



USING STUDIO TEACHING AS AN INITIATOR AND DRIVER FOR RESEARCH COLLABORATION IN DESIGN

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Abstract

This article proposes an alternative route towards initiating and developing formal design research projects, where design studios act as an "Initiator" and "Driver" for subsequent research collaboration. A concept for collaborative research, involving different stakeholders, will be introduced based upon the notion that results from sponsored studio projects create avenues for more formal research work, whether fundamental or applied. Building upon "Activity Theory", "Action Research" and "Practice Theory", the authors argue that practice and research are becoming more seamlessly connected through the increasing importance of context. This requires a strategic and educational perspective, where design thinking about social, technological economical, environmental and political aspects completed by collaborative learning determine scholarship as well as synergies between practice and research. Tactically, systematic planning and systems development is essential to develop new knowledge and networks, as well as anticipate future products and services. Operationally, iterative research and design prototyping addresses the systemic, emergent and real challenges of given contexts.

Keywords: Design education, Research methodologies and methods, Design practice

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1 INTRODUCTION

For many years, strong opinions have existed, denouncing the affinity between teaching and research (Feldman, 1987). However, following the core values of classical European University education, which is embodied in the “Humboldt” model, there is no border between teaching and research. They are complementary and overlapping activities in knowledge creation and interpretation (Williams, 1991) (Kjeldstadli, 2010).

The scientific approach in design, which has its roots at the Ulm School, confirms the above. The traditional view of the designer as a creative genius or stylist has shifted and synergies between research and practice have become more apparent. Based on acquired “Active” and “Problem-Based Learning” (PBL) skills and attitudes, the designer is currently perceived as a team member, interpreter of complex systems, communicator and problem solver (Roth, 1999).

The aim of this article is to argue for an alternative route towards initiating and developing design research projects through studio teaching. A concept for collaborative research will be proposed through the initial involvement of stakeholders in studio projects. This concept is to be developed based upon the understanding that results from sponsored studio projects, though problem solving in design, create avenues for more formal research work, whether fundamental or applied.

From an overarching level, the article will revisit both domains, design research and design thinking to understand and extract synergies between the two, and as such bring practice and research closer together. In section 2, the concept of design research and its trends will be discussed. Section 3 focuses on the connections and synergies among “Design Research”, “Design Thinking” and “Design Practice” by discussing several theoretical frameworks to provide a deeper understanding of the dynamics between these three activities. The theoretical frameworks are *Activity Theory*, *Action Research* and *Practice Theory*. In section 4, the authors argue for having a studio culture to facilitate collaborative research on a larger scale. Systems thinking and systemic approaches, as well as several educational concepts, will be discussed to show how research and practice complement each other in design. Furthermore, two cases will exemplify and illustrate, how a studio culture can initiate formal research derived out of company-funded design projects, where not only the design task has been addressed, but also new research problems introduced with a potential for radical social innovation. Prior to the discussion, section 5 discusses prototyping as a bridge between practice and research.

2 WHAT IS DESIGN RESEARCH?

Various scholars have claimed that design research is the foundation for creating products, services, and systems that respond to market needs by assisting designers in decision making, regarding a variety of users’ considerations. According to Binder and Redstrøm (2006), design research is a venue for knowledge production that is guided by the professional interests of design communities and the need for theoretical and methodological development. However, recent trends in design research have emphasised the cognitive aspects of human activity (Schön, 1987; Cross, Dorst, & Roozenburg, 1992; Norman, 2003). Complementary, other disciplines, such as psychology, neurocognition, and physics Damásio (2000), have contributed to the growing incorporation of creativity, imagination, meaning making, and intuition in design theory. Liem and Sigurjonsson (2014) investigated the trends of design research in design education, determining that intertwined scholarship and mentorship in project-based learning facilitate creative interactions and collaborations among stakeholders. But what are the marks of excellence of intertwined research and teaching, and how can it claim its relevance and ensure credibility of its results? How does the knowledge produced relate to design itself?

These questions produce a double challenge for design research, as it must show that what is proposed by the program actually can be done, and at the same time provide additionally evidence that pursuing such a line of inquiry leads to opportunities of unprecedented change and novelty (Binder and Redstrøm, 2006).

3 RELATIONSHIPS BETWEEN DESIGN RESEARCH, DESIGN THINKING AND DESIGN PRACTICE

According to design researchers and practitioners, design research, design thinking and design practice are becoming more seamlessly intertwined. Bringing the enquiry and practice elements of design

together is a result of a common agenda, which is all about innovating the future, either from a business or socially sustainable perspective.

These profound similarities, found between design research, design thinking and design practice, have gradually emerged because of the following trends:

- Research through Design (RtD) (Frayling, 1993) has emerged as a prominent research approach within the design-oriented communities in Human-Computer Interaction (HCI) (Dalsgaard, 2016), because it is a research approach that employs methods and processes from design practice as a legitimate method of inquiry” (Zimmerman et al. 2010).
- There is a significant interest in finding out the “why” and “how” of human behaviour, which motivate design researchers to adopt qualitative methods, not only to describe present phenomena, but also to anticipate future trends, products and services.
- Design knowledge and scientific knowledge are becoming more intertwined, and in some instances design knowledge determines the direction and value of scientific knowledge. According to Hatchuel and Weil (2003), who introduced Concept-Knowledge (C-K) theory, theory is based upon the understanding that concepts are generated from existing knowledge, as well as that knowledge is explored through concepts. Similar work, which brings research and thinking in Design closer to each other, has been undertaken by Bamford (2002), where in certain cases analysis/synthesis have been rejected in favour of conjecture/analysis.

With respect to the above-mentioned trends, once design thinking is able to broaden its perspective by moving away from a positivistic approach of involving different stakeholders in a structured design and development process (Brown 2009), tighter synergies with design practice and design research can be developed. Socio-cultural, economic, technological, political and environmental issues will gain more attention among designers when solving contemporary problems, predicting trends and speculating future innovations. Theoretical concepts, which will be discussed to explain the synergies between design thinking, design research and design practice are: Activity Theory, Action Research and Practice

3.1 Activity Theory

The analysis of Activity Theory (AT) revolves around human activities which are formed, mediated, and defined by their object as well as changed over time while interacting with other activities. (Kuutti, 1991). The activity object is a collective project that is stabilized by the shared tools, signs and procedures of the activity system. However, underlying mechanisms are interwoven in a complex web of mutual interactions.

AT does not only facilitate the exploration of activities as dynamic phenomena but also captures all aspects of the activity system to better understand the nature of the activities. In other words, the objects of study in AT are the relationships between material action, mind and society. The concept of activity, seen as rooted in practice (Schatzki, 2008), explores links between thought, behaviour, individual actions and collective practices. An effective and popular theoretical framework (Engeström, 1987, 1999) has made the links visible between its elements involving social actors, tools, rules, contexts, and the role structure of social actors.

Central to AT is the conception of collective or *social learning*, only to be achieved by active participation (Bandura, 1990). The approach suggests that the ambiguities, uncertainties, and contradictions that are characteristics of the human condition can provide key opportunities for learning, conceptualised as collective and individual activities (Schaal, 2009).

3.2 Action Research

Action research is typically designed and conducted by practitioners who analyse research outcomes to improve their own practice and operational methods (Bennett 1994). Dealing with problems in an integrated manner, researchers probe for new possibilities through interventions with participants concerning a specific topic. Action research has particularly been applied in organizational research, where researchers for example have taken on a kind of consultancy role in change processes in parallel with monitoring and evaluating effects of the instantiated change (Whyte, 1991).

According to Glimore, Krantz & Ramirez (1986), Action research aims to contribute both to the practical concerns of people in an immediate problem situation and to simultaneously further the goals of social science This means that there is a dual commitment in action research to study a system and concurrently

collaborate with members to change the system in what is regarded as a desirable direction by the community.

The continuous transformation, where theory informs practice, and practice refines theory is a typical trait of action research. It argues for a commitment to experiments that somehow make the research program open for tests of accountability and relevance. This test, however, is not a simple question of confirmation or rejection as discussed by Schön (1987). Rather, the experiments are exploratory probes into what the future design or service may entail and how it can be expanded and sharpened to account for how the experiments unfold (Brandt, 2004). The systemic nature of Action Research, which is emergent and collaborative, emphasises refining methodological tools “to suit the exigencies of the situation, and on collecting, analysing, reflecting on, and presenting data on an ongoing, cyclical basis” (O’Brien 2001).

One of these methodological tools, which operationalises “Design Thinking”, “Design Research” and “Design Practice” is prototyping. Hereby, prototyping is perceived to be more than an activity to create visual manifestations of ideas (Lim et al. 2008), and visualizations to “make the ideas more tangible, complexity more readable and alternatives shareable” (Diana et al. 2009). As mentioned earlier, in section 5 of this article, prototyping will be introduced and presented as a bridge between research and practice. Through interventionist actions of researchers, designers and participants, conjectures are made more frequently and experiments are targeted to solving the more immediate needs of the “real world”.

3.3 Practice Theory

Practice theory is relevant in guiding designers to be more conscious “anthropological” thinkers by bridging the gap between design thinking and design research. In other words, design and research goals intertwine with the goals of real-world practice. Inevitably to understand the deeper connections between research and design through design thinking, and to argue for their increasing similarity in terms of knowledge creation and innovation, the conceptual relationship between practice, praxis and practitioners will be discussed below.

First to make the distinction between practice and praxis, practice guides activity, while praxis is the activity itself. Hereby, ‘practices’ refer to shared routines of behaviour in the broadest sense, including traditions, norms and procedures for thinking, acting and using ‘things’ (Whittington, 2006, p.619). Praxis refers to what people actually do. Practitioners are the actors, who make, shape, investigate and execute. They include not only senior (strategic) design executives, but also designers, researchers, makers, prototypers, etc. Based on the concept of “Praxis”, which encompasses “Practice”, their work is complex and diffuse. It embraces the routine and the non-routine, the formal and the informal, activities at the corporate centre and activities at the organizational periphery (Regnér 2003). These activities include meetings, conducting interviews, presenting concepts, entertaining potential and existing customers, talking with suppliers and distributors on the phone, organizing and conducting usability studies, ad-hoc “firefighting”, and many more.

The extent to which practitioners engage in praxis at the ground level, which is typical for Industrial Design, binds design research and practice. This engagement is dependent on the speed and openness of internal existing design and research procedures and capabilities to embrace externally emergent influences. These influences are described by Mintzberg and Waters (1985), as generically processual and subject to learning experiences. Moreover, complemented with Whittington’s systemic views of bounded rationality, planning can only be effective when pursued in context. The constraint arises because human behaviour is emergent and embedded in a network of social relations, involving their families, state, their educational and professional backgrounds, religion and ethnicity (Sweberg, Himmelstrand & Brulin, 1987).

To summarise this section, the connection between design research and practice through design thinking, provides opportunities for researchers to deeply understand problems of practice and for practitioners to deeply understand the goals and implications of research. This is re-emphasised by Dorst (2008) as he argues that the future of the design discipline should be created by combining design research and practice. Hereby, “Activity Theory”, “Action Research” and “Practice Theory” are fundamental in advocating knowledge creation and innovation through scholarship, and as a result anchor the similarities between research and practice in design. These similarities can be characterized by high complexity, emergent activities, and being embedded in a network of social relations.

4 THE STUDIO ENVIRONMENT AS AN EDUCATIONAL PLATFORM TO FACILITATE DESIGN & RESEARCH

The higher objective of studio teaching is to help students and novice designers enter a community of practitioners and herewith a network of social relations. Building upon the concept of Legitimate Peripheral Participation (LPP), actors gradually learn to become accepted and influential members of their communities, absorbing its particular mix of local rules and internalized standards through a kind of apprenticeship (Lave and Wenger 1992; Brown and Duguid 2001). This view implies the need to track carefully the course of aspiring design researchers and practitioners over time by following their praxis closely, as well as to observe how they master necessary research and design practices.

Hereby, the studio environment is often assumed to be a well-defined mediator, drawing on decades or centuries of practice in established design disciplines. Environmental factors include the composition of the studio itself, both the physical space and resources and the pedagogy that occurs within the design studio, as well as the tools used by students within the context of the studio (Blevis et al., 2008). Shaffer (2003) suggests that the ‘surface features’ of a physical space, which can include ‘time, space, resources, and materials’ (p. 4), partially form the overall pedagogical experience, and that these features can affect the kinds of activities that the studio can support.

Therefore, it is important to develop a common understanding of what “Design Studio Education” is about, its uniqueness for the design profession, and how the design studio serves as an environment where projects are individually or collaboratively selected and executed, based on their applicability and conformance to the practice and research of a given design discipline (Schön 1987).

In the case of actual studio teaching, the practices of hands-on learning have been reflected in experiential learning (Kolb, 2014) for decades, while wicked problems (Rittel and Weber, 1973), reflective action (Schon, 1987), construction of prototypes, and critique or other forms of formative evaluation have been introduced in conjunction with problem- and project-based learning. To understand how the studio environment can be utilized as a driver for design and research activities, the systemic and systems approach will be discussed below. The authors argue that both a systems and systemic approach is necessary for design and research practice to complement each other, especially when these two approaches aim to engage multiple forms of collaboration.

4.1 Systems Thinking as a Driver for Design and Research in a Studio Environment

The most inclusive definition of a ‘*System*’ is a set of interconnected and interacting entities, comprising people, processes and technologies, which are dynamic in their behaviour and have a purpose or reason for existence (Singleton, 1974).

A systems design approach can be used as a driver for initiating and structuring designing activities in a studio environment, as well as creating avenues for follow-up research. In other words, a systems approach proved to be an effective generator for developing a wide range of different design and research projects within specified holistic systems (Liem, 2007). The top-down structure, which implies a dissection of the whole into sub-systems and elements, serves as a blue print for hierarchical learning as well as mentorship – scholarship interactions between experts and novices, teachers and students, etc. in an apprenticeship-driven practice and research environment. Moreover, such apprenticeship-driven practice and research environment will provide students with real coordination and cooperation training alongside individual design skills (Liem 2007).

4.2 A Systemic Approach to Facilitate Design and Research in a Studio Environment

The systemic approach is being introduced here, because similarly to an organization, studios are not simply made up of individuals acting solely in a single-minded and transactional way to meet certain “narrow” objectives (Whittington 2001) Individuals with different interests and backgrounds are acting in contexts and environments, which in many cases are ambiguous, confusing or messy. The course of action is determined through a process of bargaining involving different stakeholders, and goals are set that are acceptable to all.

The challenges between research and education in design is further complicated due to rapid technology developments, a trend towards knowledge creation, de-emphasising skills development, and a focus on anticipating the future, based on user research studies (Schon, 1987). By juxtaposing systemic and systems approaches, a clearer picture is then drawn on how to address these challenges, whereby the studio environment plays an instrumental role in simultaneously or alternately facilitating research and practice in design to anticipate future products and services; in other words “innovation”. The planning

of these type of innovation activities is bounded by rationality, partly emergent and driven by context. Singular objectives, such as profit maximization or problem solving, give way to pluralistic ones (Liem, 2014).

4.3 Cases on Initiating Research through Studio Projects

To exemplify how design studio projects have facilitated the framing of research projects, two cases within the context of social innovation and strategic design will be discussed in detail. These cases were presented to demonstrate the temporal and spatial connection between design education, research and practice, as well as how they involve different stakeholders.

The cases were evaluated on:

- How much system and systems thinking has been influential to extend the project results to research aims
- How the scope of the design brief in terms of broadness has instigated new research directions
- The level of interest and engagement among stakeholders during the design project stage and how much of these has been sustained as the project transitions into a formal research project.
- The extent of design thinking activities in the design and research stages and their focus on speculating the future.

4.3.1 Case 1: The Versatile Mailbox

In January 2016, a Norwegian start-up: Postkassen AS, collaborated with NTNU Department of Product Design (NTNU-IPD) on designing a “Versatile Mailbox”. Initial research indicated that this mailbox should have sufficient security measures to receive and store critical and personal items, such as medications, as well as provide selective access to rightful recipients. Furthermore, the mailbox should also be able to receive and store large items, inclusive of perishable goods. This last requirement demands the involvement of temperature regulating elements, e.g. cooling units.

Ideas and concepts, following the initial research stage, revealed the need for more in-depth research in Product Service Systems (PSS) as well as social innovation. For instance, a more detailed differentiation of stakeholders and how such a mailbox will meet the explicit and implicit needs of these stakeholders pertaining to the delivery of goods should be investigated in context. A formal research proposal involving industry and the Norwegian Research Council is under construction to be submitted for the upcoming user-innovation grant announcement in 2017.

4.3.2 Case 2: Interaction spaces and service concepts for the less fortunate and active in society

In January 2015, Alba AS, a Norwegian service provider, active in elderly and child care, explored ways to extend its services to helping “mentally unstable” individuals to integrate better in society through their guardians or next-of-kin. Various studies, including interviews, persona and scenario development, have been conducted with different stakeholders. Moreover, service ideas and concepts were generated. Initial results indicated that people have difficulties in managing their versatile roles in an individualistic society such as Norway, and therefore have little buffer to concern themselves or take care of their mentally unstable next-of kin. On the other hand, guardians, such as lawyers, lack the emotional connection to facilitate effective integration. Alba’s interest to extend its “Care” activities has resulted in the formulation of a research project, which centred around “Developing communities of interaction for different groups / people who need care”. The concept is based on the hypothesis that interaction, communication and emotional engagement, by bringing together groups (elderly, mentally unstable individuals, children, handicapped, etc.) may partly solve the integration problem. Furthermore, a system of interactive spaces and modes of interaction will be investigated.

4.3.3 Case 3: Redesign of shipping labels

A recent collaborative design project/design research project between IIT Institute of Design and Steelcase initially addressed the redesign of shipping labels. However, to enhance the status of the project by focussing on knowledge creation in design, a larger examination of the entire information ecosystem was proposed, of which the shipping labels were merely a small part. Over the course of the next 3 semesters, a team consisting of professors, graduate students, and company employees studied the system in terms of its information inputs, uses, and outputs. At the same time, specific touchpoints were identified that could most significantly benefit the organization, whether through better use of existing information or through capture and use of new forms of information.

As the conceptual space broadened through our increased collective understanding and divergent prototypes, the production space narrowed through specific attention to shorter-term project deliverables. The same project was therefore able to produce not only a desirable outcome for the company, but also a research outcome for the university.

Negotiating these two interests required some flexibility on both sides of the equation, since the divergent thinking phases tended to make the industry partners uncomfortable, and outcomes that were too immediate in nature left the university participants feeling that their time was not being well spent. However, open discussions and an attitude of give-and-take from industry and IIT Institute of Design, allowed the construction of alternative mental models, which for IIT led to the expansion of the conceptual space. For the industry partners, the opportunity was there to check signals periodically to make sure that the more immediate outcomes were not being forgotten.

The three cases demonstrated a significant amount of dedication in studio engagement. Not only did the students experience a comprehensive and detailed process, they also learned through a process of “prototyping” and management to present insights, communicate with stakeholders and most importantly convince a core group of resource contributing actors / investors to combine the results and insights of the studio project into a formal research project.

5 PROTOTYPING AS A BRIDGE BETWEEN PRACTICE AND RESEARCH

As briefly indicated in 4.3.3, a common element of design research and practice is prototyping. However, prototyping for the two purposes is not the same, and so to make this activity serve as a bridge, it will be necessary to adjust slightly both the process and its outcomes.

First, it should be clarified that prototyping is used in a broad range of disciplines. Well understood in industrial design, prototyping has become increasingly important in other forms of design that are not as physical, including communication, interaction, service, experience, and so on. The argument can also be made that prototyping is common in areas not traditionally thought of as design, such as chemistry, biology, computer science, math, drama, education, and so on (e.g. Ruecker and Roberts-Smith, forthcoming).

No matter how broadly construed the use of prototyping is, there is still nonetheless a difference between prototyping for practice and prototyping for research. For the practitioner, a prototype is often a learning tool that will help narrow the conceptual space until a commodity is produced. The process consists of experimenting with different possibilities for various aspects of the commodity, allowing the designers to gain additional information before making each choice.

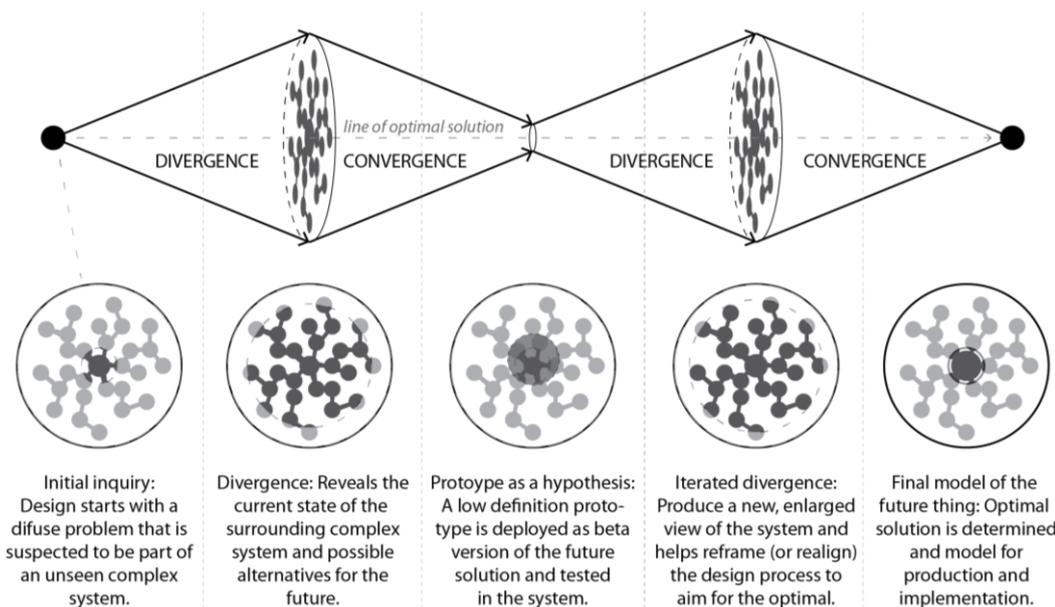


Figure 1a. The prototyping process within a divergence and convergence model of design practice

Design practitioners (Figure 1a) assume the existence of an optimal solution that can be achieved by a serious process of research for design. Such process is very useful when trying to reduce uncertainty and achieve a faster tangible result. In this context, designers assume that every prototype is a *beta*

version of the final commodity to be produced, an unrefined version that could help them correct the aim of the process to reach the expected solution.

For the researcher, prototyping is also a learning tool, but aims at knowledge acquisition, rather than the commodity at the end. Figure 1b shows how we advance in the research process. Every research prototype developed and implemented expands the conceptual space and the view of the future state of the system, so that each iteration results in a larger understanding.

Since design investigates on the possible future scenarios of reality, the goal of the researcher is to understand the nature and complexity of the future state of the system. In this sense prototypes can be used as probes into that future state due to the fact that once implemented they unveil real interactions and transformations of the system.

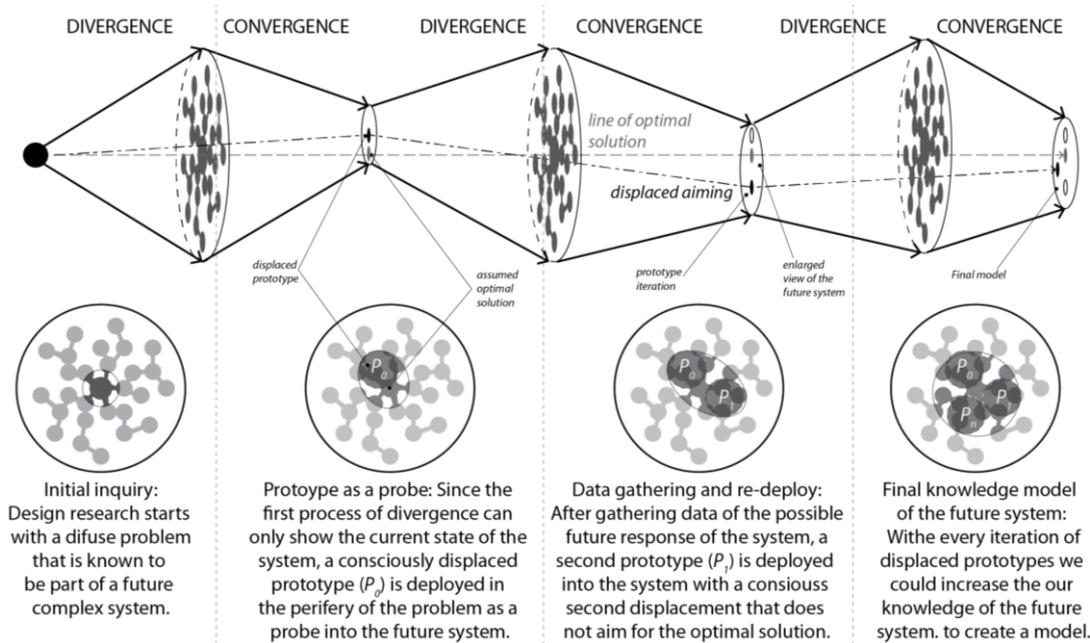


Figure 1b. The prototyping process within a divergence and convergence model for design research

Understood diagrammatically, the change necessary to form a bridge becomes more easy to conceive. In Figure 2, the combined diagram shows how this might work, with the conceptual space expanding toward a larger understanding while the decision space narrows towards the final commodity.

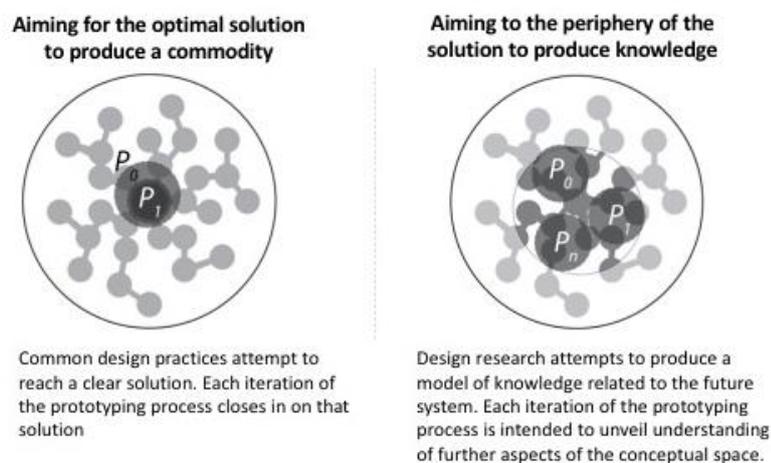


Figure 2. A prototyping process with both practice and research outcomes.

The context of the project, however, introduces additional complexities. The learning necessary to make decisions toward the next step of the commodity is not typically the same as the learning necessary to develop a larger understanding in the sense of reusable knowledge. For example, a designer interested in practically improving the experience of train travel might want to create prototypes to learn more

about appropriate leg room, head clearance, lines of sight, and so on. There will be some useful existing literature from ergonomists to draw on. A design researcher, on the other hand, might want to create an operational model for designers of what factors go into the mental model of “being a passenger,” which could apply to train travel, but could equally well be useful for any kind of travel from tandem bicycles to hang-gliders to commercial jets. The prototypes, rather than focusing on the train seating, will explore aspects of what it is to be a passenger, of which train seating might be one. However, it is probably too specific to be of much help for the general model.

In practice situations, the resources necessary to provide the features of the prototype required to produce or test an operational model of “passenger-hood” may exceed the resources needed to create prototypes to help make the next decision. Designers in practice are not usually able to follow the lead of an idea that is not in the direct trajectory of creating a commodity.

6 DISCUSSION

Building upon “Activity Theory”, “Action Research” and “Practice Theory”, this article promotes collaborative design studios as an Initiator and Driver for subsequent research collaboration. On a strategic level, the proposed educational concept is to generate formal in-depth research directions through practice-based design projects. Having an additional agenda in mind, design projects will be undertaken in a studio environment, where students act as design consultants for selected companies, given a broad or specific design project. As exemplified in §4.3.1 and §4.3.2 cases, results from the design consultancy projects initiated avenues for more structured research projects. Because of the collaborative past, such transition from design to research may enlarge the chances of the “already” participating companies and stakeholders to sustain their interest and continue participating in the larger research project. Moreover, the collaborative constellation will also be attractive for potential stakeholders to partake.

Tactically, systematic planning and crafting out a system of interacting and collaborating entities is necessary to facilitate research and practice to develop new knowledge, as well as anticipate future products and services. However, systematic and systems approaches should consider the systemic and emergent challenges of a given context.

At an operational level, prototyping plays an important role to bridge research and design. Hereby, prototyping can be understood as a platform where research and design meet. This platform is then characterised by a certain quality of representation, which is not the final commodity, but a form of intervention for experiential learning and collaborative exploration.

From an educational perspective, prototyping in a studio environment may be perceived as an essential “practice” tool to bridge research and practice in design. Within the context of an industry-sponsored classroom project, the pedagogical intent of prototyping lies in exposing students to larger issues around creating and testing operational models of knowledge. Reversely, industry may also be interested in how prototyping can play an expanded as well as a more effective role in conceptualising innovative solutions in an efficient manner.

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