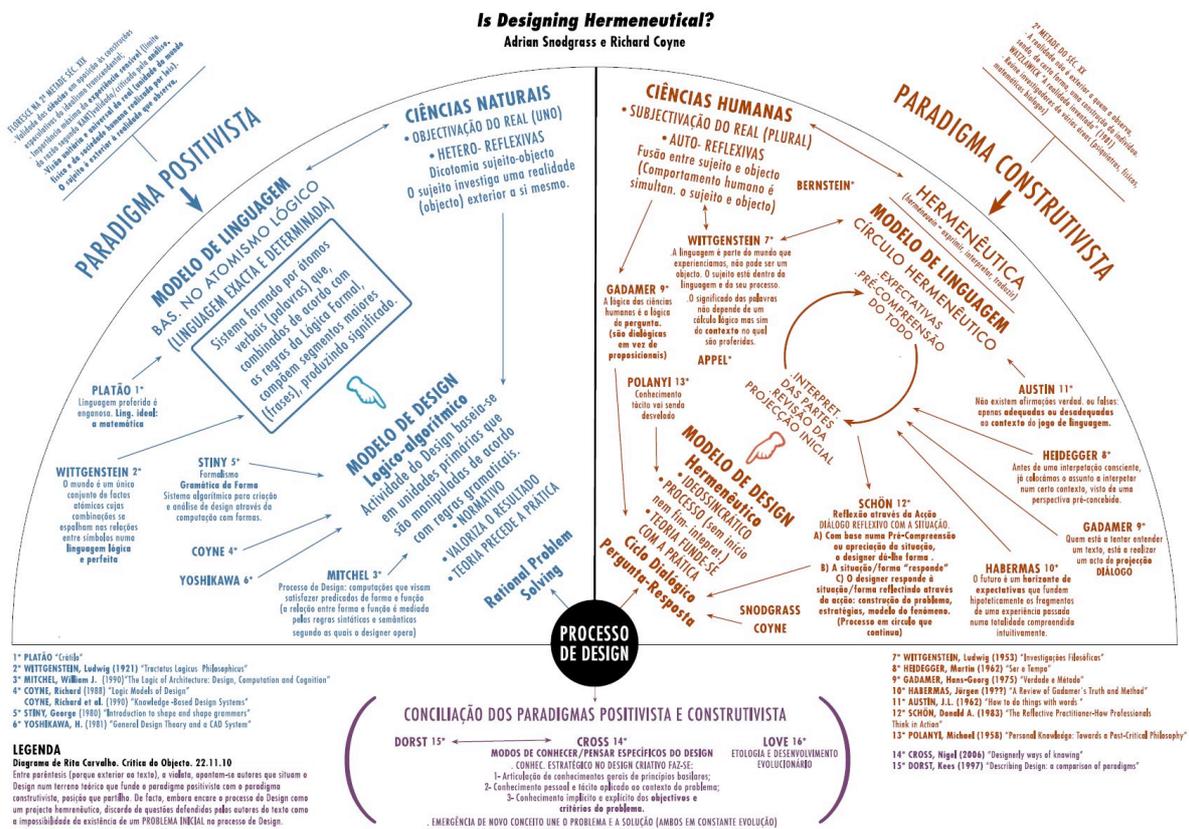


Figure 3 – diachronic vs synchronic positioning diagram exercise (student 2, 2015)

2.3 Approaching “critical nodes” – What? Why? When? Where? With whom? How?

The third step of the methodology comprehends the identification and definition of what we call “critical nodes” meaning by that the issues that are critical along the research process in what concerns the creation of a consistent and rigorous PhD proposal. These critical nodes correspond to six questions: 1. What? – definition of the exact problem to be addressed – meaning that at least a main research question must be “designed”; 2. Why? – the identification and definition of the pertinence of the proposed research – which has a strong connection with the goal’s explanation; When? – clearly linked to the time frame of the research; Where? – associated with the space of the research; With Whom? – related to the target group involved in the research (internal elements) and the people engaged in the research process (other stakeholders- external elements) and finally How? – the definition of the pool of methods to be used along the research process. Figure 4 presents an example of the approach done by one of the PhD students in which the identification of five of the questions is addressed.

#Critical_Research_Milestones

#THEME	#WHAT?	#WHY?	#WHEN	#WITH WHOM?	#HOW?
<ul style="list-style-type: none"> - Appealing and Therapeutic Footwear Design; - Orthotics / Pedorthics; - How to find the balance between aesthetics, functionality and sustainability; - Create a link through pedorthic, between physician / patient / designer / manufacturer; - How design can encourage the commerce of therapeutic footwear 	<p>- CAN DESIGN IMPROVE WELLNESS IN FEET WITH NEUROLOGICAL PROBLEMS / NEUROPATHIES?</p>	<ul style="list-style-type: none"> - Eliminate stigma and taboos, physical and psychologically for people with this type of difficulty; - Market Gaps about functional and aesthetic solutions; - Lack of speed between the appropriate medical solution and the models delivery; - Lack of pedorthics - the essential and adequate personalization to each patient; - Lack of real-time technological monitoring of the needs and difficulties of each patient. 	<ul style="list-style-type: none"> - In the last 15 years neurology is one of the areas that has visibly evolved; - There has to be a comparison of the models 70/80'S footwear and the last 15 year models; - The development of new materials such as viscofoams or latex, have brought a new life and comfort to this type of products; - If in medical terms there is a great evolution, both in diagnostics and medication, at design level appropriating it to pathologies, we do not advanced aesthetically, as it is apparently not considered a first necessity requirement. 	<ul style="list-style-type: none"> - To accompany people with this type of problems since they are diagnosed although there is a prevalence of these cases at more advanced ages due to tissue degeneration and both physical and cognitive disabilities. - Neurological diseases, depending on the disease, can be diagnosed at various ages (even children); - Accompany personalization with patients, physicians, and manufacturers; - The creation of functional and pathological models 	<ul style="list-style-type: none"> - The study of common and constant characteristics in each disease; - Customization of models through foot measurement and plantar pressure tests; - Fast prototyping of insole and upper with modular solutions, with application of materials with sensors and TENS (transcutaneous electrical neurostimulation); - Viable solutions for manufacturers to fit segments and production lines; - Create Emotional Design models that increase patients' self-esteem and encourage the treatment and use of appropriate footwear

Figure 4 – defining the critical nodes) (student 3, 2013)

#Analysis_Research_Methods_and_Result_Evaluation

	#1 CASE STUDIES	#2 INTERVIEWS	#3 EXPERIENCE PROTOTYPING	#4 DESIGN ETHNOGRAPHY	#5 DESIRABILITY TESTING	#6 EVALUATIVE RESEARCH
HOW?	Styles and patient usability study. Examination, trying to understand, in-depth, the problems, the look, the model parts that are significant to each pathology, psicologic awareness of styles use.	Questionnaire made personally, by email or phone to specialists in specific areas (doctors, manufacturers, designers, production managers...) to collect objective information or evaluation of diagnoses, treatments, details from styles, distribution	The concept and product description, illustration and technical drawings can simulate the hypothesis and facilitates active participation in it's design. Doctors, users and manufacturers can help development of the styles and solutions	Product observation within different contexts: - people who use it in terms of design, - podiatrists in questions of treatment solutions - manufacturers to apply production needs	Query with limited answers provides a way to identify and articulate how a design makes them feel. If it appealing. Preference about materials, look, outsole...and others details	Production and test the most important methodology to evaluate the hypothesis and correct it. It's essential to take considerations and redo prototype if needed
WHEN?	In Investigation RoadMap: It's important that we start with this study, side by side with Literary review, if possible	In Investigation RoadMap: After Literary review, and case studies, we have information to do our questionnaires	In Investigation RoadMap: When doing interviews, can complement with cooperation - Neurology (start February), - Podologist and Kinetics Cooperation (FMH as accepted to cooperate in 2018 start)	In Investigation RoadMap: Observation at orthopedics shop to understand the searches, and the solutions (identified shops but no observation data yet) This will be important until and during the hypothesis development	In Investigation RoadMap: The opinions os the patients will help to know wath we can improve in the aesthetic and design of the theoretical hypothesis, during or after Experience Ethnography where also test functions and technical solutions	In Investigation RoadMap: This is it. The way to test and evaluate a product and it will come at the end, after the theoretic hypothesis and the case studies. Do we need another literature review, prototype, hypothesis, orwe have the solution?
WHO?	- Patients (fisc and psicologic examples), - Neurologic Doctors (diagnoses and coincident pathologies), - Podologists (treatments and style solutions), - textile engineering (material solution) - production management	- doctors, - manufacturers, - designers, - production managers	To help development of the styles and solutions: - Doctors, - users/parients - manufacturers - production managers	looking at the environment: - from patients, - podologists - manufacturers -manufacturers, production and factory employes involved	- Potential users, - manufacturers and factory employes involved. - Everyone's opinion about aesthetic and function look.	- by real potential users / patients, - podologists - manufacturers manufacturers, production and factory employes involved.
WITH?	This method can relate to: - interviews - design ethnography - experience prototyping Because: it composes the theory with the real scenario adding the solution /hipoteses	This method can relate to: - case studies - design ethnography Because: it's the closest solution to the theoretical hypothesis	This method can relate to: - evaluative research Because: it's the closest solution to the fisc hypothesis	This method can relate to: - experience prototyping, - case studies - interviews Because: it can launch the hypothesis	This method can relate to: - experience prototyping, - evaluative research -design ethnography Because: it can evaluate the hypothesis before and after the fisc prototype	This method can relate to: - case studies, - desirability testing, - design ethnography Because: it can improve the needs of all the Users and manufacturers

Figure 5 - Defining the methods to be used according to the identification of critical nodes (student 3, 2013)

In addition, the student elaborated a table crossing the critical nodes with a pool of chosen methods (see Figure 5) trying to test the consistency of her research work. Although we can identify a few inconsistencies in this particular example (that is one of the reasons why it was used in this paper) one must bear in mind that this is part of the process and that only with the execution of this practical work is it possible to identify inconsistencies, gaps, absences, mistakes etcetera. After that work of alignment between the six structuring elements of the research process, it is necessary to create what we call "Plan B's" to each of the critical moments identified by the students. That means anticipating possible problems (for instance not being able to have access to some sources) and sketching a plan B accordingly. That being done it is time to initiate the last phase of the methodology: expand the How question, i.e. being able to make a critical selection of the methods and its articulation along the research process.

2.4 Methods as a critical tool

The use of the methods as critical tools in the PhD process implies the recognition that the choice of the pool of methods to be used along its development depends on different variables such as the context, the topic, the type of people involved; the goals of the research; the available human support, financial and time resources among others. The methodology to be used, assumed here as the system of methods designed to respond to the exploratory, generative and evaluative phases of the research process, can accommodate distinct methods and their critical combinations. (see figures 6, 7 and 8)

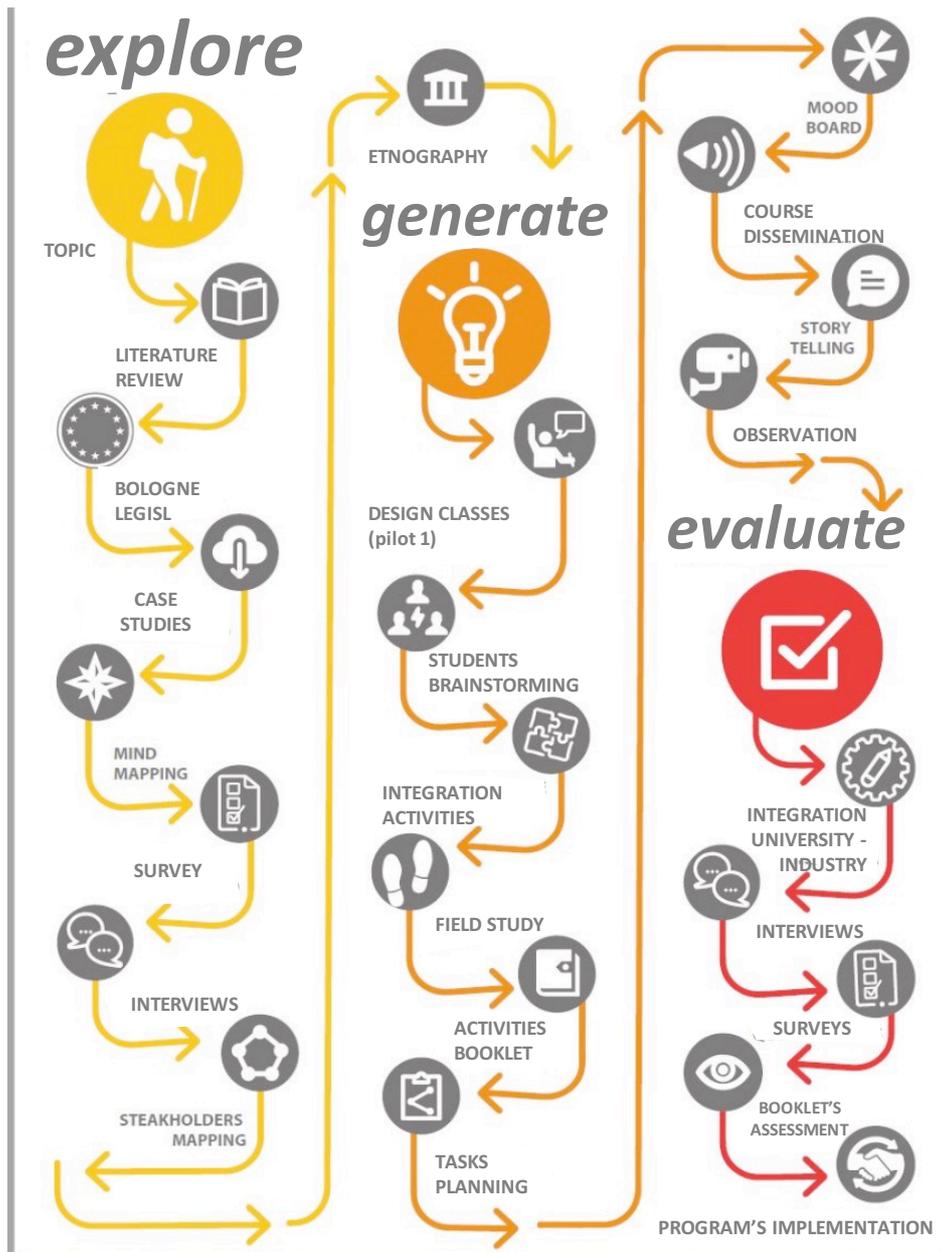


Figure 6– synthesis of method's critical use along the 3 phases (student 4, 2016)

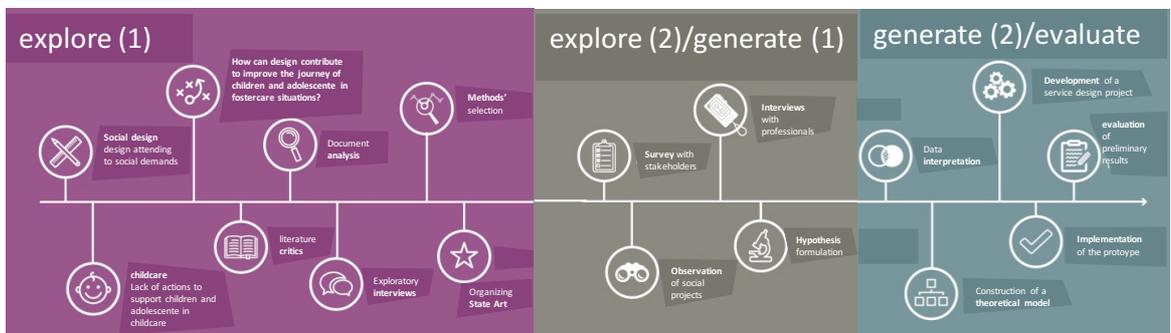


Figure 7– synthesis of method's critical use along the 3 phases (student 5, 2017)

As can be seen in figures 6 and 7, within methods the first dimension to work is related to the extent to which they are adequate to Exploratory, Generative and Evaluation phases of the research process. These dimensions were adopted from Martin and Harrington work (2012) that identifies multiple dimensions of distinct methods. Our option was to select this dimension to rule over the others such as qualitative/quantitative; attitudinal/behavioural etcetera. In our view, students must first understand and work on the necessity to explore the topic, to generate information about it and to assess the research work done; this implies a critical selection of methods that is facilitated if one assumes a table crossing these three phases with the main and secondary goals of the research work (see figure 8).

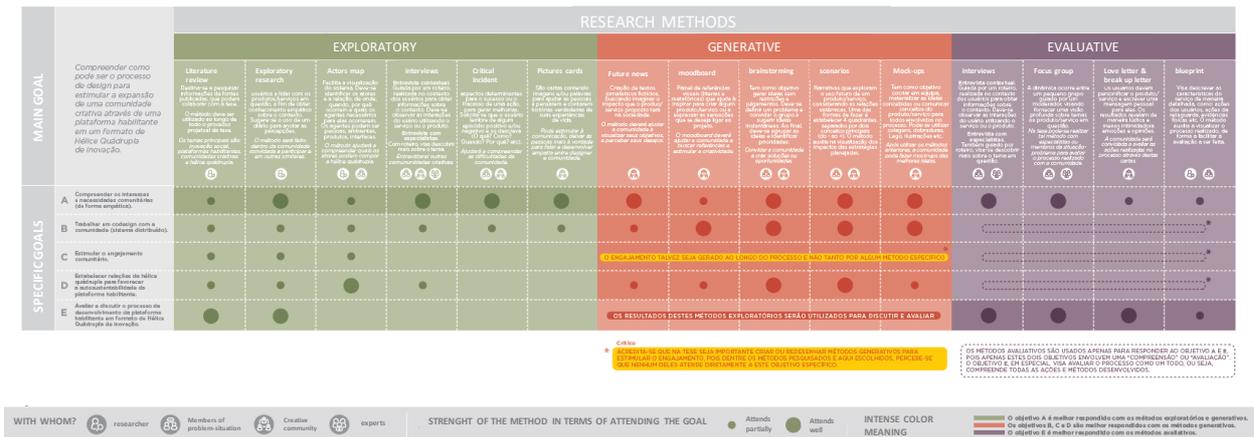


Figure 8 – Research methods' critical design exercise (student 6, 2017)

Furthermore, it is important to acknowledge that these phases are not necessarily engaged in a rigid sequence; the iteration in the research process is desirable at all moments.

In a closer look to figure 8 one can realize that the students must cross the main and secondary proposed goals with different methods classified according the exploratory, generative and Evaluative dimensions. Moreover, they will choose at least three methods for each phase, have to justify their use and to recognize how good that method will perform in terms of goals fulfilment. It is also mandatory to identify with whom the methods will be applied (in the case of figure 8 four types of icons where created – the researcher; experts, members of community; students).

Additionally, we seek that students organise their “methods journey” being aware of the possibility to have the need to substitute a method, to create alternatives and even to adapt, change or create methods.

The pool of methods to be presented by PhD students must display richness and diversity in terms of complementarity, adequacy to the sources, the context, the expected results etcetera. Students also know that they have to guarantee a methodological triangulation as well as a source triangulation in the design of their methodological process. In fact, in the end of this process students do not have a “triangulation” but a dynamic network of methods, interconnected and firmly supporting their research’s relevance, consistency and rigour.

3 CONCLUSIONS

As acknowledged by the author in 2012 PhD students have a hard time engaging with the activity of selecting interpreting and using information in a way that will really contribute to expand knowledge in the design domain area. On the other hand, establishing fluxes

between theory and practice as well as critically relating different phenomena, and building new information are crucial accomplishments to develop a good PhD thesis.

The proposed methodology described in this paper is the result of 10 years of experience teaching PhD students how to develop a relevant, rigorous and innovative PhD proposal, one that complies with the ethical commitment design must have with the creation of meaningful, useful objects, either they are material artefacts or knowledge production. This methodology emerged from a course that originally aimed to develop students' critical thinking skills, as such, from a close and personal iterative process between teacher (the author of this paper) and students, it was possible to slowly and carefully build up a methodology that could function as a useful tool in the crucial early stages of developing a research proposal. It was a thorough and highly reflected process aiming to facilitate information management and knowledge creation but essentially it was an ongoing reflective process fuelled by constant questioning and informed decision-making.

Critical thinking is essential to research, *critical* in the sense of the mental work involved when we investigate complex questions (Kurfiss, 1988); what our pedagogic experience suggests is that having a critical system to gather, organise, and analyse information is a promising method to develop those skills in novice design researchers, while simultaneously helping them develop coherent PhD research proposals.

Thus, the methodology was improved each year after reflecting on the work done by students and mostly after considering their feedback on how it helped them not only in terms of delivering their proposal but especially during their research process. The approach we described here allows the PhD students to tackle the issues in detail and to engage critically at every level of research design.

As the students are encouraged to dive into the research problems and engage critically with the research process from an early stage, they begin their investigative process holding the driving wheel, in other words, they conduct the process instead of being led by the process. The fact is that all of them report that this methodology was essential to structure both their thinking and their research process, and the work they initially do ends up serving as a kind of roadmap along the investigation.

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