



說明：本試題共有四大題，請依序並標明題號，詳答於答案卷上，可以不用抄題。  
可以中文或英文作答。

一、請解釋下列名詞在設計研究方法上的意義：(25%)

- (1) literature review
- (2) sampling
- (3) observation
- (4) historical method
- (5) textual analysis

二、設計領域(工業設計、視覺傳達設計、空間設計、數位媒體設計...)常常需要將設計階段已發展之構想進行評估，且需要將衡量構想優劣之抽象內涵，轉化成可以量化之尺標，於是構想評估量表製作，就成為研究設計中重要的一環。請說明：

- (1) 你發展(設計)一個評估設計構想之量表時，會採用之研究方法？以及如何採用此類研究方法建構其評估量表？(10%)
- (2) 你會用什麼統計分析技術，來確認所發展之評估量表，適合用來評估設計構想？(10%)
- (3) 你如何應用已發展完成之評估量表進行設計構想評估工作？請你自設一個案例依序說明之(5%)。

三、一般命題的構成要素包含有構念與關係，請問何謂構念？(5%) 若以「創造力」為例，則其概念型 (constitutive) 定義可為何？(10%)，且其操作型 (operational) 定義又可為何？(10%)



四、在設計的量化研究方法中，SPSS 套裝分析軟體常被研究者使用，其中「描述性統計量」(Descriptive)經常被研究者使用作為研究結果的呈現，下表為一描述統計量結果摘要表，請參考表格回答下列問題。

Creative	N	M	S.D	Min	Max
VCDesign	50	4.62	1.04	1.0	7.0
IDesign	46	4.85	.87	1.0	7.0
SDesign	52	4.50	1.26	1.0	7.0

- (1) 由上述描述性統計結果推斷，這會是一項針對什麼主題的研究與內容(請以 30 字以上說明之)? (7%)
- (2) 由上述描述性統計量結果推斷，這是用哪一種測量工具調查? (5%)
- (3) 表格中的「M」列代表什麼意思? (3%)
- (4) 受調查者是什麼類型? 每一類型的人數為何? (5%)
- (5) 上述哪一類別的受測者對事情的看法較一致? (5%)



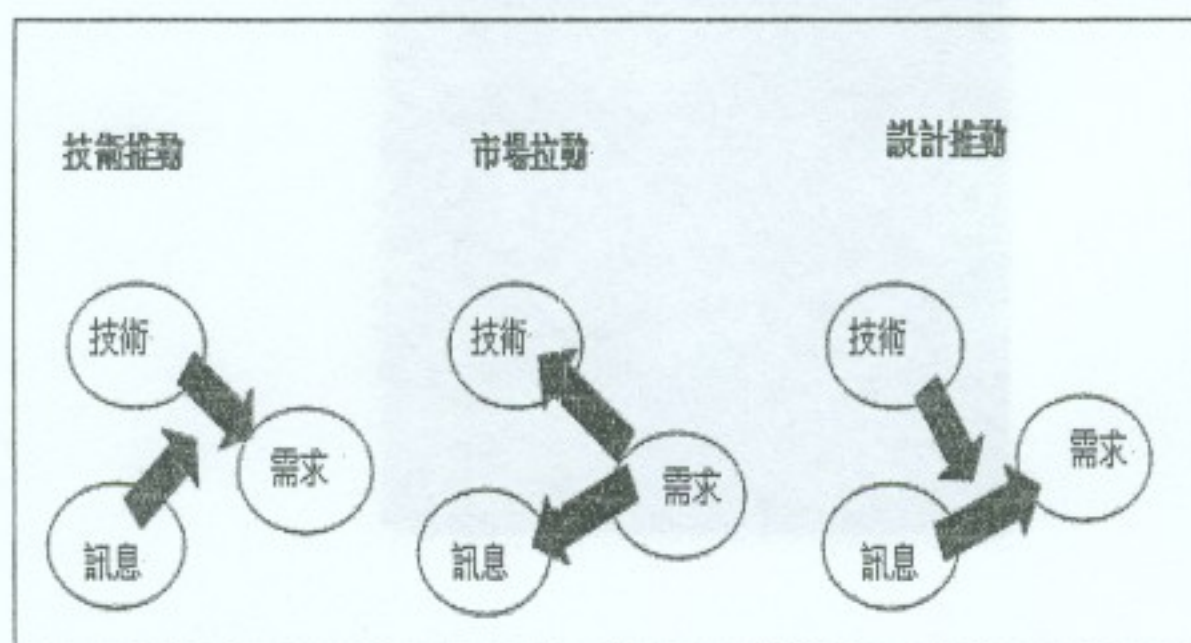


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可以中文或英文作答。

一、請依序回答下列問題：

- (1) 何謂「後現代理論」？(10%)
- (2) 請從建築設計、室內設計、空間設計、工業設計、視覺傳達設計、商業設計、數位媒體設計 (digital media design) 或設計運算 (computational design) 等設計領域中，擇一說明「後現代理論」對該設計領域的影響為何？(15%)

二、Roberto(2003)將企業創新區分為以下三種，(1)技術推動模式(Technology push)、(2)市場拉動模式(Market pull)與(3)設計推動模式(Design push)，技術、訊息及需求之關連性如下圖所示。請你提出如何運用 Roberto 的「技術推動型」、「市場拉動型」以及「設計推動型」三種模式，將文化創意產業的設計創新工作予以區分，並各以一案例說明之。(25%)



企業創新模式圖(Roberto, 2003)

三、請以中文說明下列文獻之要義，並提出你對於作者所言之論點。(25%)

How do designers actually work for business organizations that previously may have neglected to cater to their design issues? A plethora of specialist designers has emerged and they currently are offering their productive services in multiple ways to business firms and other organizations that still tend to be partly ignorant of design approaches and expertise. The relatively young profession of modern "industrial design" is a case in point because industrial designers commonly offer their productive services to managers, who often are unfamiliar with their specialism. The highly experienced, Milan-based, German industrial designer Richard Sapper, working for IBM and several



other companies, recently claimed: "Today, in many corporations, design decisions are in the hands of people without the slightest knowledge of the subject, asking consumers what they want."

Rather than predicting the need of more knowledge or organizational "absorptive capacity" on the one hand, or "survival of the fittest" designers in competitive markets on the other, we need to zoom in on *living-work relationships* between designers and organizational people to understand their interacting abilities and "lifeworlds" while working together. When I started to explore how designers actually work with firms and vice versa, I therefore chose this route—as an industrial organization researcher—approaching the field of design-business collaboration in a fairly open manner to see how it occurs. As I became increasingly aware of the complexities and unconsciousness of design issues in many organized settings, one nagging question emerged as potentially significant: How might dynamic capabilities in designing repeatedly be *enabled* in connection with organizations when organized agents were working, often temporarily, with designers? This seemed almost paradoxical; how to stabilize something that seemed to be in constant flux?

Instead of examining designing from a control-oriented or instrumental view, which has dominated many product development textbooks and early design management literature, I adopted a phenomenologically inspired approach<sup>10</sup> to understand rather than prescribe, but I do not confine my focus to the everyday routine. Design work seems to encompass more than business-as-usual, especially when we zoom in on new approaches, relationships, and innovating efforts between designers and organizations. No doubt, the design-business relationships are moving targets, but can some reoccurring practices be found? While exploring how designers work with manufacturers, I noticed that designers as well as business people with various disciplinary backgrounds may become highly involved in a wide range of activities connected to design conceptualizing, projecting, and working closely together in order to achieve "something more." Interestingly, design collaboration towards new solutions seems to offer formative experiences<sup>11</sup> and even self-transcending reflections. Although design expressions are embraced as a vital force in designing, we still do not fully understand their potential, for example, for organizations.

This article, therefore, specifically explores the design-innovating activities that seem to flow richly between designers and organizations, and which constitute constructive circles, as well as beyond organizational borders. Design activities—since living workrelationships in business are not merely about products—identities, man-machine interfaces, networks, or projects. Design-in-business may be all this, but it is going on more between designers and their collaborators when they are designing creatively "in the mess." I use this phrase to refer to conceiving and constructing something with others in the "real world"—typically messy—design-business situations attempting to capture more of the complexities and imaginative human actions involved. I find it of particular interest that designing in the mess seems to become a highly activity-based life—*vita activa*—between people and situated things, which may evoke emotions, but also tensions and mixed-motive interests. As suggested by designer Richard Sapper:

With a brilliant idea, you can solve a problem but you have to refine it to make it practical. You make a sketch or model to give form to the idea, but it doesn't come alive until it is injected into the larger world of a company or factory. Many other people have to have a dialogue with you and make a product out of it. As a result, the model changes—sometimes for the worse, sometimes for the better.



What, then, does it mean to work in concert with business organizations attempting to make something “for the better”? IBM’s Thomas Watson, Jr. often is cited from his reflection that “good design is good business,” while British design pioneer James Pilditch always stressed: “See good design and you see a good client,” but what is actually a “good client,” or better, a mutually leveraging design-client relationship? How does this collaborative, often highly secret, process take place? Insofar as talented designers *work* with others—whether in repeat client organizations or collaborating on a more short-term basis across a variety of contexts—their work probably would rarely adhere to idealized paradigms of the individual designer-creator on the one hand, or the anonymous “cog in the wheel” work of inside design-and-development staff on the other. The machine metaphor for designing in highly structured linear ways, progressing harmoniously from clear goals and specifications towards expected outcomes, does not seem appropriate for what is going on between designers and their clients, although I discovered that industrial design students may be enthusiastic about more “ordered” processes. In practice, however, real-world design challenges tend to be regarded as fascinating but “messy”—i.e., difficult to deal with, and full of awkward complications, fragmentation, and unexpected fluctuations, according to first-hand participants who still seek to bring the benefits of more competent design to a variety of stakeholders.

To understand designing in the postmodern society, I believe that we need to open up to the various ways of designing constructively “in the mess”—rather than using the lens of linear order or harmonious compromise—to capture how designers actually are cooperating with business organizations and beyond. A decade ago—before much of the current knowledge-management obsession came about in parts of academia and the consultancy industry—Paul Rand, a pioneering graphic designer, pointed out that “There is no set body of knowledge that must be mastered by the practitioners. What the designer and the client have in common is a license to practice without a license.” And yet his graphic design work for IBM suggests that design issues may become, at least temporarily, cultivated and retained in meaningful ways through connecting and synthesizing design-business work. In short, it is feasible to make design significant in the organizational context over time and space, but little is known about how designers work with their common collaborators, such as business firms.

Grounded in my fieldwork tracing ongoing collaboration between exemplary firms and designers, I could identify a wide range of design activities—I propose at least seven—feeding into the reoccurring collaborative circles unfolding through design-business relationships. As one key informant proposed: “What is really important is that the parties actually collaborate, that is, work together.” I noticed that collaborative relations also might encompass (partly) autonomous design efforts distributed not merely in the organization, but beyond its borders. Bearing this in mind, my point in this article is not the classification of activities, dividing these into fixed categories or discrete topics. Rather, I wish to open a window allowing access to how designers work with organizations and beyond, including appreciating what actually enables more constructive designing, even “in the mess.”

四、依據下列文章內容，請先回答設計研究領域可分成哪些種類，然後再針對每一種類各舉出一個實例進行詳細說明？(25%)



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## Design Research: A Disciplined Conversation

Nigel Cross

Design research is alive and well, and living in an increasing number of places. I find encouraging evidence for this in the growth of research-based journals in the design world over the last ten to fifteen years. For example, *Design Studies* was launched in 1979; *Design Issues* first appeared in 1984; the *Journal of Design History* in 1988; *Research in Engineering Design* in 1989; and *Languages of Design* in 1992. These are not the only ones; and there have been others, of course, in other languages, such as *Temes de Disseny* (Catalan and Spanish), 1986; *Revue Sciences et Techniques de la Conception* (French), 1992; *FormDiskurs* (German), 1996.

There has also been a lot of design-oriented research reported in a wide range of journals concerned with artificial intelligence, human-computer interaction, and so on. Compared with the academic design scene in the 1970s, we now have a rich culture in which to grow our design research seedlings.

Each of these design research journals draws upon scholarship paradigms from the sciences or the arts. A history-based journal such as *Journal of Design History* clearly draws upon paradigms of scholarship in the arts and humanities, and an engineering-based journal such as *Research in Engineering Design* leans heavily on the research paradigm of the natural sciences. But the important thing is that collectively we have the possibility of adding to these other paradigms and of developing our own design research culture.

At the *Design: Science: Method* conference of the Design Research Society, in 1980, Bruce Archer gave a general definition of research, which is that "Research is systematic inquiry, the goal of which is knowledge."<sup>1</sup> Our concern in design research has to be the development, articulation and communication of *design knowledge*. Our axiom has to be that there are forms of knowledge peculiar to the awareness and ability of a designer, just as the other intellectual cultures in the sciences and the arts concentrate on the forms of knowledge peculiar to the scientist or the artist.

Where do we look for this knowledge? I believe that it has three sources: people, processes and products.

Design knowledge resides firstly in *people*: in designers especially, but also in everyone to some extent. Designing is a natural human ability. Other animals do not do it, and machines (so far) do not do it. We often overlook the fact that people are naturally very good at design. We should not underplay our abilities as designers, many of the most valued achievements of humankind are works of

<sup>1</sup> B. Archer, "A View of the Nature of Design Research" in R. Jacques and J. Powell, eds., *Design: Science: Method*, (Guildford, UK: Westbury House/IPC Science and Technology Press, 1981)



design, including anonymous, vernacular design as well as the "high design" of professionals.

One immediate subject of design research, therefore, is the investigation of this human ability—of how people design. This suggests, for example, empirical studies of designer behavior, but it also includes theoretical deliberation and reflection on the nature of design ability. It also relates strongly to considerations of how people learn to design, to studies of the development of design ability in individuals and how that development might best be nurtured in design education.

Design knowledge resides secondly in its *processes*: in the tactics and strategies of designing. A major area of design research is methodology: the study of the processes of design, and the development and application of techniques which aid the designer. Much of this research revolves around the study of modeling for design purposes. Traditional models are the sketches and drawings of proposed design solutions, which in contemporary terms now extend to "virtual reality" models. The use of computers has stimulated a wealth of research into design processes; so has the development of new practices in industry such as concurrent engineering.

Thirdly, we cannot forget that design knowledge resides in *products* themselves: in the forms and materials and finishes which embody design attributes. Much everyday design work entails the use of precedents or previous exemplars—not because of laziness by the designer but because the exemplars actually contain knowledge of what the product should be. This is certainly true in craft-based design: traditional crafts are based on the knowledge implicit within the object itself of how best to shape, make, and use it. This is why craft-made products are usually copied very literally from one example to the next, from one generation to the next.

As with the design knowledge that resides in people, we would be foolish to disregard or overlook this informal product knowledge simply because it has not been made explicit yet; that is a task for design research. So too, is the development of more formal knowledge of shape and configuration, the theoretical studies of design morphology. These may be concerned as much with the semantics as with the syntax of form, or may be concerned with prosaic matters of efficiency and economy, or with relationships between form and context—whether ergonomics or environment.

My own taxonomy of the field of design research would therefore fall into three main categories, based on people, process and products:

- design epistemology  
—study of designerly ways of knowing
- design praxiology  
—study of the practices and processes of design
- design phenomenology  
—study of the form and configuration of artifacts.



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What clearly has been happening in the field of design research in the last decade or so is that there has been a growing awareness of the intrinsic strengths and appropriateness of design thinking within its own context. There has been a growing acceptance of design on its own terms, a growing acknowledgment and articulation of design as a discipline in its own right. We have come to realize that we do not have to turn design into an imitation of science, nor do we have to treat design as a mysterious, ineffable art. We recognize that design has its own distinct intellectual culture; its own designerly "things to know, ways of knowing them, and ways of finding out about them."

This view of design as a distinct culture is also embodied in attempts to break away from C. P. Snow's "two cultures" view of Western intellectual tradition, the two cultures of the Arts and Sciences. It has to be recognized that there is at least one other culture, which we might regard as the culture of Design, which can be articulated in comparison with the other two.

For instance, the "things to know," the respective fields of knowledge, are the natural world for science, human experience for art, and the artificial world for design; the "ways of knowing," the values of science are rationality and objectivity, those of art are reflection and subjectivity, and those of design are imagination and practicality. Similarly, the "ways of finding out," the intellectual skills, can be differentiated: those of science are experiment and analysis, those of art are criticism and evaluation, and those of design are modeling and synthesis.

The above categorizations may be rather simple, but many researchers in the design world have been realizing that design does indeed have its own strong and appropriate intellectual culture, and that we must avoid totally swamping our research with different cultures imported either from science or art. This does not mean that we completely ignore these other cultures. On the contrary, they have much stronger histories of inquiry, scholarship, and research than we have in design. We need to draw upon those histories and traditions where appropriate, while building our own intellectual culture, acceptable and defensible in the world on its own terms. We have to be able to demonstrate that standards of rigor in our intellectual culture at least match those of the others.

In *The Sciences of the Artificial*, Herbert Simon went so far as to say that "The proper study of mankind is the science of design."<sup>2</sup> (Of course, the quotation is a corruption from Pope's original version, that "the proper study of mankind is man.") What Simon was suggesting was that the study of design could be a fundamental, interdisciplinary study accessible to all those involved in the creative activity of making the artificial world (which includes all mankind). For example, Simon wrote that "Few engineers and composers . . . can carry on a mutually rewarding conversation about the content of each other's professional work. What I am

2 B. Archer, K. Baynes, and R. Langon. *Design in General Education*. (London, UK: Royal College of Art, 1979)

3 H. A. Simon. *The Sciences of the Artificial*. (Cambridge, MA: MIT Press, 1969)



suggesting is that they *can* carry on such a conversation about design, can begin to perceive the common creative activity in which they are both engaged, can begin to share their experiences of the creative, professional design process."

This, it seems to me, is the challenge for design research, to help construct a way of conversing about design that is at the same time both interdisciplinary and disciplined. We do not want conversations that fail to connect across disciplines, that fail to reach common understanding, and that fail to create new knowledge and perceptions of design. It is the paradoxical task of creating an interdisciplinary discipline.

For some leading examples of this developing conversation, we might turn to the series of papers which, in recent years, have won the annual *Design Studies* Award for the best paper published in that journal. These examples have originated in design research conducted in different domains and with different methodologies, but each individual contribution has had something to say to members of the wider design research community.

The Award was first instituted in 1987, and a selection of the winners includes:

Donald Schön<sup>4</sup> (Urban Planning, MIT, USA) *Designing: Rules, Types and Worlds* Analysis of design protocols to identify patterns of reasoning based on rules derived from type-concepts.

Jacob Burr and Myrup Andreassen<sup>5</sup> (Engineering, Lyngby University, Denmark) *Design Models in Mechatronic Product Development* Analysis of the properties of design models, leading to proposals for models appropriate to mechatronic product design.

Frances Downing<sup>6</sup> (Architecture, Texas A&M University, USA) *Conversations in Imagery* Study of the role of memory (mental imagery of memorable places) in the architectural design process.

Robin Roy<sup>7</sup> (Design & Innovation, The Open University, UK) *Case Studies of Creativity in Innovative Product Development* Studies of creative individual designers to gain insight into the creative process and innovative product development.

Gabriela Goldschmidt<sup>8</sup> (Architecture, Technion, Haifa, Israel) *The Designer as a Team of One* Comparative protocol analyses of an individual designer and a small team tackling the same design problem.

Terry Purcell and John Gero<sup>9</sup> (Design Science, Sydney University, Australia) *Design and Other Types of Fixation* Experimental studies of problem solving in design, aimed at understanding the causes and effects of fixation.

Jars-Erik Janlert and Erik Stolterman<sup>10</sup> (Computing and Informatics, Umea University, Sweden) *The Character of Things* A consideration of how things (hardware and software), as well as people, can have a "character."

What these examples of "best practice" in design research have in common include the following characteristics.

- 4 D. Schön, "Designing: Rules, Types and Worlds" *Design Studies* 9: 3 (1988): 181-190.
- 5 J. Burr and M. Andreassen, "Design Models in Mechatronic Product Development" *Design Studies* 10: 3 (1989): 155-162.
- 6 F. Downing, "Conversations in Imagery" *Design Studies* 13: 3 (1992): 291-319.
- 7 R. Roy, "Case Studies of Creativity in Innovative Product Development" *Design Studies* 14: 4 (1993): 423-443.
- 8 G. Goldschmidt, "The Designer as a Team of One" *Design Studies* 16: 2 (1995): 189-209.
- 9 T. Purcell and J. Gero, "Design and Other Types of Fixation" *Design Studies* 17: 4 (1996): 363-383.
- 10 L. E. Janlert and E. Stolterman, "The Character of Things" *Design Studies* 18: 3 (1997): 297-317.



The research is:

*Purposive*, based on identification of an issue or problem worthy and capable of investigation.

*Inquisitive*, seeking to acquire new knowledge.

*Informed*, conducted from an awareness of previous, related research.

*Methodical*, planned and carried out in a disciplined manner.

*Communicable*, generating and reporting results which are testable and accessible by others.

These characteristics are, of course, normal features of good research in any discipline. I do not think that such normal, academic criteria inhibit or preclude research that is "designerly" in its origins and intentions. However, they would exclude works of so-called research that fail to communicate, and which are undisciplined or ill-informed.

I think also that we should draw a distinction between works of practice and works of research. I do not see how normal works of practice can be regarded as works of research. The whole point of doing research is to extract reliable knowledge from either the natural or artificial world, and to make that knowledge available to others in re-usable form. This does not mean that works of design practice must be wholly excluded from design research, but it does mean that, to qualify as research, there must be reflection by the practitioner on the work, and communication of some re-usable results from that reflection.

The design fields covered in the selected papers, above, have included architectural design, engineering design, industrial design and software design, and the methods of inquiry underlying the research have ranged from philosophical analysis, through case studies and interviews, to protocol studies. They are examples drawn from an ongoing research "conversation" about design which is being shared by members of widely differing professions and disciplines. They draw upon the research paradigms and methods of both the arts and the sciences, but they also contribute to the emerging paradigms and methods of design research.

One of the dangers in this new field of design research is that researchers from other, non-design, disciplines will import methods and approaches that are inappropriate to developing the understanding of design. Researchers from psychology or computer science, for example, have tended to assume that there is "nothing special" about design as an activity for investigation. However, developments such as artificial intelligence and other computer modeling in design have perhaps served mainly to demonstrate the high-level cognitive ability of designers, and how much more research is needed to understand it. Better progress seems to be made by designer-researchers, and for this reason the recent European series of workshops and symposia on descriptive model-



ing of design by Cross et al.,<sup>11</sup> Akin et al.,<sup>12</sup> Frankenburg et al.,<sup>13</sup> featuring a younger generation of designer-researchers, has been extremely useful in developing the methodology of inquiry in design research. As design grows as a discipline with its own research base, so we can hope that there will be a growth in the number of emerging designer-researchers.

Another of the dangers is that researchers adhere to underlying paradigms of which they are only vaguely aware. We need to develop this intellectual awareness within our community. A good example here is the work of Kees Dourest,<sup>14</sup> in making an explicit analysis and comparison of the paradigms underlying the approach of Herbert Simon, on the one hand, and Donald Schön on the other. These two scholars have been the most influential in our field, representing positivist and constructivist philosophies, respectively. Simon's positivism leads to a view of design as "rational problem solving," and Schön's leads to a view of design as "reflective practice." These two might appear to be in conflict, but Dross's use of the two paradigms in analyzing design activity leads him to the view that the different paradigms have complementary strengths for gaining an overview of the whole range of activities in design.

We are still building the appropriate paradigm for design research. My personal "touch-stone" theory for this paradigm is that there are "designerly ways of knowing,"<sup>15</sup> many of the examples of design research I have referred to are contributions to building our understanding of this concept of particular, designerly ability. I believe that building such a paradigm will be helpful, in the long run, to design practice and design education. We still know relatively little about the mystery of design ability, and that limits our "proper study of mankind." This is the goal for design research.

11 N. Cross, H. Christiaans, and K. Dorst eds., *Analysing Design Activity*, The Delft Design Protocols Workshop, (Chichester, UK: John Wiley & Sons Ltd., 1995).

12 Ö. Akin and G. Saglamter eds., *Descriptive Models of Design*, (Istanbul Technical University, Turkey: Faculty of Architecture, 1996).

13 E. Frankenburg, P. Badke-Schaub and H. Birkhofer eds., *Designers—The Key to Successful Product Development*, (London, UK: Springer Verlag, 1998).

14 K. Dorst, "Describing Design: A Comparison of Paradigms," Ph.D. Thesis, (Delft University of Technology, The Netherlands: Faculty of Industrial Design Engineering, 1997).

15 N. Cross, "Designerly Ways of knowing" *Design Studies*, 3, 4 (1982): 221-237.