Research into, by and for design

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Abstract:

Mature theory construction in design research has been hampered by ill-considered ideas. The notion of 'research by design' is such an idea, conflating practice and research in ways that make explicit theory development difficult. This article examines some of the problems associated with the notion of 'research by design'. It also examines the roles of tacit knowledge and explicit knowledge in theory construction, while clarifying the role of explicit knowledge in reflective practice.

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Key Words:

Research, theory construction, tacit knowledge, explicit knowledge

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Frayling's *Research in Art and Design*
Sir Christopher Frayling's *Research in Art and Design* is perhaps the most-cited and least-read document in design research. In most fields, I would reserve that distinction for Thomas Kuhn's *Structure of Scientific Revolutions* or Peter Berger and Thomas Luckmann's *Social Construction of Reality*. These also show up often in design research, but there is a big difference. Each of these books now has millions of copies in print, and both are widely read, quoted and cited by people who have read them, along with the great load of citations by those who have never seen either volume.

Christopher Frayling's pamphlet, *Research in Art and Design* (1993), is different to the others in two chief respects. First, it is a small proposal, and copies are hard to find. Second, nearly no one has read it. As nearly as I can tell, over 95 per cent of the citations, references and loose paraphrases of Frayling's idea come from people who have not themselves read Frayling.

This article is an attempt to clarify what is involved in the oft-cited idea of 'research into design, research by design, and research for design'.

The problems that come up in the pamphlet are serious, but they are not new. It will help to examine the larger context in which Frayling's concept occupies a niche.

Theory construction problems in design research
Until recently, the field of design was an adjunct to art and craft. With the transformation of design into an industrial discipline come responsibilities that the field of design studies has only recently begun to address.

This transformation means that design is becoming a generalizable discipline that may as readily be applied to processes, media interfaces or information artefacts as to tools, clothing, furniture or advertisements. To understand design as a discipline that can function within any of these frames means developing a general theory of design. This general theory should support application theories and operational programmes. Moving from a general theory of design to the task of solving problems involves a significantly different mode of conceptualization and explicit knowledge management than adapting the tacit knowledge of individual design experience.

So far, most design theories involve clinical situations or micro-level grounded theories developed through induction. This is necessary, but it is not sufficient for the kinds of progress we need.

In the social sciences, grounded theory has developed into a robust and sophisticated system for generating theory across levels. A 'grounded' theory is an inductive theory emerging or rising from the ground of direct, empirical experience. These theories ultimately lead to larger ranges of understanding, and the literature of grounded theory is rich in discussions of theory construction and theoretical sensitivity (Glaser 1978, 1992; Glaser and Strauss 1967; Strauss 1991; Strauss and Corbin 1990, 1994)

One of the deep problems in design research is the failure to engage in grounded theory, developing theory out of practice. Instead, many designers confuse practice with research.

Rather than developing theory from practice through articulation and inductive inquiry, some designers mistakenly argue that practice is research. From this, they claim that practice-based research is itself a form of theory construction.

Many of the problems in design research arise from category confusion.

One example of this is the confusion concerning tacit knowledge that emerged as designers became acquainted with the term articulated by Michael Polanyi (1966) in *The Tacit Dimension*. Once again, ignorance and the failure to read are at fault. Proposing tacit knowledge as the primary foundation of design research reflects a surface acquaintance with the concept of tacit knowledge, and it is generally put forward by people who have not read what Polanyi has to say about research.

Tacit knowledge is an important knowledge category. All professional practice – including the practice of research – rests on a rich stock of tacit knowledge. This stock consists of behavioural patterns and embodied practice embedded in personal action. Some aspects of tacit knowledge also involve facts and information committed to long-term memory. This includes ideas and information on which we draw without necessarily realizing that we do so. It also includes ideas and information that we can easily render explicit with a moment's thought, and it includes concepts, issues, ideas and information that we can only render explicit after deep reflection and serious work.

In social life and professional work, tacit knowledge is reflected in the larger body of distributed knowledge embedded in social memory and collective work practice. Our stock of tacit knowledge enables us to practise. Putting tacit knowledge to use in theory construction requires rendering tacit knowledge explicit through the process of knowledge conversion (Friedman 2001: 44; Nonaka and Takeuchi 1995: 59–73).

Tacit knowledge is necessary for human action. Without tacit knowledge, embodied and habitual, nothing human beings do would be possible. Every action would require explicit conceptualization and planning, and this would be the case every time we acted. The limits on immediate attention and cognition would make it impossible to store and act on enough knowledge for effective individual practice in any art or science, let alone accumulate the knowledge on which a field depends (Friedman 2001: 42–44; Friedman and Olaisen 1999: 16–22). All fields of practice rest, in part, on tacit knowledge (See, for example, Chaiklin and Lave 1993; Bourdieu 1977, 1990; Friedman 2001: 42–44).

To say that tacit knowledge is not research and that design theory is not identical with the tacit knowledge of design practice does not diminish the importance of tacit knowledge. It merely states that mistaken arguments about tacit knowledge as design knowledge demonstrates the fact that scholars who make such statements are confused.

Their confusion rests on a simple failing, the failure to read Polanyi. The notion that tacit knowledge and design knowledge are identical as sources of theory development is linked with the idea that practice is a research method. Both rest on category confusions and both arguments are generally supported by references to Michael Polanyi and Donald Schon by scholars who have not read the works they cite.

Polanyi himself settles any confusion on the matter at the beginning of another book, *Personal Knowledge*. Tacit knowledge is embodied and experiential. Theory requires more. Polanyi writes, 'It seems to me that we have sound reason for […] considering theoretical knowledge more objective than immediate experience. A theory is something other than myself. It may be set out on paper as a system, of rules, and it is the more truly a theory the more completely it can be put down in such terms' (Polanyi 1974: 4).

Polanyi's discussion (1974: 3–9) of the Copernican Revolution uses different language to state some of the significant themes that are seen in Varian (1997), Deming (1986, 1993), and McNeil (1993). These address such concepts as descriptive richness, theory as a guide to discovery and modelling. As a guide to theory construction, this is also linked to Herbert Blumer's idea of sensitizing concepts (Blumer 1969; see also Baugh 1990, van den Hoonard 1997). All of these possibilities require explicit knowledge, rendered articulate for shared communication and reflection.

One of the little-noted points in many design research debates is the fact that reflective practice itself rests on explicit knowledge rather than on tacit knowledge. While Schon's concept of reflective practice (1991: 5–11; see also Schon 1983, 1987) is not a method of theorizing, it does raise many questions on the kinds of thinking and reflection that contribute to effective practice in many fields. Central to most of these is the struggle of rendering tacit knowledge explicit in some way. While Argyris and Schon (1974: 9) suggest that there may be more possibilities for reflection than words alone, he clearly distinguishes between the epistemology of theoretical research and reflective inquiry.

Much of this confusion is linked to an ambiguous definition of design research that Christopher Frayling proposed in a 1993 paper. Frayling (1993) suggested that there are three models of design research: research into design, research by design and research for design. Frayling is unclear about what 'research by design' actually means and he seems never to have defined the term in an operational way. In a 1997 discussion (UK Council for Graduate Education 1997: 21), Frayling notes that it is 'distantly derived from Herbert Read's famous teaching through art and teaching to art'. This leads to serious conceptual problems.

Conceptual problems in an adapted idea
Sir Herbert Read's distinctions (1944, 1974) deal with education and with pedagogy, not with research. The failure to distinguish between pedagogy and research is a significant weak area in the argument for the concept of research by design. In addition to the difficulties this has caused in debates on the notion of the practice-based Ph.D., it also creates confusion for those who have come to believe that practice is research. The confusion rests, again, on a failure to read.

Frayling's proposal seems to have been an effort to establish possible new research categories. As an inquiry or probe, this is a worthy effort. The problem arises among those who mistake an intellectual probe with a statement of fact. To suggest that such a category is possible does not mean that it exists in reality. Dragons may exist, but we have no evidence that they do. Medieval mapmakers created great confusion and limited the growth of knowledge for many years by filling in the empty edges of their maps with such phrases as 'Here there be dragons' rather than admitting, 'We know nothing about what lies beyond this point.'

Beyond this arises the problem of what 'research by design' might mean. If such a category did exist – and it may not – the fact of an existing category would tell us nothing of its contents. Unlike dragons, we know that the planet Jupiter exists. Like the edges of the map, however, we know relatively little about conditions on the surface of the planet. Even though the laws of nature mean that some facts must be known – gravity and pressure, for example – these facts tell us little about the myriad realities that may play out depending on specific factors.

As a probe, Frayling's discussion was intended to open possibilities. Those who mistake it for a report mistake its potential value, the value of raising new thoughts as distinct from offering conclusions.

In the most important sense, Frayling misread Herbert Read by adapting the surface structure of Read's terms. As a result, he muddied the distinction implicit in Read's project. This is the fact that education can be developed though the direct practice of an art. This is the case in socialization and modelling, in guild training, and it is the basis of apprenticeship (Friedman 1997: 55, 61–65; Byrne and Sands 2002).

In many situations, education and learning proceed by practising an art or craft. While we learn the art and craft of research by practising research, we do not undertake research simply by practising the art or craft to which the research field is linked.

Research by design?

One of Frayling's three categories has been particularly problematic, the category of research by design. Around the time that Frayling published his 1993 paper, Nigel Cross wrote the first of two editorials in *Design Studies* on the theme of research by design.

In his first editorial, Cross (1993: 226–27) points out the distinctions between practice and research and the value of connecting research to teaching and to practice.

In his second editorial, Cross notes how little progress had been made in research by design over the two years between 1993 and 1995. He writes that part of the problem involves the claim that 'works of design are also works of research' (Cross 1995: 2).

Cross (1995: 3) states that the best examples of design research are purposive, inquisitive, informed, methodical and communicable. This requires articulation and shared knowledge within and across the field based on articulate communication of explicit knowledge. In 1999, Cross addressed this issue again in a debate on research methods in design.

Looking back over the failed efforts of the past decade to produce valid examples of research by design, Cross (1999: n.p.) wrote, '… as I said in my Editorial in 1995, I still haven't seen much strong evidence of the output from the "research for and through design" quarters. Less of the special pleading and more of the valid, demonstrable research output might help.' Nothing suggests that Cross has changed his mind on this.

The phrase 'research by design' is widely used, but it has not yet been defined. Instead, those who use the phrase have not bothered to read either Frayling's paper (1993) or Read's book (1944, 1974). Instead, they adopt a misunderstood term for its sound-bite quality, linking it to

an ill-defined series of notions that equate tacit knowledge with design knowledge, proposing tacit knowledge and design practice as a new form of theorizing.

These problems are relatively inconsequential outside our field. Nevertheless, it is important to understand them if we are to develop a foundation for theory construction in design research. This is why they require thought.

Experience and inquiry

Several issues here deserve further reflection. The first among these is that tacit knowledge is valuable. Tacit knowledge is central to all human activity, and the background of embodied individual and social knowledge provides the existential foundation of all activities, including intellectual inquiry. The problem I raise here is not an argument against the value of tacit knowledge. It is a statement that tacit knowledge and reflective practice are not the basis of research and theorizing. This is not to say, however, that there are no relations between those different categories of construct.

We see the distinctions here in the inability of ancient science to generate useful theory. Ancient science was hypothetical and deductive, but it offered no way to select among theories. While the river civilizations of Mesopotamia, Sumeria, Egypt and China made great advances in practical knowledge, administrative routine and professional practice in many fields, they had nothing in the way of scientific theory. Explanations were traditional and practical or mythic (Lloyd 1970: 1–23; Cromer 1993).

Thales proposed the first scientific theory when he suggested that the earth was once an ocean. While he could not test his theory, what made it scientific as contrasted with mythic was the fact that Thales proposed a natural explanation rather than a story of divine action.

Greek mathematics offered another foundation for science, and the Pythagoreans and Euclid built theories that are still used today. Again, however, there were no tests. Mathematical and geometrical theories are entirely axiomatic, and they can be tested by deduction and logic. While empirical inquiry found early champions in such medieval scholars as Robert Grosseteste and Roger Bacon, it was not until 1620 when Francis Bacon (1999, 2000) published *The New Organon* that anyone articulated a philosophy of science with its foundation in empirical observation. This philosophy followed the scientific success of observation linked with inventive theorizing in the great advances of Copernicus, Galileo, Newton and others.

The tradition of empirical inquiry lies beneath two great activities in design: design science and reflective practice. These meet in research traditions of many kinds, including those traditions anchored in social science and critical inquiry. Because it is not my purpose to describe a philosophy of science in this article, I will not explain how or why this is so, Neither will this article develop an argument for any specific research tradition or the kinds of theory construction on which a tradition must be established. I do point to the fact that explicit and articulate statements are the basis of all theoretical activities, all theorizing and all theory construction.

This is true of interpretive and hermeneutical traditions, psychological, historical and sociological traditions, as well as quantitative research in chemistry, descriptive biology or research engineering, logistics and axiomatic mathematics. While the languages differ from

tradition to tradition and field to field, only explicit articulation permits us to contrast theories and to share them. Only explicit articulation allows us to test, consider or reflect on the theories we develop. For this reason, the misguided effort to link the reflective practice of design to design knowledge, and the misguided effort to propose tacit knowledge or direct making as a method of theory construction are dead ends.

All knowledge, science and practice rely on rich cycles of knowledge management moving from tacit knowledge to explicit and back again. While the craft tradition of design has relied more on tacit knowledge than on explicit knowledge, it is time to consider the explicit ways in which we can build design theory. Without a body of theory-based knowledge, the design profession will not be prepared to meet the challenges that face designers in today's complex world.

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