International Association of Societies of
Design Research Conference 2019
DESIGN REVOLUTIONS

Manchester School of Art
Manchester Metropolitan University
02-05 September 2019

IASDR 2019

WHAT KIND OF RESEARCH IS RESEARCH THROUGH DESIGN?

Herriott, Richard*[a]

[a] Design School Kolding, Koldig, Denmark
* rhe@dskd.dk

This paper serves as an analysis and critique of research through design, asking whether research through design is actually different from existing methods of scientific research, which is the way it is portrayed. If it wasn´t different would this be a desirable or undesirable? Embedded in the concept of research through design is the idea that there is a "designerly way of knowing" that justified the use of the method as opposed to "standard" research methods. The paper asks if this assumption is on safe ground. The paper presents models of "standard" research in design (and examples) and research through design processes (and examples) and compares them to see what similarities and difference exist.

Keywords: research through design, research design

1   Introduction

Frayling (1995, in Grand and Jonas 2012) discusses the distinction between research into art and design, research through art and design and research for art and design. In recent years much work has been done using the RtD approach rather than pure research into design (see Gaver, 2012 for a guide). The question arises as to what precisely the distinction between "standard" research design and the novel RtD approach might amount to. This paper serves only as a start point in a critique of the RtD. This paper asks whether research through design is actually different from existing methods of scientific research, which is the way it is portrayed. If it wasn´t different would this be a desirable or undesirable? Embedded in the concept of research through design is the idea that there is a "designerly way of knowing" (Schoen, 1983) that justified the use of the method as opposed to standard research methods. The "designerly way of knowing" implies a difference in how something is known that comes from finding out about it in a certain ("designerly") way. The paper asks if this assumption is justified.

This paper was inspired by PhD courses at the Aarhus School of Architecture given in 2017 and 2018 on research design for research through design. First it was asked what research design is? "… Research design is the logic that links the data to be collected and the conclusions to be drawn to the initial questions of a study" (Yin, 1994). The tutor (the author)

presented a lecture which suggested case study research was an appropriate model for research through design, drawing upon Yin´s (1994) methodology. The students themselves had identified their work as falling into the RtD class which is why had signed up for the course. It became apparent that only half of the students would find Yin´s approach useful for their PhD research. The others had projects where it was clear other methodologies applied for the purpose of extracting communicable knowledge from their experiments. Those methods were broadly ethnography, interviews, documentary analysis and photographic evidence. As a whole, the projects could be treated using any of the existing methods of analysing the data rather than a specifically RtD approach.

If the research procedures fell into the existing categories, on what basis was it correct to identify research through design as something distinct from research in design with which it is commonly contrasted?

2. Research

Before moving on, let us consider research in general. Research can be understood as systematic enquiry into X to discover communicable knowledge (modified from Frayling, 1993). After Archer (1995), research is systematic because it is pursued according to "some plan"; is an inquiry because it seeks to answer some question; is goal-directed because its objects of inquiry are defined by the task description; and is knowledge-directed and, finally, research must be *communicable* so the findings must be intelligible. Knowledge can be defined as justified, true belief. Of that trio, the word "justified" is the most pertinent. It means the findings must have a basis that can be objectively demonstrated. The point then of design research is to study "design" and to communicate that knowledge, to communicate the findings.

The kind of research done can be categorised. Archer (1995) breaks research down into five groups, but in practice, any research may contain elements of more than one category in that a sub-project in one category might support a bigger goal in another category.

- Fundamental research: systematic inquiry directed towards the acquisition of new knowledge, without any particular useful application in view.

- Strategic research: systematic inquiry calculated to fill gaps in fundamental research and/or to narrow gaps between fundamental research and possible useful applications.

- Applied research: systematic inquiry directed towards the acquisition, conversion, or extension of knowledge for use in particular applications.

- Action research: systematic investigation through practical action, calculated to devise or test new information, ideas, forms or procedures and to produce communicable knowledge.

- Option research: systematic inquiry directed towards the acquisition of information calculated to provide grounds for decision or action.

Turning to the nature of the output, the knowledge takes the form of theory which is useful if it has general applicability and predictive power. Typically design theories are an amalgam of descriptive, descriptive and prescriptive (Vermaas, 2010). Theories can 1) describe design practice such as structure, actions, reasoning and (2) then prescribe these for future practice. Alternatively, theories in prescribing design practice are also demarcating design from non-design (the debate on science versus design is an example). Finally, prescriptive design theory becomes descriptive when a tool, for example, is adopted and described.

So, theory-building is an important aspect of any research. Out of the work comes theory which then can be used to alter courses of action in the future. But, according to Zimmerman et al (2010) theory-building is the weak aspect of research through design. Nonetheless RtD is a method that is used increasingly both inside design, architectural- and engineering-design research (ibid. p.310; Verbeke & Pak, 2013).

It is useful now to present a description of RtD. There are a number of ways to introduce research through design. It is a "research approach that employs methods and processes from design practice as a legitimate method of inquiry" and "where the knowledge gained can be implicit, residing almost entirely in within the resulting artefact" (ibid). Buchanan (1999) provides an historical context, seeing practice-based research as a way to draw into the academy the knowledge-finding approach that was once ignored as merely artisan. See Fig. 1 (below) for a schematic representation of the division in arts research.

Research through design is seen as an attempt to re-value practice. Archer (Grand and Jonas, 2012: 109-122) distinguishes first between research in the science tradition and research through practitioner action. Science research (general, universal) and practice (particular) are often seen as distinct: "We understand practice as something that belongs to and is determined by a specific context while theory is performed by moving away from a particular context in order to reflect upon it from a more neutral or objective point of view" (Friberg, 2010, p.19). RtD can be understood as a means to re-link theory and practice.

Nowotny et al (2010) propose a sociological interpretation on why design research might take a turn towards practice. They propose that there is operating what they term Second Modernity in which the "weakly contextualised, autonomous science" is supplanted (or joined by) strongly contextualised research that participates in society". In place of reliable knowledge, the aim is to create socially robust knowledge.
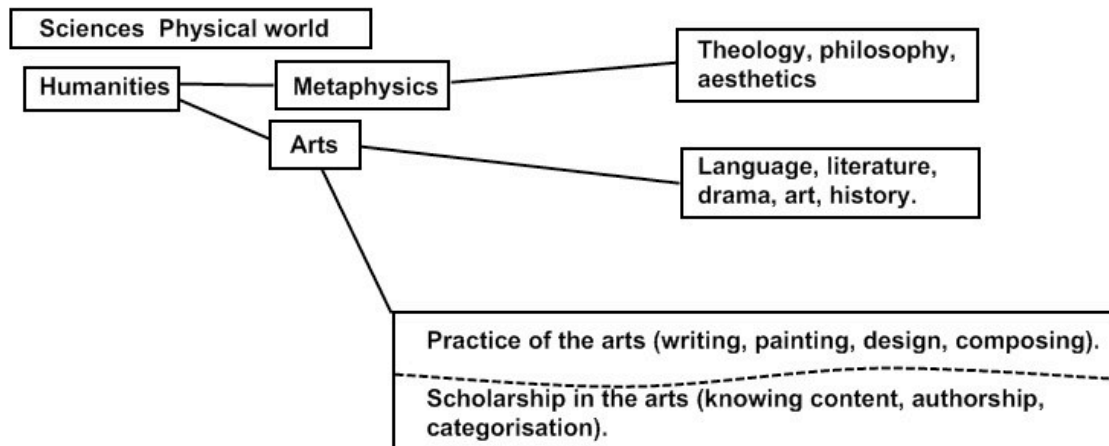
Figure 1. Arts and Sciences (based on Buchanan, 1999).

Research through design frames "the possibility of design being done on the basis of design practice i.e. by artistically/creatively making objects, interventions, processes etc. in order to gain knowledge". (Bang et al. 2012). Practice-based research strategies, as RtD may be also called, are generally concerned with advancing practice and the nature of practice, coming from Schoen´s (1983) understanding of the reflective practitioner and include the practitioner´s strategies such as reflection in action, participant research and action research (Amacker, 2017). "RtD offers several distinct advantages (...) allows researchers to rely on designerly activities as a way of approaching messy situations with unclear or even conflicting agendas; situations that are not suited to other methods of inquiry." (Zimmerman et al. 2010, p.310.) "There are circumstances when the best or only way to shed light on a proposition, a principle or material, a process or a function is to attempt to construct something, or enact something or test it" (Archer, 1995, p.118). That formula may sound familiar.
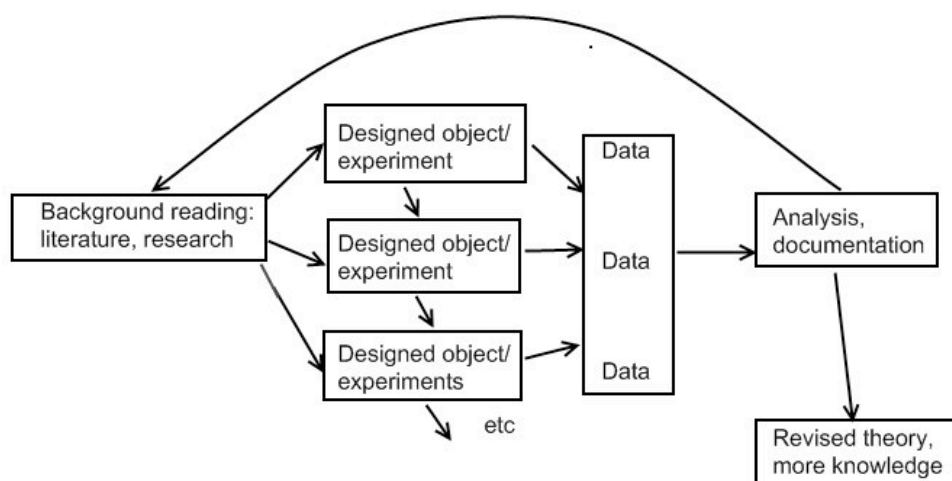

Figure 2. How research through design might work.

"Why is PBR (or RtD) not disqualified as a research model when it entails researching a process the researcher is a part of?" asks Friberg, (2010 p.20). The short answer proposed

is that in other research the researcher is *also* involved: a scientist or sociologist is part of the arrangement. In RtD this involvement is, however, explicit. Friberg disputes the classical distinction of "traditional research" against which non-traditional research through design might be opposed. He argues that what is called traditional research cannot be clearly demarcated. Rather there is "a complex and extensive field of different research practices" (ibid). Further, the matter of context dependency is discussed within the natural sciences (the typical model opposed to design research) by Kuhn (1970) Feyerabend (1975) and Latour (2003). Friberg makes the point that "knowledge of laws (theories) is not merely to know formulations thereof but also to understand their practice. Each form of knowledge is performed in their specific practice." (Friberg 2010, p.28). For this to happen, one must stand outside "design" in order to attain an objective view of it. That being the case, research through design is an example of using X to study X. The designer engages in design activities and then reports on the discoveries.

3. Science and Design

In order to assess what kind of research through design is, it is helpful to recall some distinction. Cross (2001) makes these. (1) Scientific design "refers to modern industrial design … based on intuitive and non-intuitive design methods." As Cross says, this is probably not a controversial concept. It is how design is taught in design schools and involves an understanding or where art and science meet in solving design problems. (2) Design science can be explained and dispensed with relatively easily. This emerged from a belief in the universal application of natural science approaches to create a standard design method. Hard systems or positivist approaches (Broadbent, 2003) fall into this category. If it has any application it is in the solution of what Rittel and Webber (1973) call "tame problems" and quite possibly involves little aesthetic content. The design science approach entailed some methodological improvements such as making design more impersonal and objective. It neglected the psychosocial aspects of solving problems. What is of interest here is the (3) the science of design. Cross writes that design is the subject of scientific investigation or "research" which was described above as "as systematic enquiry into X to discover communicable knowledge". Up until the introduction of the concept of research through design, such scientific investigation broadly used a variety of methods to observe and analyse the activities (what they did) and outputs of designers (what they made). It is what Cross calls "that body of work which to attempts to improve our understanding of design through scientific (i.e. systematic and reliable) methods of investigation" (Cross 2001, p.54). These studies fall into two classes, the quantitative and the qualitative. Examples of quantitative work might be a lab study of consumer responses (e.g. Hagtvedt and Patrick, 2014); a consumer study (e.g. Shih-Wen et al. 2008) or a study of the effects of styling and functionality (e.g. Sonderegger and Sauer, 2010). In these cases, the researchers looked into consumer responses and used statistical methods to analyse the results. The type of work termed qualitative (or "semi-qualitative") is where the design process is studied in a retrospective fashion via interviews and documentation of the design process e.g. Loureiro et al (2010) or Daly et al (2012).

Schoen (1983) criticised the positivist philosophy which supports the design science movement and Galle (2014) provides a review of further arguments for why design is not the same as science and continues the argument. Archer (1995) and Frayling (1993) explain how practitioner research was sidelined. Nowotny (2010) explained the sociological rationale for this shift in attitude to the science of design. Following this argument, it is proposed that research in design can be carried out through design: design activity by the researcher is used a means to study the nature of design. That leads to a question of epistemology, how we know what we know. Schoen proposes an epistemology of practice, "based on the reflective practice of design". What is worth focusing on is the way Schoen elides *what* can be known about design with *how* it is known. It is argued that knowledge "inherent" in artefacts is one type of design knowledge and there is knowledge "inherent in processes of manufacture" as well. Schoen writes of a "designerly way of knowing".

In response to those arguments, one must note that knowledge exists in a mind and not in an entity (a text is a representation of knowledge). Second, though each discipline has specific technical knowledge, this is not the same as a basic epistemological difference. Does it make sense to talk of a sociological way of knowing? Perhaps Schoen means a designerly way of finding out. Third, the "epistemology of practice implicit in the artistic, intuitive processes" (Schoen, 1983) of design is a concept that runs into the problem that knowledge must be communicable to count as such. The "implicit" is precisely where the focus of design research is. The implicit must be made explicit which brings us back again to the question of how to do so.

This section ends with the summary that even if designers have specialist knowledge they do not know things in a way that is distinct from any other rational person´s way of knowing. To the extent that designers do know things with confidence it is due to their paraphrasing of the science method of making observations and checking hypotheses.

4. Standard research-in-design process

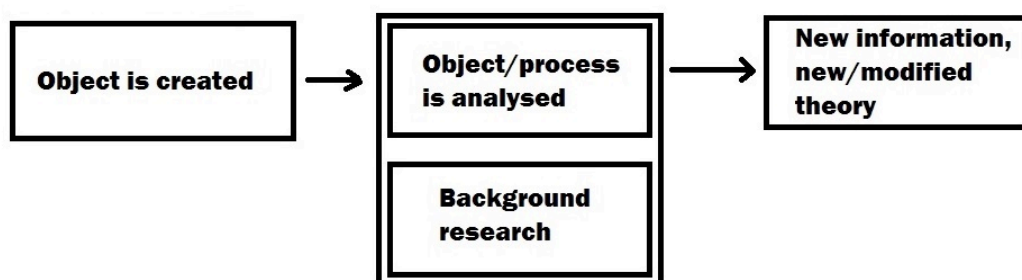Below is a diagram showing a simplified standard process how research in design might be conducted (Fig. 3):

Figure 3.Simplified research into design process "A".

In this model, "A"; at some point in time an object is created, the result of a design process. The design researcher begins their research at some time after the object is made which leads to a research question. That leads them to wish to investigate an appropriate subject.

From all pre-existing subjects, they select an object, a class of objects or a process (or a combination). That study, which may be quantitative and/or qualitative, leads to new information on the object and its design process. On the basis of resultant findings, theory is modified or new theory proposed.

Another version of the standard research in design process looks like this (Fig. 4)
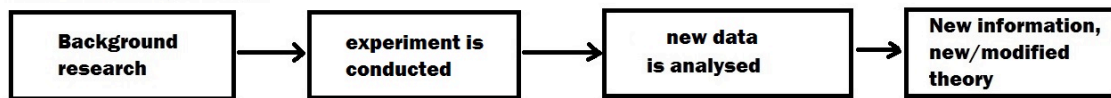

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Figure 4. Simplified research into design process "B".

In this example, "B", background research is conducted that leads to a research question. An experiment is conducted which leads to the generation of data. Analysis of the results leads the relevant theory is modified or revised. The quantitative studies cited above in Section 3 would be examples of this kind of research. A hypothetical example might be work in visual cognition leading to experiments looking at user interfaces. That might involve models being made of different interfaces for, say, a coffee automat.

Now, a model for research through design. Putting it in very plain terms, research through design attempts to discover knowledge by doing design work. What would be an example of research by design? Liekens (2013) constructed architectural "machines" to allow for communal cooking; Schoffelsen et al. (2013) studied "playful design representations". Koskinen (2011, p.5) cites the example of the iFloor, "an interactive floor built between 2002 and 2004 in Aarhus, Denmark…It was a design research project with participants from architecture, design and computer science… The aim of the floor was to bring interaction back to the library" (ibid, p.1). Two PhD theses emerged from the work on the floor. "It was this theoretical work that turned the iFloor from a design exercise into research that produced knowledge that can be applied elsewhere" (ibid. p.2). The researchers constructed an object and made new discoveries. Koskinen notes that a slide show or CAD model would not have had the same effect. So, for Koskinen, the difference between standard design research and this example is that the researchers *made an object*. There is no point where this explanation of the activity can be faulted. Generally, then research through design work as show in in Figure 5 below:
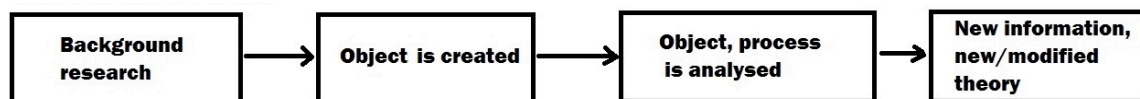

Figure 5. Simplified research through design process...

It is important to note that much useful design research (science of design) is done during each phase represented in the flow diagram in Figure 5. The background research involves defining the state of the art and formulating a research question. The designed object/s e.g. the iFloor produce/s data which is both quantitative and qualitative. This then leads to new

theory or a modification of theory. The part of the research through design method that is said to be novel is the creation or design of the experimental objects. However, if we compare Figure 5 to Figure 4 they are similar. Essentially, the design part of research through design is equivalent to conducting an experiment to test a hypothesis. A criticism of this comparison is that it is based on the author´s own definitions of what research in design is and how research through design is conducted. The defence to this critique is that that there aren´t other conceivable models for conducting a systematic enquiry into X to discover communicable knowledge about it. Any variation in the structure of the diagram shown in 4 involves adding more experiments or repeating the process until a result is arrived at. The comparison of Figure 4 and 5 shows that research through design is analogous to experimental science. Design research can follow only two principle paths:

- Abstract research – reading and analysing written texts about design research etc.

- Concrete research – a) studying a pre-existing designed thing or 2) conducting an experiment.

Both research through design and research in design make objects/processes their object of study. The only difference is that in the case of research through design the object is made for the purpose. Research in design selects objects and the associated processes from ones made by someone else. After that the methods for observation and analysing them are the same: quantitative and qualitative research techniques. In another similarity, both research in design and research through design conduct experiments. A researcher in design might conduct a laboratory experiment to study the response of subjects to variables (e.g. colour preferences or ergonomic studies). A researcher through design creates an experimental object. Both are artificial situations.

It is also apparent that research through design is analogous to experimental research in natural sciences or social sciences (or is a hybrid of both). In both cases, a reading of the background theory leads to a research question which is testable by experiment. The difference lies in the extent of and effect of the designer/researcher´s role in the design work.

5. Conclusion

This paper is focused on research methods: what you do and how you are sure of what you find. Based on the foregoing, it transpires that from a methodological point of view research through design is on precisely the same safe ground as any other form of concrete research into non-metaphysical matters. That is, so long as it conforms to the goals of being a systematic enquiry to discover communicable knowledge. As Friberg (2010) points out, it is not disqualifying that the researcher is part of the system being studied. Research through design is part of a well-established tradition in science of using an experiment of some type to test a hypothesis about X. This procedure is, after all, exactly what practicing designers do too: make some observations about the world, make a hypothesis that the user needs object X and then test the hypothesis by making a prototype of X.

It was pointed about one of this paper´s reviewers that Gaver (2011) had to some extent addressed the matter of what we should expect from RtD. Gaver concluded "that research through design is likely to produce theories that are provisional, contingent, and aspirational". Having made the argument in the previous sections that the knowledge itself is much the

same as if gained from "standard research", the kind of theoretical output will also be much the same. And indeed, since according to standard science theory, a theory is indeed provisional anyway, Gaver´s (2012) conclusions are not decisive in determining what it is that distinguishes RtD from standard design research.

In section 1 it was asked whether research through design was unlike "normal" design research and if it wasn´t would this be a desirable or undesirable? The answer suggested here is that research through design is not unlike normal design research and that this is not an undesirable outcome.

Perhaps if there is some confusion in what research through design is, it is to mistake the design of an experimental object for a new way of doing research. But the counter-argument is that research through design might be a test of the new design process that leads to a new object. In which case the *process* is the object of study and not the resultant new product. Again, research in design has also studied design processes so process study is not unique or exclusive to research through design. Research through design is possibly about the process and the type of object produced. Again, research in design does this too: a study of Inclusive Design would be interested in the way (means, process) to achieve an Inclusively Design object (end, product).

That leaves the matter of epistemology or how you know things: the "designerly ways of knowing". It is argued that in designing a new object to test a theory the designer can discover new knowledge through a process unique to the profession. As this paper shows there are a finite number of ways of knowing even if there is an infinite number of things to know. We are interested in the science of design and not whether designers are like scientists. In that sense, it does not matter if the researcher is a designer or not. Once the designer has created the new object (e.g. an iFloor) they still have to switch hats, so speak, and observe and report as a form of scientist. They make accurate observations, record the data, analyse it and then propose what are hopefully falsifiable claims about the world e.g. a particular way of designing will achieve particular results.

Designers have no other special access to reliable knowledge or justified, true belief. Schoen and others are not making a metaphysical claim about designers' insights. So it is perhaps at best a claim about tacit knowledge. Unless tacit knowledge is elevated to the same level as explicit or communicable knowledge, the idea that there is a designerly way of knowing is either an unsupported or a weak claim.

2   References

Amacker, A. (2017) Embodying openness. Ph.D. submission. University of Gothenburg.

Archer, B (1995) The nature of research. In Grand, S., Jonas, W (eds.) (2012) (eds.) Mapping Design Research. Birkhauser, Basel.

Bang, A.L., Krogh., P., Ludwigsen, M., Markussen, T., (2012) The role of hypothesis in constructive design research. Proceedings of the art of research IV Online.

Cross, N (2001) Designerly ways of knowing: design discipline versus design science. Design Issues Vol 17, No. 3. pp 49-55. DOI: 10.1162/074793601750357196

Daly, S.R., Adams, R.S., Bodner, G.M. (2012) What does it mean to design? A qualitative investigation of design professionals´experiences. Journal of Engineering Education, Vol 101, Issue 2. pp 187-219. DOI 10.1002/j.2168-9830.2012. tb00048.x

Frayling, C. (1993) Research in art and design. In: Grand, S., Jonas, W. (eds.) (2013) Mapping design research. Birkahuser, Basel.

Feyerabend, P. (1975) Against method, Verso, London/NY.

Friberg, C. (2010) Moving into the field of the unknown. In Friberg, C et al (eds.) At the intersection between art and research. NSU Press, Malmo.

Galle, P (2014) Science and design: identical twins? Design Studies 35 (201-231) DOI: 1016/j.destud:2013.12.002.

Gaver, W. (2012) What should we expect from research through design?
CHI '12 Proceedings of the SIGCHI Conference on Human Factors in Computing Systems Pages 937-946

Grand, S., Jonas, W. (eds.) (2012) Mapping design research. Birkahuser, Basel.

Hagtvedt, H., Patrick, V. (2014) Consumer Product Response to Overstyling: Balancing Aesthetics and Functionality in Product Design. Psychology and marketing, Vol 31 (7), 518-525. DOI: 10.1002/mar.20713.

Koskinen, I., Zimmerman, J., Redstrom, J., Wensween, S. (2011) Design Research Through Practice. Morgan Kaufman, Waltham MA.

Kuhn, T (1970) The structure of scientific revolutions. Univeristy of Chicago Press, Chicago.

Latour, B. (2003) Science in action. How to follow scientists and engineers through society. Harvard University Press, Cambridge, MA.

Loureiro, R.C.V., Valentine, D, Lamperd B., Collin, C., Harwin, W.S. (2010) Gaming and social interactions in the rehabilitation of brain injuries: a pilot study with the Nintendo Wii Console. In Langdon, P., Clarkson. P.J., Robinson, P. (eds.) Designing Inclusive Interactions. Springer, London.

Nowotny, H., Scott, P., Gibbons, M. (2008) Re-thinking science. Knowledge and the public in an age of uncertainty. Polity, London.

Rittel, H., Webber, M. (1973) Dilemmas in a general theory of planning. Policy Sciences 4, 155-169. https://doi.org/10.1007/BF01405730.

Schoen, D.A. (1987) Educating the reflective practitioner. Jossey-Bass, San Francisco.

Shih-Wen, H., Fu-Yuan, C., Chong, S.C. (2008) Applying aesthetic measurement to product design. International Journal of Industrial Ergonomics 38, 910-920. 10.1016/j.ergon.2008.02.009

Sonderegger, A., Sauer, J. (2010) The influence of design aesthetics in usability testing: Effects on user performance and perceived usability. Applied Ergonomics 41 (2010) 403–410. DOI: 10.1016/j.apergo.2009.09.002

Verbeke, J., Pak, B (eds.) (2013) Knowing by Designing. KU Leuven, Leuven.

Vermas, P (2014) Design theories, models and their testing: On the scientific status of design research. In Chakrabarti, A. Blessing, L.TM. (eds.) An anthology of theories and models in design. Springer, London.

Yin, R (1994) Case study research. Sage, London.

Zimmerman, J., Stolterman, E., Forlizzi, J., (2010) An analysis and critique of research through design: towards a formalisation of research approach. DIS 2010, August 16-20, Aarhus, Denmark.DOI:10.1145/1858171.1858228.

About the Authors:

Richard Herriott is Associate Professor of Industrial Design at the Design School with an interest in participatory design, design theory, science of design, anchovies, aesthetics and Inclusive Design.