



Design Accountability: When Design Research Entangles Theory and Practice

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When design research builds on design practice, it can contribute to both the theory and practice of design in ways richer than research that treats design as a topic. Such research, however, faces several tensions that it must negotiate successfully in order not to lose its character as research. This paper looks at the field of constructive design research, which takes the entanglement of theory and practice as its hallmark, and uses it as a test case in exploring how design researchers can work with theory, methodology, and practice without losing their identity as design researchers. The crux of practice-based design research is that, where classical research is interested in singling out a particular aspect and exploring it in depth, design practice is characterized by balancing numerous concerns in a heterogeneous and occasionally paradoxical product. It is on this basis that the notion of design accountability is introduced and discussed. The purpose of the paper is to enable a richer and more nuanced discussion of practice-based methods in design research.

Keywords – Design Research, Accountability, Constructive Design Research, Theory.

Relevance to Design Practice – This paper helps to clarify the line between design research and design practice by showing how research can negotiate the boundaries between theory, methods, and practice.

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Design Accountability

Design research has long historical roots, but its volume has grown rapidly over the last fifteen years in both art schools, technical universities, and universities. One of the recent growth areas has been research that borrows its questions and methods from design practice. Various research through design (Frayling, 1993), endogenous design research (Bonsiepe, 2009), practice-based research (see Mäkelä & Routarinne, 2007), academic design (Dorst, 2013), or constructive design research (Koskinen, Zimmerman, Binder, Redström, & Wensveen, 2011), such research has contributed to education and practice in Europe and Asia in particular. It has also led to questions about the relationship between design practice and research.

This paper looks at some of the answers given to these questions. We also introduce the concept of design accountability, and argue that seeing design in terms of accountability helps researchers to navigate the borderline between research and design practice. This concept builds on earlier work by Gaver, a leading interaction design researcher, who introduced the idea of a distinction between epistemic and aesthetic accountability:

Science is epistemologically accountable. In pursuing its goal of producing causal explanations of the world, what distinguishes science from similar endeavors... Scientific methods must be articulated and precise. These methods—controlled empirical investigations, statistical analyses, logic and deduction—allow the chains of inference used to posit facts or theories to be examined and verified by independent researchers.

Design is aesthetically accountable. The question is whether a design ‘works,’ not whether the methods used to devise them are sound.... Design is not epistemologically accountable; designers do

not have to justify their methods as scientists do.... Designs can be seen as embodiments of beliefs or theories about the myriad of issues relevant to them. These beliefs need not be explicated by the designer. (Gaver, Hooker, & Dunne, 2001, pp. 202-203)

Gaver’s distinction is particularly relevant for those design researchers who want to maintain a shared language game with professional designers. The distinction, however, not only creates a distance between design and science, but also paints a picture of design as an aesthetic discipline only. Yet, designers are also accountable to other parties outside the realm of art, such as manufacturers, product safety administrators, management, financing and marketing offices, current users and future generations, all of whom might either benefit from or struggle with the results and ambitions of design. In other words, design is always accountable to a plethora of various audiences.

For these reasons, we wish to expand Gaver’s concept of design accountability. Researchers who hold themselves accountable to design aim to do research that practitioners will understand, respect, and take seriously. Such research can vary from efforts at constructing new knowledge for design, as in Alvin

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Tilley's work on ergonomics (Tilley & Dreyfuss, 2002) and Roger Ball's (2011) research in Asian ergonomics; to bringing changes to design methods and processes, as in Tuuli Mattelmäki's (2006) work on co-design; to encouraging designers to think about the assumptions behind their work, as in critical design (Dunne & Raby, 2001).

What we propose in this paper, then, peels away some of the unwanted connotations of Gaver's distinction but retains its core message. Design borrows from many of the sciences and social sciences as well as from art, technology and many other fields. It is usually accountable in terms of producing design outcomes, however, rather than in terms of doing good science or social science; its accountability also is not determined in aesthetic or technological terms: Design can be good even it is not good art or good technology. Likewise, constructive design research has to teach something about design, but it does not, for instance, have to be good art. Similarly, design accountability in research means being accountable to design rather than other disciplines such as history or management. This paper, thus, is an exercise in thinking about what design research would look like if design researchers would primarily hold themselves accountable to design itself, that is, if they were to see design practitioners as their main audience. It also explores some of the issues design accountability leads to and how some of the leaders in the field have managed these issues.

Design as World-Making

Our laboratory for studying design accountability is the field of constructive design research, which tackles design problems with design-specific means and produces design outcomes (see Koskinen et al., 2011). Constructive design researchers hold themselves accountable to design practice before any field of research outside of design. Their aim is to be taken seriously by practitioners. They do, however, ground their work in theory, whether it might be, for instance, ecological psychology (e.g., Wensveen, 2004), phenomenology (Deckers, 2013), symbolic interactionism (Battarbee, 2004), or situationism (Gaver, 2001). Thus, they aim at contributing to both theory and practice.

Indeed, there are researchers who have been able to advance both practice and research. For example, the researchers who created *iFloor*, an interactive floor built into the Aarhus city library,

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were well-received by the Danish architectural establishment and design community, being awarded the Danish design prize for innovation (see Krogh, Ludvigsen, Lykke-Olesen, 2004). Other examples are Tuuli Mattelmäki, a researcher in Helsinki who was nominated designer of the year in 2008 in Finland, and a group of design researchers led by Stefano Maffei who won the Compasso d'Oro in 2011. Constructive design researchers have also become business practitioners in the Netherlands, Italy, and England (see Parsons, 2009; Ross, 2008). Interest in design from neighboring disciplines such as human-computer interaction, business studies, engineering, urban development, and design anthropology also reveals that design research is coming of age.

The key premise of constructive design research is that design research needs to build on design practice so that it can be relevant for practicing designers not only in terms of knowledge, but also in terms of methods, processes, and aesthetic quality. If design research can attract the curiosity and respect of design practitioners, it can alter their profession by encouraging informed, well-articulated, qualified interventions that fulfill the purpose of discussing design issues through creating concrete design objects. This is the very nature of design research. Like professional design itself, design research cannot be content with understanding the world, as is the case with the human sciences, or explaining and controlling it, as with the natural sciences. In the words of the philosopher Albert Borgmann (1995), design is a "world-making" discipline, which advances by imagining and constructing new worlds rather than by describing, explaining and predicting things that exist.

If we imagine design research by taking Borgmann's claim as a key premise, we can see that research that builds things through a process covering the main phases of design—from early research through concept creation and prototyping in iterative processes all the way to testing the final designs—would differ from most other competing approaches to design research. These other approaches have aimed to improve particular aspects of design practice rather than targeted the full circle of design, and in so doing, have led to new problems. For example, ethnographic techniques have improved the ability of designers to do early-stage user studies, but they have also led to the problem of how to leap from ethnography to synthesizing findings in acts of design.

For the purposes of this paper, the value of constructive design research lies in that it deals with design practice in a direct fashion. It helps to understand how we can build research on design practice rather than on its particular facets. The promise is significant: Research that helps to inform not only some singular part of the practice, but also reveals how various facets of design are linked, is immensely useful for the design industry and design education. Such research, however, also does lead to a series of issues that may tarnish the value of researchers' efforts. Regardless of their differences, every constructive researcher faces questions about: 1) how to work with theory, 2) how to work with methodology, and 3) how to maintain a proper distance between research and practical design. These concerns are each covered in the following three sections of our paper.

Who Controls Theory?

The first issue concerns theory. Design research has seen several failed attempts at turning the field of design into a science by borrowing concepts and theories from other disciplines, ranging from linguistics to operations analysis (Alexander, 1971; Maldonado, 1972, 1991), ergonomics (see Ball, 2011), engineering and systems theory (Archer, 1968; Simon, 1996), and psychology (Norman, 1988), as well as art and architecture (Aicher, 2009). The most radical form of the argument behind such attempts claims that design ought to have a theoretical basis in order to flourish. With the exception of ergonomics, however, this route has always led to disappointment. For example, Tomas Maldonado's (1984) enthusiasm for semiotics as a basis for design grew sour in ten years, and many other early design researchers voiced similar disappointments (Alexander, 1971; Jones, 1991, 1992).

The most recent discussion in this regard involves applying theories from anthropology. Since the mid-1990s, designers have increasingly borrowed research methods from the social sciences, and ethnographic methods, in particular, have proved useful in the early stages of design; by now, they are a standard part of design practice and education alike. Currently, the questions that are being raised in ethnographic applications revolve around analysis rather than fieldwork techniques as such. One of the most experienced design anthropologists, Brigitte Jordan, has reflected on her experience in teaching ethnography to engineers and designers:

A key observation is that teaching the nuts and bolts of data collection is relatively easy; what is unquestionably hard is teaching the intricacies of analysis.... What was difficult for them was to elevate those local insights to a higher, strategic level. *They were missing the kind of theoretical framework that would allow them to go beyond proposing "band-aid" solutions and instead consider the implications of their local observations for the company as a whole....* For professionally trained anthropologists, analytic skills are typically developed through years of graduate education and repetitive immersion in fieldwork, though we also know of very competent ethnographers who have no formal degrees. We speculate that intensive exposure to different kinds of analyses and considerable experience are necessary for development of analytic skills. How, we wondered, could similar skills be conveyed to non-anthropologists during a brief training period? (Jordan & Yamauchi, 2008, p. 35, italics added)

As this quote implies, at the crux of any discipline are abstractions, concepts and theories that organize the knowledge of that discipline into meaningful bundles. For Jordan and Yamauchi, having access to theory would give designers an opportunity to go beyond band-aid solutions to finding proper diagnoses and cures. Jordan and Yamauchi are not saying that designers should be anthropologists, but it is fair to say that following their advice would turn design into a sub-discipline of anthropology.

Predictably, there are others who defend fieldwork based on design. The claim here is that designers in fieldwork are sensitive to different types of things than anthropologists because their

sensitivity comes from their training in design, not from studying theories of anthropology. Seasoned designers doing fieldwork do not make random observations, nor do they subsume these observations into conceptual frameworks randomly.

The practice of observing and interviewing people in their natural habitats has become widely established in design. So much so that nowadays it is the social sciences—with their focus on people, context, behavior, and subsequent insight about motivation and meaning—that largely dominates the conversation about how observation informs and inspires design.... Certainly ethnographic-style observation can provide inspiration and grounding for innovation and design. It increases our confidence that ideas will be culturally relevant, respond to real needs and hence be more likely to have the desired social or market impact.... But for design and designers there's much more to observation than that... successful designers are keenly sensitive to particular aspects of what's going on around them and these observations inform and inspire their work, often in subtle ways... there are other equally important less-celebrated and less-obviously-logical ways that observation contributes to design. (Fulton Suri, 2011, pp. 1-2)

As this debate shows, the tension between design and other disciplines is felt even when design turns to interpretive social sciences like anthropology rather than the sciences for models. The crux of the matter is that theoretical work based on the approaches of other fields can do a disservice to the design researcher: If designers using ethnographic models contribute to design rather than to anthropology, their work falls to the fringes of anthropology (Tunstall, 2007). Or, to take an example from another field, an attempt to apply art directly to design, as Aicher (2009) has noted, leads to designs that may be catchy, but that ultimately do not fulfill their purpose.

At stake is the long-term direction of design as a discipline. Whose thinking and practice should researchers seek to develop? For us, the most important implication of design accountability is the question of how theory ought to be built into the foundations of the discipline. In design, we routinely see explicit and implicit loans from physics, mathematics, and the social sciences. Borrowing theory from other disciplines is normal in any field of learning, and this is the case in design as well. Giving control over key abstractions to other disciplines, however, may lead to turf contests. In these contests, designers are at the receiving end, and the lessons from the history of design research give reasons for being cautious about listening too intently to the siren songs of other disciplines. The danger lies in the fact that theory in other disciplines advances those disciplines rather than design, and for that reason it underdetermines design, as Gaver (2012) has recently noted. No theory informs all the decisions designers have to make. The list of these decisions involves many things essential to design, including things like historical and artistic references, rules of thumb for aesthetics, manufacturing techniques, computer work-a-rounds, and the look and feel of materials, to mention a few. Theory from other disciplines can give partial answers to design problems, but it cannot give answers to everything designers need to know.

Design, Skill, and Methodology

The second issue relates to the tension between design and methodology. Researchers need to find a way to balance the requirements of design with those coming from methodology. As we see it, the demands of design and scientific method may be at loggerheads. Even if researchers give design priority over theory from other disciplines, other disciplines may sneak in through the methodologies that design researchers apply. The needs of experiments may get priority over the demands of design; ethnography may take resources design needs; art may lead to imaginative prototypes that, however, may be too far off the mark to be of interest to the professional design community.

An emblematic discussion about how researchers today deal with methodology is to be found in the recent Dutch debate about prototyping. Constructive design researchers routinely build prototypes that are sometimes very elaborate and that work not only as illustrations of an argument, but also as proofs of a concept. One argument claims that research prototypes are like hypotheses in science rather than preparations for production (see Frens, 2006). As Pieter Jan Stappers (2007) has written:

Prototypes and other types of expressions such as sketches, diagrams, and scenarios, are the core means by which the designer builds the connection between fields of knowledge and progresses toward a product. Prototypes serve to instantiate hypotheses from contributing disciplines, and to communicate principles, facts and considerations between disciplines. They speak the language of experience, which unites us in the world. Moreover, by training (and selection), designers can develop ideas and concepts by realizing prototypes and evaluating them.... The designing act of creating prototypes is in itself a potential generator of knowledge (if only its insights do not disappear into the prototype, but are fed back into the disciplinary and cross-disciplinary platforms that can fit these insights into the growth of theory). (p. 87)

Stappers illustrates his argument with a drawing (Figure 1). As he notes, the most important things in this drawing are the arrows around the arising spiral of abstraction. The arrows describe design—the stuff that comes into (or leaves) prototyping not from theory but from design skills, insights, and judgments.

Stappers is not alone in paying attention to the tension between design skills and the requirements of methodology. For example, Wolf, Rode, Sussman, and Kellogg (2006) have described design as a black art of HCI despite attempts at despellling it. Looking at Stappers' drawing illustrates well the tension between research and design. Issues involving aesthetic judgments and design references are necessary elements of design, but from a scientific viewpoint, they are uncontrollable impurities. Yet, it is exactly this kind of knowledge that is at the heart of design as a discipline.

The relevance of this debate cuts, then, deeper than just prototyping, as the historical example of the design methods movement shows. Its aim was to give design processes a logical grounding (see Jones, 1992). The trouble with this aim was that as it made little distinction between practice and research, it raised



Figure 1. Theory and design in creating physical hypotheses (redrawn from Stappers, 2007, p. 12, with his approval).

expectations to a level too high to meet. Practicing designers went on with their practice instead of buying design processes created in universities (see Rathgeb, 2006; McIntyre, 1995). The fate of the movement is a useful reminder about the limits of logic: Going too far in the direction of methodology makes research unintelligible and irrelevant for practitioners (Jones, 1991). If we are to take design accountability seriously as a research ideal, then research methods and processes understandable to designers must be put in the driver's seat.

This conclusion does not mean that design research should turn inwards. Contributions from fields like ergonomics and ethnomethodology have solidified many decisions made in design processes and minimized the risks involved in subjective interpretations and decisions over the last five decades (see Ball, 2011; Dourish, 2002). Decisions concerning not only human actions and abilities, but also such things as molding tools and techniques or prices of production and ergonomics, can be done on reasoned, measurable and testable grounds if design researchers borrow methods from other disciplines. The danger, however, is that designers end up buying agendas from other disciplines through their methodological choices. As useful as ethnomethodology has been in teaching designers how to study humans, its methodic focus is on users, not on aesthetics or technology; methods in ergonomics give answers to questions about physiology and cognition, but not about such things as molding or social action.

The ideal of design accountability helps constructive design researchers to give a proper status to these methods in their design process. Their purpose, in brief, is to provide ways

to improve some aspects of design research, as in the case of Stephan Wensveen's (2004) study of an intelligent alarm clock, in which he first created cultural probes and scenarios, then went through sketching to prototyping, and finally tested his prototypes in a laboratory-like setting. Methods from other disciplines helped him, but these did not provide answers to everything he needed in his research. His methodic suite helped him to make better decisions about his design, but the final judgment about the quality of his work lies in his design outcome, the process that led to it, and the "interaction frogger" framework he created.

The Borderline of Design Practice

The third issue concerns the borderline of design practice. When research comes too close to design practice it may create confusion between what is research and what is practice, and this may in turn lead both practitioners and other researchers to dismiss constructive design research as a waste of time. The paradox of constructive design research is that the closer its practitioners get to design practice, the more they need to find ways to keep some distance from it. These ways of maintaining distance, however, can make it difficult for constructive researchers to find agreement about the nature of their activity and, by implication, find criteria for separating good work from bad.

We can best see how this paradox works out by looking at how critical designers have worked their way through it (see Dunne 2007; Dunne & Raby, 2001, 2013). Their aim is to make designers and the public think about design in its normal mode. In the memorable metaphor at the heart of the key text of early critical design, *Design Noir*, market-driven design is like a Hollywood blockbuster, emphasizing easy pleasure and conformist values (Dunne & Raby, 2001). Critical design asked why this Hollywood mode should represent the normal view of design, and pushed us to think about design through other modes. While its roots are in Anthony Dunne's (1999) doctoral research, critical designers have critiqued design in the Hollywood mode by creating objects that are recognizable as design but somehow strange in their function, appearance, or both.

In defining their relationship to design practice, critical designers first established a distance from science and more recently even from design research. From their very first writings, they underlined that what they were doing was "definitely not scientific" (Dunne & Raby, 2001). Recently they have suggested positioning their work outside design research altogether (Dunne & Raby, 2013). Simultaneously, they use methods and techniques familiar from design practice. Most of their references come from art, design and architecture; their work is articulated through physical and digital designs rather than texts; their research has been influenced by a number of architects, designers, and artists, all the way from the Dadaists and Futurists to John Baldessari and Cindy Sherman (Gaver, 2001); their analysis is kept deliberately creative and philosophical (Dunne & Raby, 2013; Gaver 2002); their designs are exhibited in museums and galleries; and their aim is to stir debate rather than create knowledge in any scientific sense.

The problem with these practices is that they feed confusion about whether their work is art, design, or research. Dunne (2007) and Raby (2008) have repeatedly underlined that although critical design borrows methods and approaches from art, it is not art. The problem is that if the outcomes of critical design are labeled as art, designers deem them irrelevant, which destroys their critical power.

Over the last few years, critical designers have created several ways to create distance from art. The first way is formal. Fiona Raby (2008) has distinguished her work from art by stressing that it is in principle usable and manufacturable:

By emphasizing that this is design, we make our point more strongly. Though the shock effect of art may be greater, it is also more abstract and it doesn't move me that much. The concept of design, however, implies that things can be used and that we ask questions—questions about the here and now. What is more: all our works could actually be manufacturable. No one will of course, but as a matter of principle, it would be possible. (p. 65)

Another way critical designers have created distance from art is through participation in discourse, as in projects such as *Material Beliefs* and *Iaspis Forum* (Beaver, Kerridge, & Pennington, 2009; Ericson, Frostner, Kyes, Teleman, & Williamson, 2009). The virtue of this pursuit is that it helps to keep the wildest interpretations opened up by arty prototypes in check. The third and current way is to study the prototype in detail with field trials. This turns the prototype into an object of research and thus helps to create distance from art (see for instance Gaver, 2001).

One problem with these approaches is that they make the aims of the critical design program difficult to comprehend from within design. When critical designers maintain distance from research by aligning with practitioners, and from practice by aligning with researchers, they may appear illogical. Their approaches also send mixed messages that can lead recipients to seek cues that will help them to make the things they see intelligible. What remains of the program are strange designs that, although well-constructed, remain grounded in reasoning more akin to art than design. Regardless of the claims of Dunne and Raby, many critical pieces are deemed by design practitioners as art and, by implication, irrelevant as sources of learning about design. This program would probably work better in architectural discourse, in which aesthetic, artistic, and theoretical arguments are accepted more readily than in design.

We believe that design accountability would provide a better ideal for critical design. It would position it as design research aimed at criticizing the prevailing pro-market assumptions of design. This would mean that although critical designs are not meant as actual design, they would have to be good enough to be respected by design practitioners. This positioning would be enough, and it would not create confusions about the nature of their work. Such an approach would also serve as a model to other design researchers who try to push their work close to practice, but do not want to get into the complicated world of art criticism.

Summary

This paper has introduced the notion of design accountability in design research, and examined some of the problems that arise in applying this notion. We took our initial cue from Gaver (2001), who argued that design is aesthetically rather than epistemically accountable. We have, however, sought to expand his argument by showing that to make design research useful, we need to think in terms of design accountability. Using the term aesthetic accountability runs the risk of reducing research to art or styling.

Our laboratory in this paper is the field of constructive design research, which seeks to study design problems by designing things. The value of using this field as a test case lies in the fact that it is one of the few forms of design research that has to negotiate the boundaries between research, practice, and art. To survive, constructive design researchers have had to develop arguments and practices that help to clarify these boundaries.

In this paper, we have examined three arguments in this debate, one dealing with theory, another with methods, and a third with art. Design accountability, as we understand it, offers an ideal framework that would help to manage these arguments. In the first argument, concerning theory, we've shown that early attempts at giving design a theoretical base usually failed (Alexander, 1971; Jones, 1991; Maldonado, 1991). A better alternative, we argue, is to put practice first and give theory a role in explicating practice, as is done in the humanities and interpretive social sciences. The second argument concerns key methodological decisions. Our test case here is the practice of prototyping, and we use a recent Dutch discussion on prototypes to highlight the tension between theory and practice in design research (Frens, 2006; Stappers, 2007; Overbeeke, Wensveen, & Hummel, 2006). Our aim here is to show how research methods must be understandable to design practitioners. The third argument we raise is the relationship to practice. As critical designers have pointed out, if design is seen as art, it may lose its relevance to design practice. Researchers thus have developed ways of maintaining distance from the practice of art (Beaver et al., 2009; Dunne, 2007; Dunne & Raby, 2001; Raby, 2008). Their approaches, however, have led to further complications about the nature of their work. We propose that maintaining accountability will help to resolve such complications.

As we mentioned in the opening section of this paper, constructive design research contrasts in some crucial respects with what we call exogenous research practices in fields such as design management, design studies, and design history. These fields do not come up against the boundary of practice, and thus avoid some of the pitfalls we have described in this paper. Constructive design research, in contrast, contributes to design practice by helping designers to develop and upgrade the research-intensive conceptual skills that many key design consultancy markets are craving for.

In broader terms, this is useful in an era in which design research has become a well-established specialty of the profession in most of the world's key design markets, and constructive design research has played a significant role in developing competencies

that have led to this change. To achieve this success, however, design research—and design—needs to avoid the pitfalls that arise when research gets too close to practice and thus needs to articulate its difference from practice.

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