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An Expanded Field
Design Research in TU Delft

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An Expanded Field:
Design Research in TU Delft

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Shifting Paradigms

Starting from its earliest days in 1960's, the "Design Methods" movement tried to make distinctions between design and science. Their main argument that science was analytic and design was constructive has been echoed in the succeeding years and passed on from generations of design methodologists with a shift in focus from design methods, to design issues, and to design thinking. Perhaps one of the most illustrious account of this transformation can be found in Horst Rittel's theory of "generations." According to Rittel, the "first generation" of design research of the 1960s prioritised scientific methods, while the second generation moved its attention to argumentative methods for the appropriate solution-types and participatory processes in which design the problem was seen in a wider social context (Rittel 1984). In this regard, succeeding accounts of design research can be seen as reincarnation and combinations of these two dualistic undercurrents. In a similar way, the way design research has been evolving at TU Delft can also be seen as a reflection of these shifting paradigms.

One of the most profound paradigm shifts in the genealogy of design (studies) research can be associated with the emergence of research-by-design. Namely, the shift of emphasis from the methods to the epistemology of design has brought forward not only a renewed understanding of design but also situated design in a tight relationship with technology, science and society. In 1980's, research by design emerged as the successor of the design methods approach that was dominated by the methodologies of natural sciences and humanities. Marked by several critical publications, like Nigel Cross' essay "Designerly Ways of Knowing," Bryan Lawson and Peter Rowe's study of architects' design and thinking process, this period has culminated in a new formulation of design research (Cross 1982);(Lawson 2005);(Rowe 1987). It designates an epistemological transformation in the conception of design that has led to the integration of practical (tacit) knowledge in architectural research. The primary epistemological questions of design have shifted from being object-centred (from optimisation and standardisation) to being more process-oriented, where the what and how questions are seen as part of an iterative feedback cycle in the acts of design.

One of the most significant written contributions elaborating on design as a discipline, is undoubtedly Donald Schön's book titled The Reflective Practitioner (Schön 1983). In his book, Schön studied design with its own parameters and terms, taking into account the artistic and intuitive steps enclosed in design process. He puts clearly forward the intuition and artistic components as important features to tackle with uncertainty and instability but also with the struggle on the value and uniqueness of design. Yet, Schön's definition of "reflective practice" is still primarily based on the methodological aspects of design. He perceived design methods as a chain of intuitive acts based on experience rather than structured frameworks. Therefore, his approach does not formulate an epistemological foundation

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for research-by-design beyond the proposed focus on the act of design as a self-conscious iterative process of "action design".

Experimental & Across Disciplines

Pursuing the analytical approach to design thinking in 1990's, Delft Protocols represent the last phase of the methodologist approach and marks a pivotal and internationally acclaimed body of research. The Delft Protocols Workshop was designed to put emphasis on the research methodology in analysing design activity (Cross, Christiaans, and Dorst 1996). Although primarily focusing on industrial design processes, it can be defined as a critical step in the history of design research in Delft to be recognised at a wider perspective within and beyond the university. However, the dualistic foundations of the design theories and methods largely remained a division line between architecture and the engineering disciplines for another two decades.

The paradigm shift that engineering education currently undergoes is well illustrated in a scheme in Engineering Education in the Rapidly Changing World (Kamp 2016). The table shows clearly how the emphasis in engineering education should be leading towards experiential learning, including the socio-economic context and enforcing teamwork and collaborative approach. The necessity of having a basic knowledge of other disciplines, understanding their different working methods, becomes in this framework a fundamental step because it helps to get a grip on the multi-faceted feature of complexity. In addition, if being acquainted with other disciplines and working methods is a basic requirement when dealing with complex problems, in collaborative, inter- or multidisciplinary approaches participants need appropriate communication's pathways enabling the exchange of concepts, materials, findings, data or tools coming from the various disciplines. In short, next to the uncontested trend of disciplinary specialisation in research and education, the complexity of nowadays problems calls for professionals able to integrate simultaneously multiple and diverse types of input with a high degree of synthesis. This is the reason why the designerly approach is increasingly gaining interest in academia as well as in practice; design is par excellence a synthetic way of communicating and can be an important vehicle of communication when working with different disciplines in cross-disciplinary projects.

Understanding certainty	Handling ambiguity
Analysis	Synthesis
Research	Engineering design
Solving problems – the "how"	Formulating problems – the "what"
Developing ideas	Implementing ideas
Independence	Teamwork, collaboration
Techno-scientific base	Socio-economic context, the "big p[icture]"
Engineering science	Functional core engineering

Engineering Education in the Rapidly Changing World, TU Delft, October 2014

: Engineering Education in the 21st century, from A. Kamp, Engineering Education in the Rapidly Changing World, Rethinking the Mission and Vision on Engineering Education at TU Delft, 2016, TU Delft.

Design-Research in an Expanded Field

The research and design processes should unfold in different time frames and durations, reinforcing the common goal of anticipating and responding to the transformation and restructuring processes of urban environments. On top of that, design and research should also actively contribute to the improvement of the physical, social and cultural context. For these reasons we would like to emphasize the importance of the relationship between academic work and practice in order to develop stronger perspectives on the future of our discipline by tackling currently relevant urban issues. In order to properly address these complex urban assignments, it is crucial that design and research are in constant connection at the university and that cross-departmental and even inter-faculty collaboration is further developed and applied. In such a way the result of design and research can be used as breeding ground for discussions on the future transformations of the city, bringing together various parties and disciplines while also creating opportunities for cooperation and collaboration outside the academic world.

Looking at the Faculty of Architecture's research agenda of the last two decades in TU Delft, it is undoubtedly true that the challenge of putting forward design as a scientific activity has constantly been considered as one of the pivotal issues. In tandem with this, the education of designers has also been one of the primary focus in both the Faculty of Architecture and Faculty of Industrial Design. In this respect, the introduction of the term "research by design" marks the need for reconsidering design as a scientific endeavour and yet with distinct aims in research. However, this concern predates the recent changes in the engineering fields within the university.

Joyce Ouwerkerk, in her article published in 1996 in Delta, addressed this topic referring to Taeke de Jong's book "Kleine methodologie voor ontwerpen" [J. Ouwerkerk, 'Ontwerpend onderzoek vergt een andere beoordeling', article in Delta nr. 14, April 1996.]. In his book, de Jong suggests that "research by design" should be evaluated using other criteria than the ones applying to empirical and theoretical research. According to de Jong, design focuses on what's logically possible, theoretical research on what's necessary while empirical research deals with the probable. He believes that "research by design" should really lead to new solutions and that the value of this type of research should be demonstrable if compared with similar but existing designs.

For Henk Engel on the other hand, "research by design" should be conducted following three criteria. First of all, a design should be the solution for a determined class of problems. Secondly, way of thinking and rules to be applied during the design process should be established a priori. Finally, the design should put forward new knowledge and alternative skills or prove how acquired knowledge can be used to generate new and unique solutions. Depending on the disciplinary framework, these criteria should be adequately specified following theoretical assumptions and testing methods applicable to the particular field in question.

Additionally, there have been a number of events on an international level focusing on and around this theme: Research by Design (2000), European City (2004) and The Urban Project (2008). These events resulted in more international initiatives and events, but also acted as a spin-off for the research projects engaging with practitioners. Examples are the "5x5 projects for the Dutch city", and the "Renewal of Urban Renewal" project, in which the vision of several researchers at the Department of Architecture acted as a connecting force between research and design teams out of practice (Cavallo 2014). In the meantime, a logical consequence, research

on design as a scientific activity has driven the interest of many academics and practitioners about pursuing PhDs based on design or through design. As one of the largest architecture faculties in Europe, TU Delft Faculty of Architecture and the Built Environment's education and research programme combines these paradigm shifts with its specific focus on design. Combining the experience of many practitioners involved not only in education but also tied to the culture of scientific inquiry, the research programme regards the architectural project as the junction where the complex combination of cultural, social, functional, economic and ecological factors is articulated as a concrete spatial proposal. Therefore, the multi-disciplinary character of the education community at TU Delft with diverse fields of expertise provides an extensive platform where different kinds of research in the field of design can be pursued. In this respect, the recent expansion of the concerns in design disciplines to include the living systems in conjunction of with the artificial is important to underline the integrative frameworks instead of the dualistic ones. The different research tracks in TU Delft Faculty of Architecture and Built Environment, in this regard, also reflect the overlap of different concerns in design research.

The emphasis on methodology in design research studies have led to unproductive dualisms such as scientific versus designerly or research versus design. In 1960's, this has found its echoes in what Herbert Simon called the "sciences of the artificial" (Simon 1996). In a comparable way but quite distinctively, we are facing a critical turning moment when the design disciplines require a new look not only at the so-called "artificial" or human-made (built environment) but also at the natural (living and non-living) and for that reason even more importantly with a multi-disciplinary perspective. In TU Delft, we observe different research and design cultures and design frameworks situated within different methodologies (Brown et al. 2013). Further articulation of design-research cultures could be a good bracket within the CA2RE+ framework. That is why we see the CA2RE+ project as an outstanding opportunity to stir up the debate at our faculty on design-driven PhD research, boosting this matter on the research agenda of our institution. We claim that we must replace the dominant dualistic notions of design research and embrace learning from other approaches and experiences. The expanded field of design and design research requires not only exchanging ideas and sharing best practices on the international level but also necessitates an integrative, pluralistic conceptions of design-driven research with multi-disciplinary foundations.

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