

Designing in research: characteristics and criteria

Research method, questions and programme.

Stella Boess

*Faculty of Industrial Design Engineering
Delft University of Technology, The Netherlands, s.u.boess@tudelft.nl*

Abstract: This paper sketches the potential contribution of research-through-design approaches to research. Designing is characterized as situated and engaged. It is furthermore future-oriented. And it needs to reflect on its practice and outcomes. The paper considers what these characteristics mean for the benefits, quality and acceptance of research-through-design approaches. The consideration results in a preference for qualitative method, in research questions that address future knowledge, and in the notion of the programme as an overarching concept guiding the research process, and making room for design failure and learning. With the discussion and clarification of these issues it is intended to help increase the quality and acceptance of research-through-design approaches.

Key words: *research-through-design, design-inclusive research, situatedness, engagement, qualitative research, research questions, research programme*

1. Introduction

The *quality* of research-through-design is relevant for designer researchers who seek to establish a role for designing in the academic research landscape. It is also relevant for those funding bodies that assess research proposals that include research-through-design. The last decade has seen designers increasingly involved in design research and seeking to claim their place in the research landscape. The biggest hurdle seems to be the experiential and tacit, seemingly idiosyncratic aspect of the design activity. This paper argues that it would be valuable to admit research-through-design approaches. It also proposes and argues for three aspects on which research-through-design proposals can be assessed: the research approach that is chosen, the kinds of research questions that are formulated, and the research programme in which a proposed study is set.

2. What is research-through-design?

Recently, commentators have begun to argue for the value of research-through-design approaches within design research. But what do these approaches involve? Speaking with Jonas [27]: “Research through design refers to a research and design process intrinsic to design. Designers / researchers are directly involved in establishing connections and shaping their research object.” Jonas argues that “such research helps build a genuine theory of design by adopting an epistemological posture more consonant with what is specific to design: the project.” (quoting Findeli [21]). With that, Jonas points out central aspects of designing: its situatedness and engagement

within specific projects. Research-through-design brings these aspects, situatedness and engagement, into the research process. What is the benefit? And how is this admissible in terms of research quality?

2.1. What research-through-design can contribute

The potential benefit of the inclusion of designing in design research is the designers' disciplinary focus on human circumstances of life, and on how these will be in the future. Jonas [27] suggests that design research should ponder "design's fitness for its essential function: the conception and projection of human conditions of living." Krippendorff [31] critiques the inadequacy of current scientific approaches in engaging with preferred future situations. Designers have this interest in the future by profession and (hopefully) inclination. Can we study in which ways designing has this potential, and at the same time analyse in which ways it is at risk of not living up to this potential? This is a question that design research is ideally placed to address. And, Jonas adds, a question that is of much less interest to other disciplines than to design itself. Designers should be involved in design research in order to reveal the potential in designerly approaches. Jonas [27] challenges design researchers to "claim an appropriate share of the definition power regarding future conditions of living." Dorst [17] hints that the challenges to design research are set to increase enormously as design practitioners face issues of globalisation, digitalization, sustainability and societal value systems. Design research is not at present sufficiently equipped to help designers address these challenges, Dorst asserts. "The lack of an explanatory framework for design makes it hard to build up an academic knowledge base, and it makes it well-nigh impossible to reflect critically upon each other's work." Dorst suggests that the way to go is "a new kind of design research in which the process and content of design activity are connected with a model of the designer and the context in which designing is taking place." This kind of design research must be attentive to the situation of designing, to the experience of the designer.

2.2. The acceptance of research-through-design by funding bodies.

As designers begin to formulate dedicated research projects, they also begin to seek funding from academic funding sources. Are these sources ready to admit research-through-design approaches? Can they assess whether these proposals have sufficient quality? Design research is to date not a category of its own for many funding bodies. Often, it is subsumed under other disciplinary umbrellas. In EU research projects that included designing, like for example the Presence-project [26], the design aspect was subsumed under other disciplinary umbrellas such as social science and informatics. The discussion in the UK seems to have a special position. There, designers have been discussing the funding of research-through-design since the integration of polytechnics into universities [2]. Design research funding came to sit mainly with Arts and Humanities research funding bodies, but also with Engineering and Physical Sciences research funding bodies. The discussion in the UK therefore includes reflections on similarities and differences between art and design (e.g. [49, 44]). Often, design researchers are designers (or artists) in the first place and come to research from a primary position of design or art practice. In the Netherlands, design research has previously sought funding from engineering and informatics budgets. Often, it does not involve design-specific approaches. Psychologists, mechanical engineers, computer scientists and others all call themselves design researchers if they study the design process, context, design practitioners or outcomes. It would be counterproductive (and also unrealistic) to argue that only specific disciplines should be involved in doing design research. However, in multidisciplinary research projects,

designers sometimes found themselves playing a secondary role, and also seeing their potential underestimated. Rather than being involved in generative activities from the start, they were called on to put ‘finishing touches’ to projects. This state of affairs has contributed to a broad engagement of designers in seeking to formulate the specific contribution of designing to their research, and in making the design activity amenable to assessment in a research context. We have seen above that research-through-design has the benefit of bringing the aspects of situatedness and engagement explicitly into the research process. What does that contribute to research?

3. What the situatedness and engagement of designing can contribute to research

Before moving on to consider their implications for research methodology, I will sketch some characteristics of designing that pertain to situatedness and engagement, and that hold potential benefits for research. Designing has more characteristics than these, but these especially, it is supposed here, bring novel benefits to research. Each one of these aspects of designing alone is *not* special to designing. But taken together, they form an intersection located within the transdiscipline of design [11]. This intersection can roughly be characterised as a place where research (/science) can investigate its subjectivity, embodiment, and the many knowledge areas that are not easily generalised but remain contingent upon human experience, circumstances and context. This is an initial attempt to provide such a list. It is probably not exhaustive.

3.1 Tacit aspects of designing

The activity of designing, it has been said, cannot be made entirely explicit. There are always parts of it that remain tacit and are purely subjective (see also e.g. [38, 44]). With that, however, they are not mysterious. Rather, they are embedded in the skills and experience that people – including designers - build through their practice. While this tacit aspect of designing is difficult to handle from a scientific point of view - it cannot be easily accessed, and it has no clear presence in observable facts - it is essential to the understanding of designing and other skills-related activities. The design activity involves skills that are like cycling: if one had to demonstrate each of its movements stably, for inspection, one would no longer be cycling and in fact one would fall over. Cycling requires a certain speed and embodied activity, acquired as a skill and executed through responses honed by previous experience. While observation can teach us how the cyclist technically achieves balance, only insight into their previous and present experience can teach us how cycling is learned. Dorst [17] provides a categorization of levels of advancement in designing. From novice to ‘visionary’, at each level a designer has a certain experience and way of thinking available to them that flow into the design activity. Purposefully accessing and making use of this tacitness requires new approaches in research. For example, approaches that focus on how people’s knowledge changes throughout the learning, mastery and teaching of a craft (for example, [53]).

3.2 A contingent and associative activity

Throughout the years, successful models have been proposed to guide the activity of designing. For example, that designing should follow a process of analysis, synthesis, embodiment and evaluation [43]. From personal experience the author knows that design students experience such guidelines as very useful. Yet it has also been acknowledged that the activity of designing rarely follows such models cleanly or even at all. Case studies of design practice have shown that design processes are much more serendipitous, associative, iterative and

situation-contingent (for example, [8]) than models tend to suggest. Designers, it has been alleged, often do not use methods [17]. Many aspects of design problems cannot be resolved by prior reasoning or general guidelines, because they arise on the spot. They can only be addressed in the course of a design process and through it. An interaction designer, Erickson [20] reflected on this situation: *“As a designer, I’m continually confronted with new sites and situations, and for each site I need to come up with a way to see it, to analyze it, to design for it, and to understand the consequences of what I have designed. I find that I work best when I orient to the site or situation in which the interaction takes place; for me the site comes first, and the conceptual framework and methods and tools come later.”*

In relation to research, this raises the issue of the plan of action that is adopted at the start of a project – such as a research plan. A design research project needs to remain attentive to the circumstances it influences and that influence it.

3.3 A human activity

Besides being a professional, artificial activity, designing has also been described as *the* basic human activity [23]. The human activity of designing can also be detected and studied in other professional or personal realms, or it can be seen as a shared activity as acknowledged by co-design approaches (for example, [45]). If designing is seen as a basic human activity (whether professional or not), it means that it has a complexity that is not easy to reduce to specific singular aspects. It also means that the design activity is amenable to study through behavioural research by specialists on human activity and conditions, such as sociologists, anthropologists and psychologists. The question remains, however, how these specialisms can produce results that can benefit and be used by designers. Designers should not ignore the potential insights from these disciplines. But designers also need to be involved at least in the setting of research goals and testing of outcomes, so that the results of such research are acceptable to the designers who attempt to apply them.

3.4 An activity questioning the make-up of human conditions of living

What distinguishes designing from other disciplines is that designing is ideally placed to notice, act on and ponder what one can and should do to physical things and environments that people live with. Schön (in [1]) talks about the importance of considering the backtalk arising from design situations. This backtalk can, if the designer is open towards it, lead to a questioning of the make-up of human conditions of living. Two kinds of awareness should particularly be available as sources to designers in this questioning:

3.4.1 Questioning the workings of things

Designers (should) question and have a heightened awareness of the relation between the technical configuration of things and how these things then behave in use. (See for example in Schön [46], the case in which a teacher and a student discuss the best arrangement of a building on a hill). Many of the designers’ practical decisions and skills are about effecting changes and behaviours in particular physical or virtual things. While that alone does not enable the designers to *argue* decisions in design practice, it is a source of design strategies. And it can be harnessed to make configurations of physical or virtual things amenable to exploration by others, as well. It can be used to visualize and prototype decisions, to make them available to personal experience, and to show their effects in context. This potential is embodied in e.g. illustrated scenarios, prototypes, and models. In recent design research, the prototype is advocated as a tool for insight and discourse [51,22, 28].

3.4.2 Questioning interactions with things

Product design as a discipline partly arose out of an engagement with the quality of people's lives from the start. This engagement sought to find answers to new problems that arose for users with developments such as mechanization or urbanization. The decision of when to invent new ways of doing things, and when to stick to accustomed ways of doing things, is a matter that is not easily resolved, as Lawson [34] noted. Designers are still struggling to deal with the phenomenon that people create the meanings of products themselves, in their own lives, and that designers only contribute to that [30]. Notably, recent advances in engaging with product meaning in real life came from designers who had to deal with the increasing digitalization and interactivity of products (for example Black and Buur [4]). Researchers started to invent experiential games such as body-storming [12] and dramatizations of design problems [13].

3.5 An activity with a meta-level to it

What perhaps distinguishes professional designing from other forms of designing most is that professional designing always also includes a meta-level: not just, 'what could I do now', but also, 'what are the wider effects if I decide this, and in what respects is it desirable from a societal, business and technological point of view?' Design is positioned between society, technology and business. Besides having to ponder these issues for the design *outcomes* that are produced, the *practice* of professional designing also includes a large portion of meta-activities that serve the goal of actually bringing about the designs that are being thought up, such as negotiations and coalition-building [17]. This meta-level is particularly manifest in areas such as user-centred designing or sustainable designing, where the effects of the design outcomes are particularly complex to assess. Especially since the professions have had to start turning to "reflective practice" [46] to resolve an inner crisis of usefulness, they, and designing with them, have become more participatory. Designing is increasingly focusing on issues of communication, participation and co-creation. These approaches can also contribute usefully to research efforts that seek to produce a tangible benefit in society.

4. Implications of the situatedness and engagement of designing for research

In the following, three implications of the situatedness and engagement of designing for design research are sketched and illustrated with examples from recent research-through-design efforts. These could become aspects to be considered in assessing research-through-design. The first acknowledges the particular amenability of designing to study through qualitative approaches. The second acknowledges the future-oriented nature of designing and what kinds of research questions correspond to this nature. The third expresses reservations about an overly singular focus on outcomes in design research, and introduces the notion of the 'programme' as a way to assess the coherence of research-through-design.

4.1 Research-through-design and qualitative approaches

In order to produce insights that are useful to designers, it has been suggested that the design activity should be studied not just at the micro-level of discrete cognitive moments in which design decisions are made (as for example in [18]), but also at the macro-level, over longer time spans, and taking into account all the social, business and technical aspects that also come to play in a design process (as for example in [40]). Pedgley also argues that this means a phenomenological perspective on the design process needs to be considered legitimate,

with qualitative study approaches. Pedgley and Wormald [41] present three cases that illustrate studying design over a longer time span. However, such an approach can be a problem in the effort to make design research acceptable to e.g. engineering oriented funding bodies. This problem is only partly specific to design research. The acceptance of qualitative research is a more general problem. Of course, the full range of epistemological stances should be admissible in design research, as argued by Biggs and Büchler [2] and Niedderer [39]. However, because qualitative research and its trustworthiness is more contentious with those funding bodies who are less familiar with this type of research, such as engineering-oriented bodies, its legitimacy should be discussed well in the context of design research. To tackle problems of acceptance of qualitative research, design research can rely on experiences from and join in with efforts with other fields. Design-related or –similar disciplines in which this problem has been discussed are, for example, ergonomics [25] and nursing [24]. Discussions of the acceptability of design research could draw on the experiences from those fields. While it has been alleged that the quality of design research often suffers because no use is made of existing knowledge [33], there is no reason why it should not. Qualitative, quantitative, exploratory, hypothesis-testing - the chosen approach should not eschew making use of previous findings and should be appropriate to the research goal. The design research field should not deprive itself of valuable insights and opportunities. A point to note in the context of research-through-design is that the qualitative research field has seen a lively discussion on the implication of the researcher in the worlds being studied. Some qualitative research approaches explicitly align themselves with a positivist paradigm of the researcher as neutral observer of facts ‘out there’ (for example [19]). In the cases presented by Pedgley and Wormald [41], it is also argued that the aim is to be as neutral as possible in the recording, to provide a reflective distance from one’s own process focus on a designer’s reflection of her design process. They present techniques to ensure reflective distance. The need or possibility for this has been discussed controversially for example on the PhD design list in 2006 [42], with some commentators arguing that monitoring one’s own process always results in distortions. This is undoubtedly so. Yet as we have also seen, for some questions facing design research there is no alternative. Another approach is demonstrated by Wood, Rust and Horne [53]. They emphasize a careful documentation of craft activities that teases out the tacit knowledge involved in master and learner craft practice. Video and photographic documentation trace that which cannot be described fully in words but has to be learned as a skill. As much as possible of the activities is made available to the scrutiny of non-involved parties. Of particular potential value to research-through-design approaches might be the field of critical ethnography, which turns to look at its own knowledge production strategies and investigates the ways that conclusions are produced (for example [10]). From building theory for future use, the aim of research turns into that of monitoring itself as a process of communication and deriving insights from that that are again useful to the discipline. This development holds particular promise in clarifying acceptable approaches in research-through-design.

4.2. Research-through-design and research questions

Research and design are different, though not incompatible activities (for example [41]). Yet we have seen above that designing has an important role to play in design research. Some insights on designing must be sought by individuals within themselves, and will be partly tacit. Designing is also an activity that changes situations into preferred ones, engaging with a future not yet in existence. Cockton [14] distinguishes between *a priori* and *a posteriori* knowledge and analyses that design principles (recommended modes of acting in design) have often

focused on one or the other or mixtures of the two. However, Cockton emphasises the importance of *a priori* knowledge for designers, since the result of their work is not yet available to experience. Too much focus on *a posteriori* knowledge creates over-commitment, limitations of scope and obstacles to trust, according to Cockton. While evidence is lacking in *a priori* knowledge, frameworks are needed that connect the means, the efforts and resources to be expended to bring a design about, to the ends, the eventual benefit of the design to all potential beneficiaries. This implies that something that is useful to designers should be flexible enough so that they can use it for inspiration and during their design work as well, instead of it just being a requirement in their design process. The knowledge that is produced, need not necessarily be exact and proven. It is more important that it creates a scenario, a possibility. This situation results in having to be very careful about distinguishing between design and research goals in a research-through-design project. How fine the line is, is illustrated in a type of research question we often see in design research: “How can I ...?” “How can this situation be changed into another one?” For example, in Boess [5]: “*How can I design bathing and personal care environments that promote/(enhance) wellbeing and are adaptable to the varying needs of people who are getting older?*” In Mattelmäki [35]: “*How should interaction and product design through empathic approaches be supported?*” and “*How can probes be applied to the R&D environment and an industrial context?*” In Sleeswijk-Visser [50]: “*How can the designers’ empathy with users be enhanced by rich experience information?*” “*How can designers be inspired by rich experience information?*” These are practical design problems, not research problems, some would say (for example, [52]). However, designing is about future situations, situations about which we can have no knowledge in the present. Yet design anticipates, projects these situations. As we have seen above, designing has the level of the actual activity of designing, and a meta-level. If the question is posed on the first level, it is a design question. If it is posed on the second level and followed with an adequate set of assumptions (for example about inferred value or worth [14] and an adequate research set-up, it is a research question.

- A design question is at the level of concrete design goals, decisions and evaluations. “How can I ... connect these two materials?” will be answered through e.g. “By soldering. Does this work? Yes! Now it’s a stable structure!”

- A research question is at the meta-level of what this activity and its outcomes will mean. “How can I ... connect these two materials?” will be answered through e.g. “By systematically experimenting with the qualities of the materials. By creating a collaborative process in which domain knowledge from various experts is brought together to generate new avenues. Do these approaches work, and why? And what does this mean for the nature of internal and external processes in designing/the nature and process of collaboration/the use of objects made with the materials in specific situations?”

A research-set up should contain clear indications of the meta-level being present. It should also present or develop frameworks and criteria to answer questions like “Does this work, and why, and is this desirable?” in such a way that newness of the resulting knowledge is demonstrated. Often such research set-ups can be framed within a general paradigm of reflective practice [46]. The research aims in these cases may not be to give proof of something existing, but rather to “*indicate that an approach is possible*” [9]. Because the assessment of such proposals requires a certain amount of insight into the situation and interests of designing, Biggs and Buechler [2] appeal to the peer review as a necessary complement: “there is something context-dependent about method that has to do with the needs and expectations of a community. Such a community

“owns” the question and the conditions within which the question arises as meaningful and pressing. (...) This is institutionalized in the process of “peer review.” Brandt and Binder [9] also champion the peer review.

4.3 Research-through-design: towards a programme

While the case examples given by Pedgley and Wormald [41] illustrate the involvement of a ‘preferring’ individual in research, the cases were mainly directed at materials and design outcomes. Pedgley and Wormald strongly emphasize high quality design outcomes as an important element of design research. They propose ‘completeness’ and ‘esteem’ of the design outcomes as partial criteria for successful research. “*Completeness refers to the delivery of high-quality design outcomes. (...) Esteem refers to the significance of the design outcomes, and their reception outside of the host academic institution.*” [41]. However, it is argued here that such requirements for design outcomes would be limiting to the further development of research-through-design approaches. They limit the coherence of a design research agenda to a stream of outcomes, ‘peppered’ by attendant research questions. The overall goal remains excellence of design outcomes. Research questions can basically be anything that contributes to that. Conversely, Krippendorff [31] raises the challenge that: “proposals for designs may fail for all kinds of reasons, and systematically studying why they failed is an important source of changing design practices from within.” Indeed, there are other routes than design success to an agenda for research-through-design approaches. For example, inquiry can also be driven by a desire to make a design outcomes accessible and useful to stakeholders. The criterion then becomes whether interventions successfully involve the stakeholders and elicit their views. This leads to different research emphases than design outcome excellence, defined by criteria external to the process itself. In Pedgley and Wormald’s [41] conception, failure of design outcomes would be detrimental to the quality of the research endeavour itself. In the cases [5, 35, 50] conversely, partial failures of design interventions were important findings of the research. They helped to formulate theoretical insights regarding improvements to a design process with stakeholders. So if the design outcomes are not a useful notion to ascertain the coherence of research-through-design, what is? A useful concept might be that of the programme. The notion of programme is discussed by [3] (BR), [36] (MR), and [9] (BB). Their descriptions seem to take inspiration from Lakatos’ notion of ‘research programme’ to some degree [32], although none of them reference Lakatos’ work. There is some ambiguity in the way the term is used by the authors. Partly, the term is used to refer to the design programme, as in the larger conceptual task of design into which smaller, specific design outcomes have to fit logically (MR). Partly, it is used to refer to a design research programme, and as a counterweight to designerly experimentation (BR, BB). The latter use of the term ‘programme’ is of particular interest here. Binder and Redström [3] see this programme’s role as a “knowledge regime”. It is provisional and “as the design research unfolds, it will either substantiate or challenge this view and the dialectic between program and probing is in our view central to this kind of design research.” They also see the programme as a momentary instantiation of the theoretical background of a design project, rather than as an overarching concept: “Not being meant to be sustainable for very long periods of time, the design research program therefore has to demonstrate its viability also in terms of how well its experiments come to express the proposed design space within given resource constraints, perhaps adding some aspect of real-world applicability to the largely “hypothetical worldview of the program itself.” Here, it is argued that the notion of programme has more potential than this. It can become a notion that provides the continuity and agenda for research-through-design approaches. With that, it can become an alternative to a stream-of-outcomes type of agenda. This notion

is illustrated here with a last example. I will try to identify my own research programme as it has evolved throughout the twelve years that I have been active in design research.

4.4 A design research programme case

As an example of a research programme, I describe my own progression from my PhD research [5] to the research I do today. I should add that it is coincidental that I am describing a programme of an individual design researcher. Design research programmes can just as well be conceived and pursued by research groups or by diverse researchers contributing to a singular notion. Indeed the programme that I present is by no means mine alone. Many researchers have contributed to this problem field in diverse ways, and I have collaborated with others.

In my PhD, I sought to identify how I as a designer could design a particular type of object in a user-centred way for a particular set of people. I first turned to social science approaches. I found that they are not simply transferable to the problem of designing. Having a model of a set of people's attitude in their world does not provide sufficient information to design successfully. That insight was the starting point for my research programme to develop. What support do designers need to design successfully for other people so that the outcomes enhance these people's well-being and are adaptable to their needs? The initial failure of a model describing the users' attitude as a support for designing, led me to search for alternatives. It also directed my attention to the needs of designers. Input has to be adapted to the designers' needs, too, if it was to help them design for somebody else's needs. Initially, a solution to this was sought in the notion of metaphor. Schön [47] suggested that 'generative metaphors' can help designers have a conversation with the situation they are designing for. Such generative metaphors are not easy to create and use, however, since they are "ordinarily tacit". *"In order to bring generative metaphors to reflective and critical awareness, we must construct them, through a kind of [...] analytic literary criticism, from the givens of the problem-setting stories we tell...."*. However, the metaphor I developed using this approach, I again rejected. As a designer, I judged that it was too complicated and too textual to be of use to designers. This led me to further experiments, such as workshops with other designers in which it was observed how they interacted with information from user research [16], interviews with other designers in which I asked them how they dealt with knowledge about product use during designing [6], and the creation of role playing workshops, in which it was sought to let design students actively experience and interact with notions of product use [7].

My starting point as a designer had been to try and solve an applied problem: designing for a specified context. A research programme became stacked onto that: a disciplined anticipating, experimenting, recording and reporting so that lessons could be derived for myself and other designers trying to design for a specified context. The programme consists of an agenda of systematic inquiries around a research problem. Such a research problem can shift in time, as findings arise. If attention is given to the research programme and its outcomes and shifts in time, it reveals reflective, designerly insights on design practices and outcomes.

5. Conclusions

How can we argue for the potential of research-through-design of contributing to future human conditions of living while being conducted in a trustworthy, traceable way? How was the process and content of design activity connected with a model of the designer and the context of designing? This paper presented the design

activity as a situated and engaged one. It proposed three avenues towards accessing the benefit of these characteristics of the design activity for research. For each of the avenues, research methods and assessment criteria are discussed. It is hoped that this can contribute to the acceptance and development of the design discipline and of research-through-design approaches. The paper has suggested that qualitative approaches are particularly useful in research-through-design. Research questions can be future-oriented. And the research programme can serve as an alternative conception to a stream-of-outcomes model of research-through-design. The research programme as a concept makes room for design failure and learning. It provides a meta-level at which design and research outcomes can be integrated towards the consideration of genuine design-oriented research questions. Lastly, the notion of programme has been illustrated in a case example.

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