

Lab, Field, Gallery, and Beyond

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Over the last 10 years we have seen a growing number of researchers integrating design experiments in their research inquiries. Initially, this work borrowed heavily from neighboring fields, employing a dual strategy in which design experiments and their evaluation were largely treated as separate processes that were often carried out by different people. More recently, design researchers have developed several approaches that integrate design-specific work methods into research. This paper takes a methodological look at three such established approaches that the authors call Lab, Field, and Gallery. They are described and their similarities and differences analyzed. In conclusion, whether design research today needs foundations based on the standards established for other disciplines is discussed.

Keywords: design research, gallery, field studies, laboratory, research through design

INTRODUCTION

Since Frayling (1993) more than a decade ago suggested research through design as a viable road to take for design research, we have seen a number of researchers integrating design experiments in design research. Initially, this work borrowed heavily from more established disciplines. For example, from human–computer interaction, design researchers learned the experimental tradition of human factors engineering. From the humanities and artists, they learned to exhibit their work in galleries and to critique design. From the social sciences, they learned action research and other case-based research traditions. Whatever this supporting structure has been, much of this early work has tended to employ a dual strategy. Design experiments and the evaluation of design have largely been treated as separate processes, often carried out by different people. By “design experiment,” we refer to pieces of design carried out as a part of a research effort.

However, more recently, we have seen a proliferation of design research that puts design experimentation more firmly at the core of the research process. Examples include: contextual inquiry and co-design (Johansson, 2005); cultural probes (Gaver et al., 1999; Mattelmäki, 2006); and design games (Brandt, 2006). However, some of this work deals only with methods, has no distinct theoretical basis (Laurel, 2003), or focuses on the early stages of design only (like design ethnography in Clarke, 2007). This work is not our concern. What we will focus on and find particularly intriguing is that a growing number of design researchers pursue integrated approaches where design work and research is interwoven. Accordingly, design work becomes inseparable from research.

A striking feature of much of this work is the speed at which it has gained influence and has been adopted by its audience. For instance (interface design approaches such as tangible interaction (Djajadiningrat et al., 2004; Ullmer & Ishii, 2000) have provided a rich repertoire of design cases, with a significant impact also on commercial design. New approaches such as cultural probes by Gaver et al. (1999) have been spreading rapidly, and have quickly been appropriated to a wide variety of design work, often with a limited connection to the intentions of the original work (see Boehner et al., 2007). More recently, notions of co-design and co-creation have been adopted by design researchers, demonstrating how design proposals may be generated by open collaborations with a multitude of potential future users through original design work (for example, Sanders, 2006).

However, from a methodological standpoint, much of the work published today is poorly elaborated. Despite the growing number of individual research contributions, design research is often poorly related to the work of other design researchers.

Consequently, it does not easily open up for peer evaluations. As suggested by Boehner et al. (2007) in an examination of the way in which the probes approach has been taken up in human–computer interaction (HCI), methods and techniques are often appropriated without a concern for the underlying methodology. The original orientation of the probes approach towards dialogue and mutual interpretation has been transformed into data collection. Something similar has happened to notions like tangible interaction and new interaction “paradigms” like aesthetic interaction, embodied interaction, and social computing. These notions have commonly been applied to interface design without thoroughly investigating what implications they have for design and design research.

However, questions of the methodological foundations of design research are increasingly important for design researchers when they need to find their place among other fields of research. With this paper we intend/seek to address some issues of methodology. In particular, we aim to discuss how design research is conducted in three currently established approaches. We will call these “Lab”, stemming from experimental psychology; “Field”, based on the social sciences; and “Gallery”, with origins in art. We will focus on how these approaches have been appropriated to design research, and how they have shaped this field of research. We conclude by asking if design research is in the middle of a transition. Clearly, the original starting points continue to shape design research, yet, simultaneously, new and more design-specific programs may also be taking shape.

APPROACHES TO INTEGRATING DESIGN AND RESEARCH

The line between design research and design is fuzzy in both directions. Both are methodologically sensitive, and may advance knowledge in design and beyond. If a designer is successful in proposing the design of a new chair, he/she has also explicitly or implicitly convinced us that we can think of chairs and the act of sitting in ways we were not familiar with before. He/she may also teach us new facts about ergonomics, intentionally or unintentionally.

For its part, design research typically builds on several practices that have their origins in design. In particular, the design process at the heart of design

research typically comes from design practice; it is the theoretical scaffolding that makes the difference. Furthermore, design research usually deals with something that does not yet exist: it is projective in character, dealing with products of imagination. These products of imagination may be products, concepts, prototypes, spaces, or, more typically, techno-social systems. At the lower end of the scale, these imaginary qualities are introduced to the design research process in terms of verbal descriptions, sketches, and images. At the more sophisticated end, they may also be introduced to the process as highly polished prototypes. Regardless of their form, these imaginative items are treated as representations of an actual product. Their function is to make interactions with hypothetical, non-existing products tangible and observable (see Sæde, 2001).

However, even though there are many similarities between design and design research, there are important differences too. They mainly relate to the objectives and the community in which design work is done. Thus, even if a chair designer were to make a contribution to what we know about sitting and chairs, it does not make this chair design into a research contribution. Creating a new chair may require thousands of hours of research. However, if the only outcome of all this work can be bought from the shop, then the process has been lost. It cannot be examined reliably to find out how it was done and whether it could be done better. In contrast, when the chair is done as part of a research effort, it is treated as an experiment, and reported following a few key principles:

- *The CUDOS ethos.* Design research rests on a completely different institutional basis than design, which usually aims at market or media success. In his classic writings on the sociology of science, Robert Merton (1968) outlined four principles of scientific ethos. Science is Communist² in that its results are the property of the community, not the one who created knowledge; it is Universal in that any truth claim has to be based on pre-established impersonal criteria; it is Disinterested in that it is not based on such personal issues as profit or personal thirst for fame; it obeys Organized Skepticism in that any claim is open to criticism at all points. This ethos makes critique possible, helping to weed out infertile and false ideas and to focus on the best ones; it makes sure

that results and practices spread quickly. It also makes research teachable through texts, not just through master–apprentice relationships, as in the traditional Bauhaus model of education.

- *Program.* Any piece of design research has to situate design experiments in a research program to contribute to knowledge in the long run. As the philosopher Imre Lakatos (1970) has argued, progress ultimately lies in research programs, not in individual studies. Progress in research happens only when a study makes an argument and contributes to a research program either by adding new knowledge to it or by correcting it. What makes a research program successful is its ability to generate new questions in the long run (see also Binder & Redström, 2006).

In current design research, the main methodological problem in our view is that researchers give too little concern to research programs in a Lakatosian sense. However, there are several approaches that attempt to do design within theoretically consistent frameworks. These approaches borrow their basic ideas from other, more established institutions, ranging from science to the art world and more commercial design. Some design research approaches borrow their foundations from experimental research in the natural sciences by conducting research in laboratories specifically tailored to study products of imagination. This approach is seeking causality: how some things inevitably lead to other things under certain circumstances. Some approaches function like interpretive social sciences, taking the products of imagination out to the world, observing how people learn to use them to understand whether design ideas are valid or not. Yet other approaches reject this scientific agenda altogether and borrow their working modes from the art world by placing the products of imagination into gallery-like spaces. Design experiments are evaluated as aesthetic and conceptual statements, like art works in galleries.

In order to develop research programs for design research, it is important to understand the differences between these approaches. Though any overview like the one presented here will suffer from being schematic, it is nevertheless important to address such general differences because they have important implications. For instance, while the actual design process at the heart of each approach is largely the same, their differences have

implications to how one constructs arguments, how one understands contribution, and how one has to budget, evaluate, and conduct the actual research.

LAB: CAN YOU REALLY STUDY DESIGN IN THE LABORATORY?

The first approach we focus on is the mainstream of design research in technical design disciplines. We call it the Lab. The foundations of this approach are in the natural sciences, but for design research it usually comes through experimental psychology. Studies are conducted in laboratory-like conditions by introducing explanatory variables such as gender or lighting conditions into the laboratory systematically, and by observing what happens to the outcome variable as these parameters are varied. The aim is to identify causal mechanisms in factors such as how limits in cognitive processing capabilities affect error rates in user interfaces. The justification for the program is straightforward: if causal mechanisms are found, they provide a solid ground for design.

Our exemplary cases come from the Netherlands. Recently, several first-rate doctoral theses have been produced in Eindhoven and Delft. Theoretically, work in the Netherlands was strongly linked to cognitive psychology, but has since gone beyond these origins. In his inaugural lecture summarizing this development, Overbeeke (2007) has recently argued that researchers overrate cognitive skills, and has clarified how such dissatisfaction has driven theory in his and his students' work, first to Gibson's ecological psychology, and later to phenomenological psychology and pragmatic philosophy. With this turn, research has focused on perceptual-motoric, emotional, and social skills rather than following the cognitive paradigm only:

Meaning . . . emerges in interaction. Gibson's theory resulted from a long line of "new" thinking in Western philosophy, i.e. Phenomenology (Merleau-Ponty, Heidegger) and American Pragmatism (James, Dewey) All these authors stress the importance of "acting-in-the-world," or reflection being essentially reflection-in-action. (Overbeeke, 2007, p. 7)

The best research in this tradition combines sophisticated theoretical thinking with rigorous empirical research. The process typically starts

with a small field study. It continues to concept development and prototyping, and ends with a series of experiments conducted in laboratory-like conditions. The aim of the second stage of research is to study whether the original theoretical notions were achieved in design, for instance, whether ideas concerning affective and rich interaction really improve emotional and tangible user experience (Wensveen, 2004; Frens, 2006a,b). Outside Europe, the most advanced work in the field has explored cultural factors in design (Lee, 2001).

Perhaps the best recent example is Frens (2006a,b), who set out to create a tangible camera that would be based on “rich interaction”, by which he specifies the notion of affordance to integrate aesthetic interaction through the unity of form, interaction, and function. Specifically, he wanted to create a concept that would require using perceptual-motor and emotional skills in addition to cognitive ones. He conjectured that by integrating form, interaction, and function, he could make interaction more pleasing aesthetically. His study began by creating five scenarios that explored interaction styles, illustrated with physical mock-ups and foam models. Based on feedback from these scenarios, he created a tangible camera with several variations, and created an experimental setup to compare the rich interaction paradigm with the more conventional interaction paradigm. The phases of his study are described in Table 1.

At the end of his study, he tested four interface variations with different interaction styles in laboratory-like conditions, asking his experimental subjects to review and take pictures of still-life

photos with his prototypes. He tested his hypothesis using standard statistical procedures like t-tests and analysis of variance.

Twenty-four participants, ranging in age from 19 to 29 years old, took part in the experiment. They were all students from the Architecture Department of the Technische Universiteit Eindhoven. Each participant observed and used all four cameras and finally compared them (Frens, 2006b)

His tests supported the idea that there are alternative interaction paradigms. For example, Frens’s new camera concept was found to be aesthetically pleasing, and its perceived beauty was correlated with its perceived goodness. However, severe usability problems did obstruct aesthetic interaction.

Frens’s work is interesting and forms an important part of the bulk of work on new approaches to interaction that has come out of the group of researchers working with Overbeeke. In terms of an open, transparent process, it lays out the steps taken and the arguments supporting the direction of the design work pursued in order to establish the rich interaction of the digital camera. Some aspects of the process are, however, questionable. The first concerns what methodologists would call “external validity”, i.e. whether results from the experiments can be generalized to situations outside the laboratory. Also, subjects are typically selected through convenience samples rather than through proper randomization. Typically, subjects are design students. However, the choice by Frens to include novel design work in his research has to do with the fact that the design is not merely a means to validate

Table 1. Phases in Frens’s study (constructed from Frens, 2006a)

Theoretical foundations	Developing the notion of rich interaction.
Scenarios	Creating five alternative scenarios of rich interaction for digital cameras, illustrating them with mock-ups, service concepts and foam models. Testing scenarios with colleagues.
Creating physical prototypes	Creating two mock-ups, one with a rich user interface (RUI), another with a conventional interface Walkthrough with few users (number unclear)
Experiments with prototypes	Creating final functioning RUI prototypes based on the findings of the previous phase Testing the designs with 24 participants



Figure 1. Research design in Frens (2006a,b). Top: An early interaction and service scenario. Middle: four variations of the prototype. Bottom, left: setup for viewing, right: setup for taking pictures.

a general causal relationship between interaction parameters and user experience. Rather, his aim is to show that features of the particular design proposal actually elicit expected experiences. A small number of cases are enough for this purpose.

However, there are also more profound methodological problems. In particular, theoretical framework plays a crucial role. A laboratory study may lead to severely biased results if crucial variables are missing, or if there are specification errors in the hypothetical causal model motivating the research. If we look back to the quote from Overbeeke on the importance of studying interaction as “acting-in-the-world”, and take this as a backdrop to Frens’s study, we see that his work stretches the lab approach to the limits of what it can offer in its classical form. This theoretical background is slowly pushing research out from a laboratory into real contexts of use, making identification of causal mechanisms considerably more difficult than in the standard cognitive paradigm.

The strength of the lab approach in areas such as HCI, where it is still pushed by powerful institutions like the CHI conference, is its transparent methods and its well-defined experimental setups. However, with new post-cognitive theoretical foundations, the conventional lab approach is being stretched to the limits. Instead of attempting to remedy the shortcomings of the lab approach, we find that some design researchers today are developing new theoretical orientations that are also reflected in their empirical investigations. This is accomplished by taking a broader view on lab approaches used in technological research. For example, Scrivener (2000) proposes to shift the emphasis from parametric evaluation to more “holistic” explorations of patterns or prototypes. Another recent example is the extension of the lab idea to a site of manageable yet open-ended experimentation (Binder, 2007). These broader views pay respect to transparency inherent in the experimental tradition, but target multiple needs in design research instead of advancing the theoretical aims of cognitive psychology alone.

Table 2. Morphome: phases of the study

Pilot phase	Probes study, spring 2003	A probes package was sent into six homes for 1014 days each Closing interview with collages
	Cushions, summer-fall 2003	In three homes, one-week experiment with a technological prototype in each An optional video camera Closing interview
Prototyping	Piloting with an IKEA- style lamp, summer-fall 2004	A four-week study with one lamp in four homes, plus a closing interview with technology scenarios Scenario interviews in 12 other homes
	The Four Lamps Study, spring-summer 2005	A four-week study with four lamps in four homes Closing interview with technology scenarios Weekly intermediate interviews
Testing an environment	X10 and MisterHouse, summer 2005	A two-week study in which X10 was installed in two homes Interviews, photographs

FIELD: HOW TO FOLLOW DESIGN EXPERIMENTS THROUGH SOCIETY

An alternative approach builds on interpretive social science. Instead of bringing the context into a design experiment as a set of variables to be varied in an experiment, it places design into a naturalistic setting. Researchers follow what happens to it in that context: how people and communities understand it, make sense of it, talk about it, and learn to use it. The Field approach is typically grounded in sociological theory. Precursors to this approach come from ethnomethodological research carried out in Palo Alto Research Center, with Dourish (2002)³ as its most recent proponent, participatory design (for example, Greenbaum & Kyng, 1991), and activity theory (Nardi, 1995). More recent work tends to build on pragmatism and symbolic interactionism (see Battarbee, 2004; Battarbee & Koskinen, 2004). The main difference between these precursors and recent work is the role given to field studies. In precursors, it informed the early stages of design. In more recent work, research is integrated seamlessly into design.

In Field, the way in which use context is brought into design is different from Lab and Gallery: here it is typically ordinary people leading their ordinary lives who become the context. As Kurvinen et al. (in press) have argued, one should design research so that the artifact is placed into an ordinary social setting in which it is followed using naturalistic research design and methods over a sufficient time span so that social processes have time to evolve. They also stress that the artifact should not be understood as stimuli in a laboratory, and that one should pay special attention to the sequential unfolding of events. Under these conditions, the artifact acquires several meanings in social action, and these meanings can be studied empirically. Here, design experiments become social objects; people talk about them with others. People do not just make sense of experimental designs. They also use them, compare their interpretations, and even come into conflict with each other because of the experiments. Experimental designs are also typically not the center of attention, as in other approaches, but take on a far more peripheral role as they commonly do in ordinary life.

Figure 2. Pictures from Morphome. Clockwise: probes (detail), one home, IKEA-style lamp with technology exposed, scenario about the lamp talking to a TV and vacuum cleaner.



One study in which these principles were observed was Morphome, which focused on proactive information technology at home (see Koskinen et al., 2006). The main design question was: If information technology is used to augment ordinary objects with conventional uses – like chairs and tables – how should new functionalities be communicated to people? Instead of adding user interfaces or graphics to objects, Morphome started with a probe study and then went on to prototype technology with cushions and lamps, alternating field research with prototyping. Morphome went through three main phases: piloting, prototyping, and testing a proactive environment (Table 2).

Throughout, Morphome was conducted in an iterative fashion, basing each successive prototype on findings from field studies of previous prototypes. In all, user-centered studies were conducted in 19 real homes with prototypes, and in an additional 12 homes with scenario interviews. In all, 65 people participated in the study. Morphome followed an interpretive procedure analyzing how people understood the prototypes by explicating variations in human perspectives articulated in field data rather than by testing a set of predefined hypotheses.

However, adopting this approach means also changing scientific tradition. When interpretation follows an inductive rather than a statistical inference, issues like randomization and so forth are less important than in Lab. Whether a piece of research is interesting depends on how successful one is in description and specification. The work’s contribution depends on whether the study is able to produce something new, or to point out problems. Also, theories are typically treated as sensitizers,

and are used as precedents in Common Law. When one meets something interesting, one interprets it in theoretical terms. When one meets features that do not fit with theory, one develops the theory further, and ultimately reinterprets it (Seale, 1999). Thus, although research starts from previous research, it usually leads to new findings and interpretations. Data have a chance to prove that a theory is wrong, or at least in need of reinterpretation. New knowledge is gained, but not through a series of experiments. This approach builds on interpretive social science, with roots in exegetics in which “progress” is almost never based on scientific discoveries, but on creating insight and improving clarity.

Field studies are particularly informative when design objects are ambiguous and have no obvious interpretation. In this case it is better to see how people make sense of it, and how they construct dominant interpretations for it. Similarly, if the complexity of the product is high, then the learning process can best be followed through a field study by focusing on how users learn the product. Finally, when products are socially significant, and people learn to use and appreciate them from social cues, an economic way to study how these indications evolve into socially shared interpretations is through a field study. The main pitfall of the approach is that unless one follows the canons of induction carefully, research in this approach falls into a series of case studies that do not create a program.

Table 3. Phases in the Placebo project (constructed from Dunne and Raby, 2001)

Theoretical/conceptual foundations	Connecting to discourses of privacy, intrusive wireless communication and electronic objects
Concept design	In the project a number of concept designs for electronic furniture are exhibited in different “showroom”
“Adoption” of prototypes by volunteers	A selected group of people volunteer to live with the prototypes for a period of time Their experiences are widely documented through interviews and photo documentation
Documenting the project in a book	The “design noir” book completes the project through positioning the project in a larger discourse of cultural criticism

GALLERY AS A MODE OF DESIGN EXPERIMENTATION

While Lab and Field are in debt to the natural and the social sciences, the third approach builds on forms familiar in an altogether different institution, the art world. For artistically oriented design researchers, gallery is one of the traditional formats for disseminating one's work. Ranging from degree shows at design schools to large corporate expos and fairs, the exhibition presents concepts and design objects as well as ideas and visions, by giving people the opportunity for first-hand experience. This format implies that the design experiment, be it a model, a prototype, or a performance, is the final presentation of the work and its process. Of course, exhibitions might be followed or accompanied by other kinds of material documenting aspects not present in the exhibition itself. However, ultimately it is the designed object that is placed at the center of attention.

Though the exhibition certainly can be an experiment – even an experiment inviting and involving people – the exhibition itself in many ways plays the role of a publication rather than the experiment in Lab. Considered as a format for knowledge dissemination (in a wide sense of the word), curated exhibitions in particular fill a function rather similar to that of a research paper, since the work has to be invited and accepted. However, this format typically encourages a high-quality finish for the objects and exhibition rather than the theoretical thinking, which is the central function of most written reports. Naturally, rich theoretical frameworks are usually constructed in the exhibition. After all, there are specific traditions of reading and analyzing works in art theory and art criticism. However, the primary purpose of an exhibition is to enable experience, not only reflection. There is a profound difference between going through a result in an exhibition and reading an art historian's or an art critic's analytic interpretation of what was going on in the exhibition.

However, in design research, the word "gallery" should not be understood in terms of a typical art gallery. Art and design have long since been expanding beyond the gallery space to other sites and situations. And it is also the case here, in the transformation of practices as they move from one context to another, that we find some of the new

hybrid forms emerging where designers more fully integrate the different steps of the design research process. In his study of electronic objects, Dunne suggests that design research should explore a new role "that facilitates more poetic modes of habituation: a form of social research to integrate aesthetic experience with everyday life through 'conceptual products'" (Dunne, 1999, p. 29). With regard to such conceptual products, the gallery format becomes more like a showroom:

The space in which the artifacts are shown becomes a 'showroom' rather than a gallery, encouraging a form of conceptual consumerism via critical 'advertisements' and 'products'. New ideas are tried out in the imagination of visitors, who are encouraged to draw on their already well-developed skills as window-shopper and high-street showroom-frequenter. (Dunne, 1999, p. 78)

In this way, design research may build upon and yet expand notions of what it means to read a piece of work. It may also expand the ways in which design researchers can present their results. In subsequent projects such as Placebo and Evidence Dolls, Dunne and Raby have elaborated this position:

The Placebo project is an experiment in taking the conceptual design beyond the gallery into everyday life. We devised and made eight objects to investigate peoples' attitudes to and experiences of electromagnetic fields in the home, and placed them with volunteers Homes for the objects were found through a variety of means, including adverts in a London listings magazine, workshops at the Victoria and Albert museum, a window display in Selfridges department store on Oxford Street and an article in a national newspaper. (Dunne & Raby, 2001, p. 75)

Importantly, the final design product of the Placebo project is not this field exhibition of the prototypes, but a book documenting the project as well as all the interviews with the adopters. As such, it illustrates how established literary genres can be appropriated and brought into design research.

With respect to notions of "subjects" and field studies, Dunne and Raby in no uncertain terms state that their work is not scientific. In line with this anti-scientific ethos, they do not explain how their designs came about, or how contexts of use were

studied. Still, with the exception of an elaborate conceptual foundation, their design process appears to follow a fairly ordinary track from ideas, to concepts, to prototypes:

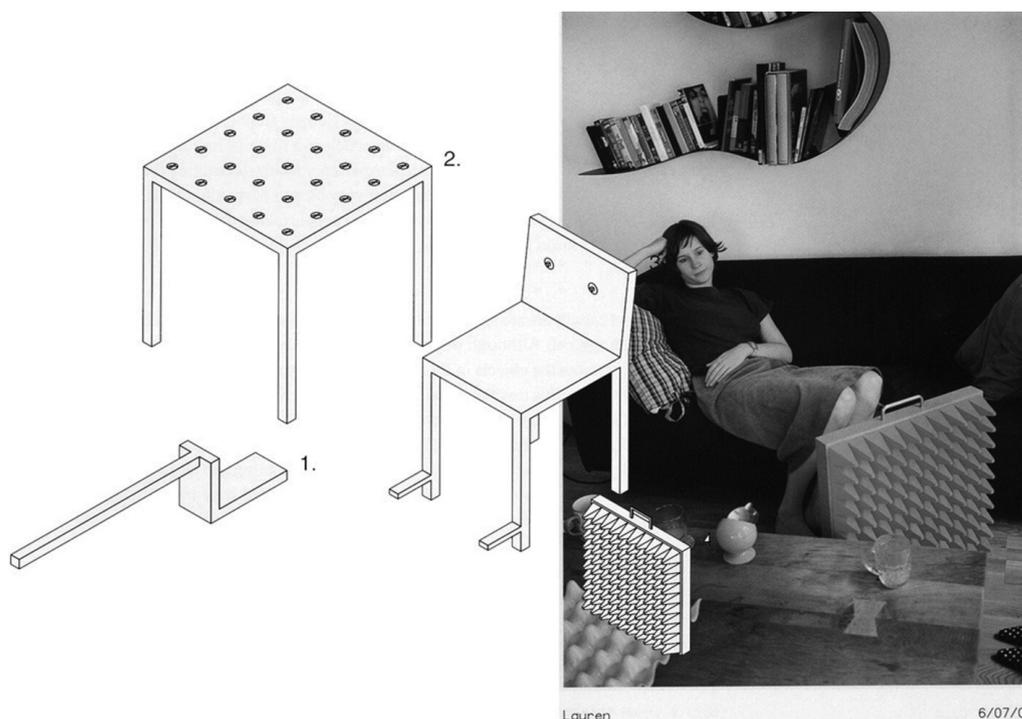
The Placebo project is definitely not scientific We accept that the group of adopters was self-selecting. We also accept they are probably exceptional people. But they are real people, anything we discovered would be grounded in reality rather than fiction. (Dunne & Raby, 2001, p. 75; see also Sengers & Gaver, 2006)

There are several interesting aspects in this development towards new hybrid exhibition formats. For instance, while the traditional Gallery approach places design into art-world formats, the development of new exhibition formats revises this notion significantly. In particular, notions like showrooms, product placement, and consumption put far more emphasis on professional opinion about the work's interest and quality/merit. Importance is placed on encounters with everyday life, taking this approach closer to Field. Experimental conditions are not manipulated to get at causal relationships. Also as in Field, there is an interest in studying design in embedded and embodied settings, not in settings that encourage detached reflection. The reading of the works is based on interviews and observations of how ordinary people use and make sense of the experiments.

There are several other developments of post-critical approaches to design, that is, a kind of design where the design critique increasingly moves from the design community to outsiders (Mazé & Redström, 2007). A related yet different approach is described in Routarinne and Redström (2007) for whom the notion of domestication provided an alternative basis for studying prototypes in real-life settings. They gave experimental design prototypes to ordinary homes for several weeks, observing and interviewing participants to explore how they understood the designs. They comment that: "domestication as design intervention ... lends itself to be interwoven into practices in ways that cannot be anticipated by its design" (Routarinne & Redström, 2007, p. 6). These approaches shift understanding design from professional design theory to how design is interpreted and appropriated by ordinary people in ordinary situations. It is not the art theorist whose readings of the work are critical to the success of a design experiment.

In general terms, it is quite clear that the Gallery approach to design research differs significantly from the other two discussed in this paper. Plainly, it does not build on a scientific tradition. Thus, it does not seem to aim at developing a new program either, though it clearly is design research rather than mere design. For design research, Gallery is an important approach in that it puts design into

Figure 3. Prototype from Placebo project. Electro-Draught Excluder is made from conductive foam, but is not grounded and not radiation absorbent. Design sketch and picture from a home (Dunne and Raby, 2001, pp. 76, 85).



the middle of design research, not Lab's theory or Field's community. However, Gallery is converging methodologically with many issues explored in Field, and shares conceptual premises with both Lab and Field. Still, Gallery is not after scientific legitimacy, but its development primarily owes to a willingness to situate design research in new institutions. For us, the most important thing in Gallery is that designers increasingly get into domains and issues previously explored by research-based design research programs. In doing so, it is converging with other developments in design research methodology, though not in terms of the ethos that drives it.

BEYOND LAB, FIELD, AND GALLERY?

This paper has described three successful, integrated approaches to design research. These approaches are successful in the sense that they consistently produce research, and have been taught to new generations of researchers. All have produced exemplary research with rigor in the sense that, in each of these approaches, there is a dynamic that pushes new research beyond the limits of current knowledge. In Lab, the construction of knowledge functions as in the natural sciences through a series of carefully constructed experiments. Field advances knowledge just as rigorously, but in another way, through methodologically sophisticated field studies. Gallery pushes knowledge to new domains by way of critical discourse through practices borrowed from the art world. Each approach we have described relies heavily on openness, making criticism possible and advancing knowledge accordingly. While design research clearly lacks research programs in the strict sense proposed by Lakatos (1970), these approaches have many pre-programmatic features. In particular, they provide in-built solutions for many of the problems design researchers face on a daily basis. Through critique, one may also identify questions not covered in the original approach. They provide important steps towards maturity in design research. Maturity is called for when design expands its scope from graphics and products to interaction, environments, and other increasingly complex systems (see Buchanan, 2001).

We would like to stress that, in many crucial respects, these approaches are incommensurate. In particular, Lab and Field are based on two

completely different understandings of social context, notions of causality, and methodological procedures. With its artistic undertones, Gallery in turn is clearly incompatible with Lab (actually, it is partly created to counter the scientific ethos of the Lab), and also with Field, which situates design in ordinary rather than gallery or showroom-like settings.

However, although the approaches are incommensurate at a broad institutional level, they have many commonalities. In particular, many practitioners share theoretical assumptions. A good deal of recent work builds on phenomenology and pragmatism either directly or, more probably, indirectly through traditions like postmodernism, ethnomethodology, Gibson's notion of "affordance", and symbolic interactionism. Methodologically, each approach relies on familiar research techniques like contextual inquiry and cultural probes in early phases of the research process. Furthermore, if we look at development within approaches, there are signs of convergence. For example, studies based on Lab have not just become more sophisticated, but also gone towards Field, as in Ianus Keller's (2005) recent work. Similarly, several works exemplifying Gallery have recently entered the field (Dunne & Raby, 2001; Sengers & Gaver, 2006; Routarinne & Redström, 2007). On the other hand, Field has been going towards quasi-experimental research designs, bringing it closer to Lab (Koskinen et al., 2006).

Earlier, we noted that design research is pre-programmatic, which makes it difficult to evaluate progress between approaches. However, it is important to note that, as a whole, research by design has evolved quickly during the last 10 years. Unlike earlier attempts to make design a field of research (see Gedenryd, 1998, pp. 59–60), this attempt has had at least modest success. As we have witnessed, the last 10 years have seen major progress in design research. Although design research is maturing, we feel that there is confusion concerning the way in which practitioners understand the work they are conducting. One of the aims of this paper was to spell out three main variants of design research and to clarify the state of design research.

However, we have also seen that all three approaches are converging to some extent. We would like to argue that this development has

something to do with the amount of design research being carried out. The traditional positions related to Lab, Field, and Gallery were initially used because of a need for validity and rigor. To get published in a new field, one has to start with a reference to some kind of “normal” science. However, over time and with a growing design research audience, external notions of relevance become less important. By sacrificing some rigor, design researchers are able to achieve relevance in the eyes of the growing design research constituency, which encourages and accepts risk-taking as long as it serves design.

The implication is that we shall see adaptations and appropriations of established formats that make sense only if we consider their contribution to be design research. Thus, we have laboratory studies that do not contribute to psychology; field studies that do not live up to the standards of ethnography; and exhibitions not suitable for the collections of art museums. Likewise, there is a massive difference between discussing design theory and discussing philosophy, even if the basic material and methods may immediately look similar. In brief, while design research started out from established traditions, this was probably primarily for the reason of dissemination (such as through conferences and journals). With design research achieving a degree of maturity, there is less need for honoring the standards established in other disciplines. Instead, emerging programmatic formulations of design research are forcing us to revisit basic notions such as validity and rigor. Needless to say, we welcome this development as long as respect is paid to the essence of the CUDOS ethos (Merton, 1968).

A key aspect of this step, as we see it, may lie closer than one would think. Each approach reviewed in this paper shares one thing: they place some kind of design process and design skills at the heart of design research. When we read reports from the approaches, we routinely see sketches, scenarios, mock-ups, models, prototypes, and 3D renderings all embedded in a process that is recognizable to any professional designer. This process is far less elaborate than typical engineering processes, and has clearly different aims than a typical research process. It is design skills that enable these approaches to continue to be reported in journals and conferences, making collegial criticism possible. It also adds a new mode of learning, borrowed from more established fields of research,

to design, enriching the design field without making claims of reducing design to merely a branch of some existing science. For practitioners of the Lab, Field, and Gallery approaches, concepts, methods, and protocols borrowed from fields like experimental psychology and conceptual art are just the scaffolding, temporary structures required for constructing buildings. Even though these buildings may not be completely ready, the many elements needed for a new constructive discipline are in place. However, means of interpretation cannot be defined within the limits of this paper. So far, Lab has the best track record in terms of taking steps towards a research program, but Field and Gallery provide strong alternatives to it. As design researchers, we need to study the most methodologically advanced design research practices, allow each a fair chance, and let the field define its own criteria for success.

NOTES

1. Thanks are due to Timothy Austin for comments, and also for suggestions that improved our language.
2. Merton’s original article is from 1942 and predates McCarthy. During the 1950s, he substituted “Communist” with “Communitarian”, illustrating how science and politics interact.
3. Dourish builds on many strands of theory and is not consistent in his writing. Mostly, he is in line with the sociologist Harold Garfinkel’s ethnomethodology, but also with phenomenological philosophy (especially Merleau-Ponty’s phenomenology and Heidegger’s fundamental ontology).

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Published online 28 November, 2008
 ISSN 1749-3463 print/ ISSN 1749-3471
 DOI: 10.1080/17493460802303333
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