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**VISIBLE LANGUAGE**

DEDICATED TO DR. MERALD WROLSTAD

36.2

**A SPECIAL ISSUE**

An Annotated Design Research Bibliography:  
by and for the design community

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# ACKNOWLEDGE

# ments

Many people collaborated on this project beyond the energetic Ph.D. candidates who served as the guest editors for the three bibliographic sections. Doctoral candidates are like professional readers and we want to acknowledge those candidates who joined the guest editors to read and annotate: Suzan Boztepe, Turkey; Roberto Holguin, Mexico; Youn-Kyung Lim, Korea; Luis Pereira, Portugal. Dr. Jay Melican and Dr. Peter Storkerson, former American doctoral candidates at the Institute of Design, IIT, also contributed to this project. Kay Burnett, a former Master of Design student, also couldn't resist the temptation to work on this. A guest doctoral researcher from Milan Polytechnic, Simona Maschi, read and annotated too.

We are also indebted to John Heskett of the Institute of Design faculty who contributed. Those beyond our community who contributed are deeply appreciated: Dr. John Broadbent, University of Technology, Australia; Dr. Jill Franz, Queensland University of Technology, Australia; Dr. Ken Friedman, Norwegian School of Management, Norway; Dr. Lorraine Justice, Georgia Institute of Technology, USA; Dr. Terence Love, Edith Cowan University, Australia; Dr. Barbara Martinson, University of Minnesota, USA; and Dr. Pradeep Sharma, UNITEC Institute of Technology, New Zealand. We also thank the anonymous participants who ranked books on the website and recommended additional titles.

It is a truism that the literature of a field defines its discourse. Design has been a field of practice with few substantial formal resources, much less agreement on what the important resources might be. With no common sense of importance, design practitioners, teachers and researchers set out to inform themselves about design in an unmarked territory. The project that unfolds on the next pages is an attempt to remedy this situation.

## P R E F A C E

# Preface

The annotated bibliography assembled here crosses disciplinary boundaries as design borrows pointedly from others what it particularly lacks. But the books annotated here have been filtered through a design sensibility by virtue of community response to an on-line invitation to evaluate books and by the personal and collective reading of doctoral students in design at the Institute of Design, Illinois Institute of Technology. As such the selection of books is not inclusive and some readers may find their favorites missing. The target for this bibliography is moving — publishing is dynamic with new entries and lost classics. Our reading is by necessity selective, purposefully for information as we address a design task or purposefully as we read to extend our thinking and depth of understanding.

Not all books on these lists will be to the reader's liking and some might even offend. The bibliography presented here is subdivided into three classifications: Philosophy and Theory of Design, Principles and Methods of Design Research and Theory and Practice in Design. These are beginnings, a signal that design is getting serious about its foundations, literature and discourse. This bibliography is a follow up investigation from Foundations for the Future, Doctoral Education in design, a conference held in La Clusaz, France in July, 2000. One of the conference organizers, Ken Friedman, suggested this project and we are indebted to him for this. It has been a rewarding, if sometimes frustrating, experience for us all.

You might ask, why is *Visible Language* publishing this bibliography. Books are visible language and the journal has a scholarly connection with design. The founder of this journal and its former editor, had an unspoken mission to encourage research and scholarship in design, to encourage designers to write about their experience and ideas at the very least. With a Ph.D. in typography, Merald Wrolstad was a reader and thinker grounded in design but unbound by disciplinary rigidities. In his last years he was deeply engaged with cognitive science. I believe he would applaud this issue and so we dedicate An Annotated Design Research Bibliography to his vision for design, his interest and support for research and his generous life.

Sharon Poggenpohl,  
Editor

ANNOTATED  
DESIGN  
BIBLIOGRAPHY  
OVERVIEW  
PROCESS

## Annotated Design Research Bibliography Process Overview

*Praima Chayutsahakij*

This Annotated Design Research Bibliography brings together a network of design scholars to select the most relevant bibliographical references for the field of design. The books that appear annotated are selected through two analytical approaches: the essentialness of the book determined through a design community on-line ranking survey, and the discipline distribution through field-keyword analysis. Annotations were collected from the volunteer on-line survey participants and a more focused community of individuals targeted for each particular section including members of the Ph.D. listserv, the Ph.D. community at the Institute of Design and its database. The project consists of ninety books in three essential areas of design study: 1) Philosophy and Theory of Design, 2) Principles and Methods of Design Research, 3) Theory and Practice in Design. Interpretations of the observations from the data collected from the on-line bibliographic survey also are suggestive of the state of design as a discipline.

# Annotated Design Research Bibliography

## Process Overview

Design has a long but undistinguished history. Academicians have spoken and published on the subject almost from the time design was first considered an actual subject, as early as architectural design theories were written in Roman times. Yet, design as a discipline is still immature and has not developed the internal structures and understanding that older disciplines have. In short, there is little to point to as a theoretical base for design. Although design has its own purposes, values, measures and procedures (Owen, 1994), they have not been extensively investigated, formalized or codified or even significantly entered into the literature created for the field. As a result, those who seek to work more rigorously look to other scientific and scholarly models for guidance, and we find references to 'design science' and examples of 'design research' that seem to fit more appropriately in other fields (Owen, 1994) — such is the current state of research and discourse in design.

### THE NEED FOR A DESIGN RESEARCH BIBLIOGRAPHY

Despite prominent individual efforts — including major contributions in modern times by design theorists in the UK — the degree of interest in design literature among design disciplines has been quite uneven, ranging from more than a little in engineering design, to some in architectural and product design, to not very much in the fields of design most closely associated with the arts and crafts.

Thus, design integrates several fields with different research traditions and competing methodological claims, 'Not surprisingly, design as a knowledge domain is invisible, dispersed within other classifications' (Poggenpohl, 1998).

# Design

## Research

There is no database and/or Library of Congress (LC) classification: Design. Design literature resources are organized under databases of related fields such as architecture, psychology, business and economics, marketing, humanities, and engineering. For example, the sub-category Industrial Design is organized under the LC classification of 'Technology,' while Graphic Design is under 'Art.' In addition, in a Dialogweb search, Design literature is found under the datastar of ARCHITEC, ARTS, BUSECON, ECON, ECOLOGY, EDUCAT, ENG, ENVIRON, HUMANIT, PRODINFO, PRODUCTS, MANAGE, MKTRES, PSYCH. 'Design' as a keyword search itself does not usually lead to useful design literature. The search for design literature (as an appendage to other dominant classifications) poses a challenging problem for the design community. This leads to a lack of foundation on which to build a discipline.

Communities of knowledge and research-based communities of practice involve sharing information which requires a literature. Klaus Krippendorff's (1998) article in the *Proceedings of the Ohio Conference on Doctoral Education in Design* considered how — and why — scholarly communication builds a field. Tore Kristensen's (1999) Helsinki presentation and many of the papers at La Clusaz and other conferences have addressed the same issue. The ADC (Asian Design Conference) series of international conferences also shows a readiness to develop a more serious approach to design discourse. The information shared in scholarly and scientific communications, thus, becomes part of the common heritage of human knowledge, building the foundation for disciplinary development and sharing ideas and information more broadly, across disciplines.

As Ken Friedman stated in *Design Research News*, December 2001:  
 “This half-decade has been a period of dramatic growth and visible development. We had only a few journals six years ago. Now we have several: some established, some new and more in development. Six years ago, we managed an occasional conference from time to time. Now, we have several international conferences on a regular schedule and many regional and nation conferences. Next year, we will hold our first global design research conference. Where we had a handful of research books and no textbooks, we now have a small shelf of solid monographs, a few textbooks and more of each under way. Where we had two or three online discussions groups, we now have over a dozen. The most active of these have between six and seven hundred subscribers each. Research centers and professional associations of many kinds meet different needs, and research education is blossoming along with doctoral education.”

Design as a discipline with its own literature is growing. To build an intellectual design culture we need to develop design bibliographies as a systematic resource for locating literature in books and journals, professional and research conferences, seminars that encourage information sharing and exchange among design practitioners and researchers around the world.

## INTENTION AND EXPECTATION

This design bibliography project emerged from questioning what is unique to design and what is borrowed from other disciplines. *(Pages 134-135, 172-173, 210-211 show complete charts of books with disciplinary descriptions. Table 2 in each of the three sections.)* Here we acknowledge that we borrow from other disciplines. Thus, complex design problems that require extensive inquiry and evaluation become more meaningful when they are grounded in theory and systematic inquiry from whatever appropriate source. Most importantly, this project is also aimed at building a research culture which overtime can create a base of design knowledge through the development of continuing research by designers and design teams. This project is the documentation and dissemination of research findings. It is imperative that design research is documented and disseminated in a systematic way so that others can understand design research, its outcomes and use. It is even more important that dissemination occurs so that other researchers are aware of the work that has been done and can build upon it. This project also holds promise as a stimulus to the further recording of design literatures. After years of documentation and dissemination of design research, a naturally recorded history of the design field occurs. Trends in design can be tracked through the records of design research and its impact on design performance in case studies throughout the years.

## ABOUT THIS PROJECT

This project emerged as an extension from the second conference on doctoral education in design, in July 2000 in La Clusaz, France. The Conference, Doctoral Education in Design: Foundations for the Future encouraged participants to present findings, debate ideas and propose bench marks for the future development of the doctorate in design. This conference presented many perspectives — some of which are not represented in this project. There are substantial omissions in this project such as little history and virtually no criticism.

There are many ways to develop a bibliography — through professional subject specialists (who are rare or nonexistent for Design), through citation searching (whose shortcoming is inadequate representation of recent literature and the shortcomings of a more formalized Design discourse itself), through ideosyncratic approaches like the American Center for Design Bibliographies (Davis, 1997) which represent a series of singular points of view. In this project, after trying the citation search method which failed to produce adequate results, the decision was to engage a community of scholars.

This bibliography project is an effort to bring together a network of design scholars to select the most relevant bibliographical references for the field of design. Especially, the scholars who participated in the La Clusaz Conference and who are in a position to influence the future of design education.

The project consists of selected literature review in three essential areas of design study (based on the La Clusaz Conference proceeding): 1) Philosophy and Theory of Design, 2) Principles and Methods of Design Research, 3) Theory and Practice in Design. The focus is on advanced thinking in design whether from a theoretical, methodological or practical perspective.

The books that appear annotated in the bibliographic references for design are selected through two analytical approaches:

- 1) The essentialness of the books to the design community — members of the design community ranked books on-line*
- 2) The discipline distribution (the fields that a book covers) by field-keyword analysis*

### **1. Design community book ranking (on-line survey)**

To find consensus among the design community on the most relevant design books, an on-line survey with an initial list of books consisting of three areas of design study mentioned above: 1) Philosophy and Theory of Design, 2) Principles and Methods of Design Research, 3) Theory and Practice in Design was developed for its contribution to and assessment by the design community.

For each section, an initial list of about sixty books, selected from the La Clusaz Conference proceeding references, experts' suggestions and a literature survey, was presented for the participants to rate/rank the essential character of each book. Four questions were asked:

- 1) Have you heard of this book?*
- 2) Do you recognize the author?*
- 3) Have you read this book?*
- 4) Do you recommend this book?*

Annotated Philosophy and Theory of Design List

Annotated Principles and Methods of Design Research List

Annotated Theory and Practice in Design List

**Design Books in Philosophy**

Philosophy of Design: No.1-40  
 Principles and Methods of Design: No. 41-99  
 Design Research and Practice: No. 100-141

**Selected by category**

**Instruction**

- 1) Mark at least one of the three lists. You are welcome to contribute to more than one list and can return at a later time to respond to another list.
- 2) Select the box if you are in agreement, otherwise leave it blank. If you want more information about a book, you can click on its title and a new window will open connecting you to the publisher or distributor.
- 3) To recommend a book, enter the information for the book in the spaces provided in the section "My Recommendations" at the end of each list. If you wish to volunteer to write a 125 word annotation for any of your recommended book(s), select the appropriate box to confirm your intention.
- 4) When finished answering as many lists as you wish and adding your recommended books, press the button "Send my answers" and a note confirming that your message was received will be presented.

No.	Author (Last Name, First Name)	Title	Publisher	I have read this book	I have heard of this book	I know of this author	I recommend this book	I would like to write an annotation for this book
1	Ackoff, Russell L.	<i>The Art of Problem Solving</i>	John Wiley, 1978	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Appadurai, Arjun	<i>The Social Life of Things: Commodities in Cultural Perspectives</i>	Cambridge University Press, 1986	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Argyris, C.	<i>Inner Contradictions of Rigorous Research</i>	Academic Press, 1980	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Argyris, C., Putnam, Retai	<i>Action Science</i>	Jossey-Bass Publishers, 1995	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Attfield, Judy	<i>Utility Reassessed: The Role of Ethics in the Practice of Design (Studies in Design and Material Culture)</i>	Manchester University Press, 1999	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Attfield, Judy	<i>World Things: The Material Culture of Everyday Life</i>	Berg Pub Ltd., 2000	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Cross, N., Dorst, K. et al	<i>Research to Design Thinking</i>	Delft University Press, 1992	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Dart, Tim	<i>Material Culture in the Social World</i>	Buckingham: Open University Press, 1999	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Dasgupta, Subrata	<i>Creativity in Invention and Design: Conceptual and Cognitive Explorations of Technological Originality</i>	Cambridge University Press, 1994	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Demerut, Daniel C.	<i>Consciousness Explained</i>	Little Brown & Co., 1992	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Flood, R. L., Carson, E.R.	<i>Dealing with Complexity</i>	Fleerum Press, 1993	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Flood, R. L., Jackson, M.C.	<i>Creative Problem Solving</i>	Wiley, 1991	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Flores, Vilen	<i>The Shape of Things</i>	Reaktion Books, 1999	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Glasser, B. G., Strauss, A. L.	<i>The Discovery of Grounded Theory: Strategies for Qualitative Research</i>	Aldine De Gruyter, 1980	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Gurwitsch, Aron	<i>The Field of Consciousness</i>	Duquesne University, 1964	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Harnly, D. W.	<i>In and Out of the Black Box: On the Philosophy of Cognition</i>	Basil Blackwell Ltd., 1990	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Jantsch, E.	<i>Design for Evolution: Self-Organization and Planning in the Life of Human Systems</i>	George Braziller Inc., 1975	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	Johnson, Victor S.	<i>Why We Feel: The Science of human emotions</i>	Helix Books, 1999	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Knackip, Fritz	<i>Knowledge and Information</i>	Pionetron University Press, 1979	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
101	Salvendy, Giovanni	<i>Handbook of Human Factors and Ergonomics</i>	John Wiley & Sons, 1997	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
132	Savoff, Henry	<i>Integrating Programming, Evaluation and Participation in Urban &amp; Housing Research (Housing paper 347)</i>	Adaptive Publishing Company, 1992	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
133	Schmuck, Richard A.	<i>Practical Action Research for Change</i>	IRU/Slaylight, 1997	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
134	Schon, Donald A.	<i>The Reflective Practitioner: How Professionals Think in Action</i>	New York: Basic Books, 1983	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
135	Schneekloth, Lynda H.	<i>Place-making: The Art and Practice of Building Communities</i>	John Wiley & Sons, 1995	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
136	Stake, Robert E.	<i>The Art of Case Study Research</i>	Sage Publications, 1995	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
137	Stringer, Ernest T.	<i>Action Research: A Handbook for Practitioners</i>	Sage Publications, Incorporated, 1996	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
138	Warfield, John N.	<i>A Science of Generic Design</i>	Iowa State University Press, 1994	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
139	Waring, Alan	<i>Practical Systems Thinking</i>	Thomson Learning Europe, 1997	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
140	Wenger, Etienne	<i>Communities of Practice: Learning, Meaning, and Identity</i>	Cambridge University Press, 1999	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
141	Woodson, Wesley E.	<i>Human Factors Design Handbook: Information and Guidelines for the Design of Systems, Facilities, Equipment and Products for Human Use</i>	McGraw Hill Text, 1991	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
142	Yin, Robert K.	<i>Case Study Research: Design and Methods</i>	Sage Publications, 1994	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Send my answers**

Add books important to Philosophy of Design.

Rank edit books test others Home

Link: <http://www.id.it.edu/phd/design/feedback.php>

**Figure 1** is a snapshot of the on-line survey website. Participants could choose to rank and/or recommend the books for a particular section or for all three sections: Philosophy and Theory of Design, Principles and Methods of Design Research and Theory and Practice in Design.



## Participants

The on-line bibliographic survey was sent to 502 recipients who are members of the PhD Listserv [LISTSERV@JISCMAIL.AC.UK emailing address] and the results were collected within a five week period. Participants were encouraged to pass on the survey address to other interested people, so the exact number exposed to the survey is uncertain. There was no attempt to engage practicing designer participation through professional organizations. Few practitioners engage in research and even fewer are interested in philosophy. The final survey results were based on a total of eighty-two respondents who participated in the on-line ranking. The greatest response was to the Theory and Practice in Design list. Philosophy and Theory of Design yielded a modest response. The weakest response was to the Principles and Methods of Design Research list.

## 2. Field-keyword analysis

To ensure an appropriate disciplinary distribution of the final book selection 'field-keyword analysis' was employed. Design and design related books are organized under many different disciplinary keywords. In this analysis, the fields of the books are identified by the keywords indicated in the on-line literature reference (Amazon.com). For example, *The Design of Everyday Things*, by Donald A. Norman is found under keywords such as design, industrial, psychological aspects, human engineering, technology and industrial arts, technology, industrial design – general, cognitive psychology and consumer behavior. This set of keywords indicates that the book is a combination of social science, technological science and industrial design.

# Keywords

In this analysis the disciplinary distribution (or combinations) were compared through eight fields: natural science, social science, technology science, education, business, architecture and environmental design, industrial design, and communication design. These eight fields are indicated by the example keywords listed below:

**Natural science** includes keywords related to biology, mathematics, physics

**Social science** includes keywords such as anthropology, sociology, psychology, social systems, social engineering, social change, sociological theory, sociology, social science, sociology-general, sociology-social theory, action research, philosophy and social aspects, popular culture, anthropology-cultural, cognitive psychology

**Technology science** includes keywords such as software engineering, electronic data processing, structured techniques, software design, computer books: general, language/programming, software development, operating systems, computer-aided design

**Education** includes: teaching, training, studying, study and teaching, learning, psychology of transfer of training, educational reform research, teaching methods and materials

**Business** includes: business, economics, finance, management, organizational development, marketing, creative ability in business, industrial management, customer services, success in business, management

**Architecture and environmental design** includes keywords such as architecture, symbolism in architecture, city planning, architectural design, architectural practice, design and drafting, urban and community development, urban planning, interior design

**Industrial design** includes: design, industrial, new products, industrial design, production management, production planning, production engineering

**Communication design** includes: visual perception, interactivity and multimedia, typography, media studies, visualization

After analyzing the disciplinary combination for each book, the percentages of the discipline distribution were calculated for the whole list. The percentage of each field is calculated from the number of the books in the field divided by the total field counted as shown on the discipline distribution table (*table 1 in each section*). Based on the discipline distribution/comparison of the initial book list and the additional book list recommended by the design community, the final list of the most relevant bibliographic references for design were selected and adjusted according to the appropriate disciplinary distribution. The books selected for the final list represent good coverage for all the relevant disciplines specific to each section.

The discipline distribution and the essentialness of each book are indicated on the comparison tables (*table 2 provided for each section*). Greater detail regarding book selections and adjustments to the bibliography are discussed further in each of the three sections.

## ANNOTATION

Following the on-line survey, participants were asked if they would volunteer to write a brief annotation for various books. Additional annotations were also collected from a more focused community of individuals targeted for each particular section. Philosophy and Theory of Design annotations came from the academic community. Principles and Methods of Design Research came largely from the Ph.D. community and Theory and Practice in Design from a variety of sources including some selected from the Institute of Design database, OD3 (Online Design Document Database [www.ir.iit.edu/id](http://www.ir.iit.edu/id)).

## CONCLUSION

Interpretations of the observations from the data collected from the online bibliographic survey are suggestive of the state of design as a discipline. The greatest response was to the Theory and Practice list. Since practice is the dominant activity in a young discipline, this came as no surprise. Interestingly, the Methods and Principles of Design Research section yielded the weakest response even though there seems to be a growth in doctoral programs worldwide. Response to books on research methodology demonstrated that this was new territory for many. The books familiar to the design community are broad and practical. Most of the in-depth theoretical books are not ranked very high. Not surprisingly, there was little response to Philosophy of Design. Admittedly there are very few specifically philosophical investigations of Design. In fact few designers might recognize the need to acknowledge a philosophical perspective, but we need to ask what might constitute an ontology, epistemology or even a teleology of Design. Those engaged in research are surely asking such questions — and asking them in the current vacuum.

The online survey took the measure of the discipline and found it severely fragmented. Without a community with shared knowledge resources and understanding it is impossible to even begin to develop consensus on essential literature much less found a discipline.

From the on-line survey with little consensus with regard to ranking, the editors, all of which are Ph.D. candidates at the Institute of Design, IIT, exercised judgment based on specific criteria to form the final list. The program at the Institute of Design emphasizes user-centered design, design planning and design research, which influenced decision making on the final book selection. This is a research Ph.D. that takes an ecumenical approach to research methods but expects substantial evidence to be developed in whatever research question is investigated, by whatever research method.

The editors of this bibliography recognize this is a beginning, and it is surely an arguable one. Individual readers may find their favorite resource missing. But the editors hope this work will stir others to take action and develop other even more specialized bibliographies that will help give shape and definition to the field.

## Conclusion

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DESIGNRESEARCH@JISMAIL.AC.UK

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Material Culture and Mass Consumption

The Meaning of Things;

Domestic Symbols and the Self

Mechanization Takes Command

Design Discourse;

History, Theory, Criticism

General Evolution Theory

The Idea of Design;

A Design Issues Reader;

Communication, Action and Meaning;

The Creation of Social Realities

Conjectures and Refutations;

The Growth of Scientific Knowledge

Critique of Judgment

Abductive Inference — Computation, Philosophy, Technology

Autopoiesis and Cognition: The Realization of the Living

Understanding Media - the Extensions of Man

Utility, Reassessment

The Role of Ethics in the Practice of Design

Understanding Computers and Cognition

A New Foundation for Design

Understanding Even

Affect and the Construction of Social Action

The Symbol System

The Tact Dimension;

Technology and the Lifeworld;

From Garden to Earth

Representation and Reality

Return to Reality

The Sciences of the Artificial

Philosophical Tools for Technological Culture — Putting Pragmatism to Work

Philosophy in the Flesh

Of Problematology, Philosophy,

Science and Language

Practical Reason, On the Theory of Action

Mind, Language and Society —

Philosophy in the Real World

On the Pragmatics of Communication

Personal Knowledge

Phenomenology of Communicative

Knowledge in Communication and Semiology

Knowledge As Design

Material Culture and Mass Consumption

The Meaning of Things;

Domestic Symbols and the Self

Mechanization Takes Command

Design Discourse;

History, Theory, Criticism

General Evolution Theory

The Idea of Design;

A Design Issues Reader;

Communication, Action and Meaning;

The Creation of Social Realities

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Autopoiesis and Cognition: The Realization of the Living

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General Evolution Theory

The Idea of Design;

A Design Issues Reader;

Communication, Action and Meaning;

The Creation of Social Realities

Conjectures and Refutations;

The Growth of scientific knowledge

Critique of Judgment

Abductive Inference — Computation, Philosophy, Technology

**Building a Philosophy of Design is one of the three sections of the Annotated Design Research Bibliography. Design suffers from the ambiguity of its philosophical context. Although design communities attempted to solve this problem a decade ago, there is no agreement concerning what a philosophy of design might be. The study addresses the differences of philosophy in design and science. This is followed by an analysis of the most read books as determined by community ranking. Field-keyword analysis is then used to analyze interdisciplinary books and expert recommendation of books. The results from community ranking demonstrate that books related to philosophy of design still require substantial development since there is a limited literature that directly points to a philosophical context for design. Most current books tend to be design history and criticism of design. From the field-keyword analysis, the majority of books recommended fall within the social science field. From the results it is evident that design requires progressive action to establish a foundation in this area.**

Philosophy  
*of* Design

**Perspectives on Building  
a Philosophy of Design**

*Sakol Teeravarunyou and Carlos Teixeira*

**& Annotated Philosophy and  
Theory of Design List**

# Perspectives on Building a Philosophy of Design

## INTRODUCTION TO PHILOSOPHY OF DESIGN

### Definitions, perspective and roles of philosophy of design

'Philosophy' has a long history and ambiguous meaning. The Merriam-Webster dictionary defines philosophy with different levels of meaning: as the most general beliefs, such as concepts of love, moral self-discipline, knowledge, justification and as the attitudes of an individual or group in pursuit of wisdom. The content of philosophy comprises cognition, logic, ethics, aesthetics, metaphysics, body and mind relations, epistemology and theology. These different philosophical subcategories call into question which of them have importance to design.

Philosophy's method is both critical and constructive. Its critical function calls into question assumptions and ideas in order to clarify and understand them. Theories of knowledge and value, examined analytically, are the focus of these critical approaches. Its constructive function attempts to take into account and organize all the facts in developing a view of the world as a whole. Metaphysics and theories of reality are the focus of this approach.

The need for a philosophy of design occurs when designers seek to define their own discipline, beliefs and knowledge. In the last thirty years, design has evolved and been influenced by scientific thinking. Many designers who teach in graduate programs nurture the hope of defining design's own body of knowledge. Nevertheless, the nature of most design problems, with their ill-defined structure, is in conflict with scientific inquiry.

Design methodologists as well as philosophers attempt to solve this problem, but there is no agreement regarding a solution. If this problem remains, the judgment of design cannot be accomplished. Design, as well as other disciplines, needs reasonable judgment and belief structures to guide its development as a discipline. Without judgment, it is impossible to take an appropriate direction to establish belief. The more we understand design judgment, the more we are able to develop new knowledge and encourage its growth.

Design appears to not belong in a single discipline; the study of subcategories of philosophy in the arts and sciences should be examined to find the knowledge that fits to design. However such an examination is beyond the scope of this brief introductory essay. Philosophy in design should stand for design knowledge, judgment, justification and new attitudes toward design.

## *Differences*

### **Differences of philosophy in design and other disciplines**

There is no apparent common understanding and definition concerning a philosophy of design. In contrast to the philosophy of science, which is a metalanguage that refers to an object-language (science) and is grounded in theoretical constructs, design lacks a philosophical structure. For example, the philosopher of science asks whether it is possible that a term occurring in a definition refers to physical objects and their properties. Klemke (1998) explains: "Philosophy of science is the attempt to understand the method, foundations, and logical structure of science and to examine the relations and interfaces of science and other human concerns, institutions, and quests, by means of a logical and methodological analysis of both the aims, methods, and criteria of science and of the aims, methods, and concerns of various cultural phenomena in their relations to science."

One of the distinguishing characteristics between the philosophy of design and others is described in terms of the logics of design by March (1984). He explains that the model of explanation in natural science mostly uses deductive inference while social science uses inductive inference. A scientific hypothesis is not the same thing as a design hypothesis. "Abduction, or as we have it production, 'is the only logical operation which introduces any new ideas; for induction does nothing but determine a value; and deduction merely evolves the necessary consequences of a pure hypothesis. Thus, production creates; deduction predicts; induction evaluates." March's explanation of logic is another viewpoint design should examine. Yet another supporting idea is the concept of 'Design Science.' It is a potentially new subcategory of science. Herbert A. Simon suggests in his book *The Sciences of the Artificial* (1981) that a science of this sort is concerned with the organization of natural and artificial things, and characterizes such things by the functions they perform and the goals they achieve.

According to Owen (2000), design is a unique discipline. "Design as a broadly-based discipline suffers mightily from philosophical ambiguity. Design is not science, and it is not art – or a branch of any other discipline." Design has its own theories such as "Form follows Function." Design also has its own methodologies such as *Notes on the Synthesis of Form* (Alexander, 1964), *Design Methods* (Jones, 1997) and others. Friedman (2001) defines the design knowledge domain that shapes philosophy of design. He identifies four domains: 1) Skill for Learning and Leading, 2) the Human World, 3) the Artifact and 4) the Environment. Nevertheless, design knowledge does not have a clear position in one particular domain. For example, problem solving in the learning domain is useful for psychology and education but might not necessarily contribute to design. Problem solving in design relates

to the artifact (second domain) and design process (third domain). This presents a unique domain from the field combination. Cross (2000) describes design as an interdisciplinary discipline. He positions design as a discipline rather than as a science. Design as a discipline seeks to develop domain-independent approaches to theory and research. The underlying axiom of this discipline is that there are forms of knowledge peculiar to the awareness and ability of a designer, independent of the different professional domains of design practice (such as architectural, industrial, communication design, etc.).

Popper (1963) explains the nature of philosophical problems. Rather than ask "What is philosophy?" which requires a definition, he suggests instead a description, "What is the character of philosophical problems?" He admits that many problems involve many disciplines, thus it is difficult to tell whether the problem belongs to one or another of the traditional disciplines. As a consequence, philosophy does not contain any theories, but is an activity or a process of thinking. The argument continues that philosophy of design should not refer to theories but rather to disciplines.

From observing and analyzing the books we collected for the philosophy section, it is interesting to see a variety of perspectives and opinions regarding design. Books written by philosophers, such as Kant, Popper, Polanyi do not speak directly to design disciplines, but their ideas contribute to design with regard to aesthetics, conjecture and refutation and tacit knowledge respectively. They identify an ambiguity in scientific inquiry and the intuition that leads to judgment. This shares the same problems faced by a philosophy of design. Design judgment can begin with these philosophers. Books, like those of Simon (1969) and Perkins (1997), take an explanatory approach to design through artifacts, processes and structures. These provide another entry into the philosophy of design.

Although it is impossible to identify which ideas belong specifically to a philosophy of design, it is a significant idea to perceive the connections between philosophy and design. In conclusion, the books in the philosophy of design section are based on both domain specific and interdisciplinary domains. A discipline stands for a point of view, it puts a fence around its domain. But today disciplinary boundaries are increasingly insubstantial and design has historically been a synthetic and pragmatic discipline. This complicates the criteria for book selection and makes the field-keyword analysis essential.

## Roles

### **Roles for philosophy in design**

Unlike theorists, methodologists and practitioners, philosophers are theory critics, disciplinary builders and belief missionaries.



The role of philosophy in design has a clear mission and purpose.

- Philosophy of design like other philosophies is composed of concepts, meaning, reference, knowledge, truth, reason and value.
- Similar to the philosophy of science, philosophers in design are responsible to define the terminology for design, accumulate design knowledge and justify design theory.
- If design is a broad-based discipline, the new terminology and knowledge from a field combination should be defined. For example, the proposition of user-centered design is a combination of four human factors – social, cultural, physical and cognitive human factors. The question for philosophers is can such terminology and technique as is used for those disciplines, be transferred

to design and can they be the source of knowledge useful to design. Such knowledge and its transference should be carefully selected and used for design.

• Philosophy of design can be generated from field combinations or a specific field. The combination of different fields generates a uniqueness and contribution to design philosophy. For example, the concept of the Simon's book *The Sciences of the Artificial* is a field combination of economics, sociology, humanities and computer science.

## Focus

### Focus and scope of this research in the philosophy of design section

Certainly, an argument of which books belong to philosophy and non-philosophy happened when we first collected the books. For example, some books related to history might not be philosophy books. The history of design is a valuable pursuit for both designers and non-designers. But it must not be confused with the philosophy of design. In reality, it is difficult to find philosophy of design on bookshelves of design or philosophy; therefore the tolerance for error in selecting as philosophy books of criticism and design history, must be excused. Those books might not be philosophy in the first place, but they might have an influence on design philosophy and its development in the future.

The project does not attempt to verify or judge the books in relation to philosophy of design, but does so through the consensus of the participants who ranked the books and contributed new titles. The collection of books represents a basic idea of philosophical study. Since philosophy of design relates to the disciplinary approach rather than as an identification as science or art, comparison of contributory disciplines among the books that participants rank and the books that participants add to the list are a further criteria of selection.

## RESULT AND DISCUSSION

The results from community ranking demonstrate that the philosophy of design books drew the second greatest response from the design community (after the theory-practice section). The results of book ranking and field-keyword analysis are discussed next. Specific issues and observations regarding the methods and emphasis among disciplines in the field-keyword analysis are explored.

### Results from ranking

Forty books appeared under the philosophy of design for ranking. Books that are high ranking are most read, most recommended and written by well known authors. Eight books from the ranking are selected as seen in table 2 (see p. 134-135). This list is a selected ranking that is modified from the original ranking of books. Some books are not included, for example, *The Reflective Practitioner* was shifted to another section of this bibliography. This points up the fact that some books crossover among these three lists and so the editors needed to make a judgment with regard to which list most strongly represented their contribution to design thinking.

The books that participants read most in Philosophy of Design are:

1. *Design Discourse* (1995) and *The Idea of Design* (1996)
2. *The Sciences of the Artificial* (1996)
3. *Discovering Design* (1995), *The Reflective Practitioner* (1984)

*Design Discourse* and *Idea of Design* are the most read. As can be seen from table 2, these books are based on the history and criticism of design. Both of them present the design field clearly with regard to product design and graphic design. *The Sciences of the Artificial* is second. This book explores an idea of a science of design and its relation to cognitive psychology. The author makes a significant contribution to the design field, but not directly in relation to design practice. Third is *Discovering Design* and *The Reflective Practitioner*. Both of them mention design practice and the social role of design.

The books that participants recommend to read are:

1. *The Sciences of the Artificial*
2. *Discovering Design*
3. *Design Discourse*

The books whose authors the participants know are:

1. *Design Discourse* (1995)
2. *The Sciences of the Artificial* (1996)
3. *The Idea of Design* (1996) and *Discovering Design* (1995)

In the philosophy section, the high ranking group deals with history and criticism of design.

## Result

### Field-keyword analysis

Keywords are categorized in eight fields as shown in table 1 (see p. 128). According to field-keyword analysis in table 1, the original books in first row (40 books) have a high percentage in social science, technical science and education fields respectively. None of the books fall under visual communication which is a branch of design. The original books ranked by participants in the second row (8 books) vary from the original books especially in social science; no book falls under the category of natural science, architecture and visual communication. Similar to the original book ranking, books added (34 books) by participants have a high score in social science, education, natural science and technical science.

For the added-selected list (6 books), the field-keyword analysis is used to select the book (as can be seen in the fourth row). Based on the method of selecting books, two ways of using the keyword analysis is proposed. The first is a selection of specific fields from a design point of view. Annotations from individuals in the design field facilitates this selection since they perceive and review those books from that perspective. The annotation should reflect why the books relate to design and its relevance. This criterion is a qualitative justification for the books. The second direction is a field combination. If the combination of fields have not been found in any books, that might suggest a lack of study among those combinations or that those fields do not fit together. The number of combinations is also another indicator that suggests the repetition or pervasiveness of the content. By using these criteria, the added-selected list has only six books. The books with a high percentage are social science and education.

## Analysis

	Natural science	Social science	Technology science	Business	Education	Architecture	Industrial design	Visual design
<b>Original list</b>	7.46	40.29	16.41	8.95	13.43	2.98	10.44	0
<b>On-line ranking</b>	0	37.5	18.75	12.5	12.5	0	18.75	0
<b>Recommended books</b>	10.41	27.69	8.33	2.08	22.91	0	4.16	4.16
<b>Added-recommended</b>	0	42.86	0	0	28.57	14.29	0	14.29
<b>Added by experts</b>	20	56	12	0	0	0	0	12
<b>Final list</b>	10.42	47.91	12.50	4.17	8.30	4.17	4.17	8.33

**Table 1** Field-keyword Analysis

Since the number of books selected from the ranking and added list is not sufficient for the final selection, experts also recommended books (17 books). From the analysis in table 1 (see p. 128), the books from experts are in social science, natural science, technical science and visual communication. The final list (30 books) in row six represents all fields. Social science has a high percentage followed by technical science, natural science and education, followed by the three design fields and business.

### **Observation on the methods**

From the ranking result, many low ranking books fall into creativity and psychology categories. Examples of such of books are: *Creativity in Invention and Design* (Dasgupta, 1994), *The Nature of Creativity - Contemporary Psychological Perspective* (Sternberg, 1998) and *Why We feel: the Science of Human Emotions* (Johnson, 1999). From observing the participant results in community ranking, it may be that they do not select books not related directly to design, since those books might not apply to design, or conversely, the books that are not well known represent new emerging fields.

The high-ranking books present a concept of philosophy different from traditional philosophy books, since most philosophy books are written in the style of theory justification. This observation reminds us of the character of philosophy books. There are many books in the added list that are serious philosophy but they are not selected in the final list. Some refer to the pre-history of philosophy such as in the Greek period; they are not selected because modern philosophy tends to have a closer connection to the design context than those based on historical foundations.

From the field-keyword analysis, the total percentage of design including architecture, industrial design and visual communication are equal to other fields, but each field in itself has a low number. As a result, most of the philosophy books have little emphasis on building a philosophy in design, since deep knowledge involving design still depends on other disciplines such as cognitive science, social science and scientific theories of explanation.

## Selection

### Final book selection

Many philosophy books fall under the social sciences which are comprised of psychology, anthropology and sociology. These have a different approach from the natural sciences. They are based on social activity, human judgment and cognition. High ranking scores relate to books presenting criticism of design rather than theory justification as might be found in more mature disciplines. The number of philosophy entries under the design category is small. This signals a need for improvement in the design field.

From the community participatory book ranking operation, we collected books from medium to high ranking. Eight from forty books were selected. Five books were selected from the added list of thirty-four books using the field-keyword analysis for appropriate discipline distribution. Seventeen books from expert recommendation were added to the final list. The total number of books is thirty for the final list.

Obtaining a good list for the Philosophy and Theory of Design section was not predictable or easy. There are many possible reasons that might explain this. First, the books on this list are not commonly read within the design community, since few books relate specifically to a philosophy in design. Many of the books listed are pure science or pure social science. Second, many books are out-of-print and it is difficult to find participants who have read them. Third, there are a large number of added books from participants in our database that do not pass the qualification to be a contributor to philosophy of design. Some books are conjecture rather than philosophy such as *Future Shock* (Toffler, 1999). As a result, we cannot depend only on the consensus from the ranking process and the added books from participants.

## CONCLUSION

The field specific and field combination analyses related to design functions well as an indicator to identify design philosophy books. Nevertheless, many books relate to the philosophy of design only by virtue of serious investigation and interpretation. They do not present the justification of design theory that we mentioned as our goal. With regard to this point, a pattern of design justification can be observed from existing philosophy books in the list that bridge the gap between science and social science, such as *General Evolution Theory* (Laszlo, 1996) or *Return to Reason* (Toulmin, 2001).

Philosophical development in the design discipline is nascent. Since design is a young discipline, the number of philosophers in this field is tiny. Supporting design philosophers is a crucial step to accumulating design knowledge. Design philosophers require a substantial understanding of theory and analytical thinking to prove existing work. If a theory is rejected based on testing or falls short in an examination of its logic, a search for new theory should be launched from knowledge gained from the refuted theory.

Conclusion

This process will create knowledge growth. Although design considers action and result rather than theory verification as its proof, the development of a philosophy remains a requirement to identify the truth of design knowledge. Justified inference and standard validation of design should be established to prove design theory and to confront the problem of ill-defined problem structures mentioned earlier. The list of philosophy books presented here provides many philosophers from other fields that can serve as guides to open new opportunities for thinking about design. Design philosophers can use the existing fundamental framework of philosophy to understand what a philosophy of design might be.

The finding from this research demonstrates that design extends over many disciplines. In conclusion, design as a discipline is a powerful concept, but it should not be a trap to limit design to its own standard of performance that is unique and out of synchronization with other disciplines. This would assure the isolation of Design. Given its synthetic and cross disciplinary nature, design can use existing philosophical ideas to establish its mission to connect and use other disciplinary knowledge as well as generate its own knowledge to effect change in the manmade world.

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	<b>Title: The final list</b>	<b>Author</b>
1	Abductive Inference — Computation, Philosophy, Technology	Josephson, John R.; Josephson, Susan G.
2	Autopoiesis and Cognition: The Realization of the Living	Maturana, Humberto R.; Varela, Francisco J.
3	Communication, Action and Meaning: The Creation of Social Realities	Pearce, W. Barnett
4	Conjectures and Refutations: The Growth of Scientific Knowledge	Popper, Karl B.
5	Critique of Judgment	Kant, Immanuel
6	Design Discourse: History, Theory, Criticism	Margolin, Victor, editor
7	General Evolution Theory	Laszlo, Ervin
8	The Idea of Design: A Design Issues Reader	Margolin, Victor; Buchanan, Richard, editors
9	Knowledge As Design	Perkins, David N.
10	Material Culture and Mass Consumption	Miller, Daniel
11	The Meaning of Things: Domestic Symbols and the Self	Csikszentmihalyi, Mihalyi, et al
12	Mechanization takes Command	Giedion, Sigfried
13	Mind, Language and Society — Philosophy in the Real World	Searle, John R.
14	On the Pragmatics of Communication	Habermas, Jürgen
15	Personal Knowledge	Polanyi, Michael
16	Phenomenology of Communication: Merleau-Ponty's Thematics in Communicology..	Lanigan, Richard L.
17	Philosophical Tools for Technological Culture — Putting Pragmatism to Work	Hichman, Larry A.
18	Philosophy in the Flesh	Lakoff, George; Johnson, Mark
19	Of Problematology, Philosophy, Science and Language	Meyer, Michael
20	Practical Reason, On the Theory of Action	Bourdieu, Pierre
21	Representation and Reality	Putnam, Hilary
22	Return to Reason	Toulmin, Stephen
23	The Sciences of the Artificial	Simon, Herbert A.
24	The Symbol System	Elias, Norbert
25	The Tacit Dimension	Polanyi, Michael
26	Technology and the Lifeworld: From Garden to Earth	Ihde, Don
27	Understanding Computers and Cognition: A New Foundation for Design	Winograd, Terry; Flores, Fernando
28	Understanding Events: Affect and the Construction of Social Action	Heise, David R.
29	Understanding Media - the Extensions of Man	McLuhan, Marshall
30	Utility Reassessed: The Role of Ethics in the Practice of Design	Attfield, Judy, editor

**Table 2** Philosophy of Design Book List



# Bibliography

## Annotated Philosophy and Theory of Design List

### 1 **Abductive Inference — Computation, Philosophy, Technology**

*Josephson, John R. and Josephson, Susan G.*

*Cambridge: MIT Press, 1996*

Based on the work of the logician Charles Sanders Peirce (1839-1914), the authors develop abductive inference. In informal terms, abductive reasoning involves inferring the best or most plausible explanation from a given set of facts or data. The authors argue that knowledge arises from experience by processes of abductive inference in contrast to the view that it arises non-inferentially or that deduction and inductive generalization are enough to account for knowledge. Confidence in an abductive conclusion depends on how decisively the best explanation surpasses the alternatives. Abductive inference is a procedure: collect knowledge from data, match hypothesis, classify and assemble hypothesis. The authors discriminate qualitatively among hypotheses as: belief, guess, potential explanation, explanatorily useless and unbelievable.

A common occurrence in everyday life, it is present in such diverse areas as medical diagnosis, scientific theory formation, accident investigation, language understanding and jury deliberation. The artificial intelligence community has found abduction to be a fruitful research topic. Much AI research is hypothetical so part of the importance of this book is that it reports key discoveries about abduction that have been made as a result of designing, building, testing and analyzing actual working knowledge-based systems for medical diagnosis and other abductive tasks. The book tells the story of six generations of increasingly sophisticated generic abduction machines. The final chapter argues that perception is logically abductive and presents a layered-abduction computational model of perceptual information processing. This book will be of great interest to researchers in AI, cognitive science and philosophy of science.

*Sakol Teeravarunyou*

## 2 **Autopoiesis and Cognition: The Realization of the Living**

*Maturana, Humberto R. and Varela, Francisco J.  
Dordrecht, Holland: D. Reidel Publishing, 1980*

*Autopoiesis and Cognition* is the most fundamental, clear and direct explication of constructivism available. It follows Piaget's psychology. The thesis is that organism's cognitive systems construct the world around them according to their sensory systems. Such organisms operate by actively seeking homeostasis or equilibrium, and alter their internal structure (adapt) according to internal disturbances. Those disturbances are the basis of perception, projection of an outside world, and of self-reorganization, cognitive change, learning and development.

Autopoiesis develops a general theory of ontology and epistemology for individuals and for social systems. It seeks to radically solve problems of truth and knowledge in terms of evolutionary elaboration and pragmatism. For example, meaning is not problematic among participants. It becomes problematic for observers, those who do not share the common context.

The theory is of development and discovery as creative processes. Knowledge is always synthetic — it is constructed by the organism. Thus, knowledge is a historic product. But, because it is based on common neural and physiologic structures, it is not merely culturally relative, but embedded in cognitive structure. This view is called 'critical constructivism.' It underlies Piaget, Vygotsky, and Michael Mahoney, among others. It links cognitivism, Peircian semiotics, symbolic interactionism and ethnomethodology.

*Peter Storkerson*

### 3 **Communication, Action and Meaning: The Creation of Social Realities**

*Pearce, W. Barnett*

*New York: Praeger, 1980*

Pearce starts from: 1) the paradox of recursion that results from stepwise thought and its unintended consequences, e.g., "All cretans are liars and I am a cretan. Therefore, I am a liar," and, 2) from Suzanne Langer's formulation of Cassirer's philosophy of symbolic forms. According to Langer, in the twentieth century, "the triumph of empiricism is jeopardized by the surprising truth that our sense data are primarily symbols. Thus with respect to themselves and the things they purport to represent they are recursive.

According to Pearce, "If the structure [of current thought] is recursive, its content is communication... defined as the process by which persons collectively create and manage social reality." Pearce argues that the twentieth century notion of communication is new: a method of construction and of action (e.g., language games), rather than description. The information society is a result of the discovery of communication: no previous society ever considered communication as important.

Pearce studies communication as a mode of social organization — a play without a director — based on 1) empirical actions as worthy of study; 2) actor's meanings are relevant; actions construct social reality, and; 3) development is the creation of order out of disorder. Thus, awareness of communicative construction presents postmodernism as the dilemma of recursiveness. Pearce builds anatomies of communication as action, communicative competence both in individual and interactive systems and in ritualistic systems. Empirical studies of communicative competence and the social management of meaning are presented demonstrating the operationalization and measurability of the theory.

*Peter Storkerson*

#### 4 **Conjectures and Refutations: The Growth of Scientific Knowledge**

*Popper, Karl B.*

*London: Routledge, 1989*

A collection of lectures and essays, this book illustrates a theory of knowledge formation that is preceded by conjectures and refutations (a theory of trial and error). Through testing our conjectures on theories, we are able to identify mistakes and so better understand the problem that we are investigating. Popper believes that our discoveries are guided by theory rather than that theories are the result of discoveries due to observation. Thus science starts from problems and not from observation; though observations may give rise to a problem. If a theory withstands severe attempts to refute it, the conjecture becomes more credible. A successful refutation of a conjecture is a breakthrough. Popper uses many examples from well-known scientists and philosophers to critique his studies. He applies his thesis to many topics, ranging from philosophy and the history of the physical to historical and political problems. His concepts can be applied to theory building and validation in design.

*Sakol Teeravarunyou*

#### 5 **Critique of Judgment**

*Kant, Immanuel*

*New York: Oxford University Press, 1952*

Aesthetics are always a significant issue in design and how designers make aesthetic judgment is critical. This book is an important work in modern philosophical aesthetics as it draws a bridge between pure and practical reason. Kant, an eighteenth century German philosopher, reflected on aesthetic judgment in terms of the conditions for using judgment and through emphasis in a deep experience of beauty. He illustrates his theory of aesthetics in two parts: Analysis of the Beautiful and Analysis of the Sublime. Beauty is linked to cognition in terms of sensibility, understanding, condition of disinterest and universal validity. Sublime lies beyond the boundaries of sense experience, directing us to form concepts of pure reason. In part two, Critique of Teleological Judgment, he makes a case that the principle underlining all of our judgments relate to our inclination to see purpose and order in nature.

Not an easy read, Kant nevertheless provides excellent explanations of terms in aesthetic and teleological judgment.

*Chujit Jeamsinkul*

## 6 Design Discourse: History, Theory, Criticism

Margolin, Victor, editor

Chicago: The University of Chicago Press, 1989

As an anthology of carefully selected writings in the emerging field of design studies, *Design Discourse* brings together the discussion of design thinking regarding its social and cultural significance to understand what design is and how it functions in society. The essays in this anthology represent design thinking from various fields and disciplines. They are all collected from the first six *Design Issues*, published between 1984 and 1987. These essays are organized into three sections. In the first section, *After the Modernists*, writings are drawn from a postmodernist point of view, a departure from modernist conceptions of design. The second section, *The Interpretation of Design*, focuses on how we give meaning to design. In the last section, *Writing Design History*, the authors provide a new approach by linking design to the issues of economics, power relations and social ideology, instead of traditionally focusing on great designers or designs that have great influence. The essays included in this book provide a diversity of design thinking, yet share a common contribution to a discourse about what design is and how we can interpret it.

*Napawan Sawasdichai*

# 7

## General Evolution Theory

Laszlo, Ervin

Cresskill, NJ: Hampton, 1996

This book has its origins in the twentieth century sciences of complexity rather than the reductionist views of traditional science. It was developed to better understand the behavior of whole complex adaptive systems rather than their elemental parts and, as such, provides helpful insights into the broader sociocultural role of design. Laszlo applies his theory at a high level of abstraction to physical, biological, social and cognitive dynamic systems. It is thus proposed as a 'unifying' theory and accommodates more specific theories like that of Darwin for biological systems. The general principles of Laszlo's work help us to better understand the many complex adaptive systems that increasingly define design practice and its broader sociocultural context.

Laszlo's thinking is useful both to interpret the transitions in design education during the Industrial Age and to predict those most likely as we embrace the Information Age. It is, by nature, an inexact science, but it does provide a theoretical basis for approaching sociocultural change proactively rather than reactively. This latter point is well understood by parts of the systems community, who view design as a sociocultural evolutionary guidance system — an interpretation with truly profound implications.

John Broadbent

# 8

## The Idea of Design: A Design Issues Reader

Margolin, Victor and

Buchanan, Richard, editors

Cambridge: MIT Press, 1995

*The Idea of Design* is an anthology of writings collected from the international journal *Design Issues* as an effort to demonstrate the important shift of focus on how the idea of design is explored in contemporary discourse. It offers a broadening view of design that includes issues and problems that were seldom developed in depth in earlier practices to expand the scope of design thinking. The essays included in this book are examples of design criticism, theory and the exploration of philosophical issues. These essays are assembled into three sections. The first section, *Reflecting on Design*, addresses several themes such as the discipline of design and its relationships with other disciplines, the connections between contemporary and historic ideas and practices and the direction of new practices and research. The second section, *The Meaning of Products*, focuses on how meaning is socially constructed through interactions between users and the manmade world. The last section, *Design and Culture*, addresses the broad relations between design and culture in which designers and communities of users function.

Napawan Sawasdichai

## 9 Knowledge As Design

Perkins, David N.

Mahwah, NJ: Lawrence Erlbaum, 1997

*Knowledge As Design* is a general design ideology for multidisciplinary thinking in education, physics, mathematics and other disciplines. The book illustrates a simple concept of design that is not particularly based on science or art. Four design questions — purpose, structure, model or case and argument — are the main themes of the book. The author distinguishes between knowledge as information and knowledge as design and the book develops many analogies for the four parts. Purpose includes the significance of design and its goal. Structure can be an abstract form (i.e., theory), structure of procedure (i.e., supermarket shopping) or algorithms of arithmetic. Model can be represented as a physical model (i.e., drawing, map or mental model like cognitive processing). Argument is a justification in philosophy of science and informal reasoning (i.e., heuristic and justification). From a design point of view, *Knowledge As Design* assembles a crucial part of these four design elements. A deeper study of this topic will make a tremendous contribution to the philosophy of design.

Sakol Teeravarunyou

## 10 Material Culture and Mass Consumption

Miller, Daniel

Oxford, UK: Blackwell, 1987

Miller investigates the relationship between society and material culture. He proposes a theory of mass consumption as the context through which we relate to goods. The discussion starts with the subject-object relationship at its most abstract philosophical level. From Hegel, Marx and Simmel, the concept of objectification is derived. Objectification is a process of externalization and reabsorption, which is a necessary part of becoming. Continuous objectification makes mass goods an internal part of the process by which we create ourselves, our identities, affiliations and everyday practices. Goods become one of the languages with which we communicate with each other. Their consumption is defined as a “continual struggle to appropriate goods and services made in alienating circumstances and transform them into inalienable culture.” Goods are therefore representations and part of the process of building culture. In the process of establishing a theory of material culture and consumption, the author builds strong links to the work of Veblen, Bourdieu, Baudrillard and Douglas who also recognize goods as objects to be examined in terms of their expressive and symbolic functions. Design and design history is criticized for ignoring these functions of goods and their transformation in the process of consumption.

Suzan Boztepe

## 11

### The Meaning of Things: Domestic Symbols and the Self

*Csikszentmihalyi, Mihalyi and  
Rochberg-Halton, Eugenie  
Cambridge: Cambridge University Press, 1981*

*The Meaning of Things* is an extraordinary study of the cultural meanings between artifacts and people. The authors use theories from semiotics, cultural theory and philosophy to develop research findings from questionnaires, interviews and statistics on domestic objects such as furniture, television and home characteristics. They use history, case studies and theory to support their interpretations. Although the authors mainly work in the context of social science and psychology, the study provides another viewpoint for the meaning of design. The meaning in this book is not usability or fashion, but is the broad meaning of objects in people's minds. This meaning can be cultivated and it requires time and transactions between people and things. The authors clearly distinguish among sign and symbol; object values by action; object values by contemplation; and terminal material value and instrumental materialism. It is interesting to see how design can be involved in the creation and redirection of meaning in a pragmatic sense, guided by moral standards oriented toward the good life for the wider community.

*Sakol Teeravarunyou*

## 12

### Mechanization Takes Command

*Giedion, Sigfried  
New York: Norton, 1948*

When it first appeared, Giedion's book rapidly became, and remains, a classic. He contrasts what he terms 'the ruling taste,' fashionable forms of social display, with 'vernacular' forms, very firmly emphasizing the validity of everyday products against the elite forms of the so-called Fine Arts. The book demonstrates how processes of mechanization have transformed objects in such fields as work, the home and transportation. Yet although an enthusiast for modernity, Giedion was an early member of the modernist movement in Europe, he depicts the results as being mixed. Steam baking transformed bread from being 'the staff of life' into a floppy white substance of dubious nutritional value. On the other hand, domestic improvements in such areas as cooking, heating and sanitation have decidedly brought great benefit. Although inevitably dated in some respects, the illustrations still fascinate and many of Giedion's ideas are highly relevant.

*John Heskett*

## 13

**Mind, Language and Society —  
Philosophy in the Real World***Searle, John R.**New York: Basic Books, 1998*

John Searle, a contemporary philosopher, has three objectives in this brief book: 1) to advance a series of theoretical claims about the nature of mind, language and society; 2) to demonstrate a style of philosophical analysis; and 3) to make observations about the nature of philosophical puzzlement and problems. Going after dualism, his argument takes a biological approach to mind in which subjectivity is inescapable and consciousness is integral to mind and intension. Of particular interest is his distinction between 'observer-independent' and 'observer-dependent' features of the world in a chapter titled *The Structure of the Social Universe*. Throughout the book he gives excellent practical examples of abstract philosophical distinctions. Not an empiricist, he demonstrates a form of logical or conceptual analysis.

*Sharon Poggenpohl*

## 14

**On the Pragmatics of Communication***Habermas, Jürgen**Cambridge: MIT Press, 1998*

Jürgen Habermas, a German philosopher, examines the pragmatics of communication and theories of meaning and action in particular. In contrast to other formal linguistic approaches to communication theory, he anchors communication in a social setting by focusing on dialogue. "The structure of language maintains and renews itself solely through the linguistic community's practices of reaching understanding." Such linguistic agreement allows the participants to coordinate their actions.

This collection of ten articles requires careful reading and study. Familiarity with other philosophical positions such as those of Wittgenstein, Frege, Derrida, Rorty, Searle and others is essential. The bibliography at the conclusion is extensive.

*Sharon Poggenpohl*

15

**Personal Knowledge***Polanyi, Michael**Chicago: University of Chicago Press, 1962*

Written in a critical style, the author attempts to bridge the gap between fact and value, science and humanity. Many examples are drawn from the natural sciences, law, psychology and religion. The theory of knowledge presented here points to the fact that the human condition always shapes knowledge. The author, a distinguished physical chemist and philosopher, demonstrates that the scientist's personal participation in his knowledge in both its discovery and its validation is an indispensable part of science itself. As such the process of discovery and confirmation ultimately rely on one's own accrediting vision of reality or beliefs. Some of man's most important knowledge is tacit, such as the knowledge of how to swim or judge a work of art. The discovery of knowledge is the 'heuristic' function of science. This viewpoint can be applied to design as a means to discover design knowledge and to create a stable framework within which various kinds of knowledge can be justified.

*Sakol Teeravarunyou*

16

**Phenomenology of Communication:****Merleau-Ponty's Thematics in Communicology and Semiology***Lanigan, Richard L.**Pittsburgh, PA: Duquesne University Press, 1988*

Lanigan's treatment seeks to free communication from the lenses of linguistics and other disciplines, and place it in the realm of experience through Husserlian phenomenology, as passed through Merleau-Ponty, whose phenomenology is based on perception as the primary or first mode, thus ground, of meaning. By this method, Lanigan poses a semiotic view, that all knowing or perceiving of things is not grasping the things in themselves, but grasping them in terms of determinate forms or signs, i.e., knowing or perceiving 'as.' Unlike semiologists such as Saussure and Kristeva, Lanigan's 'knowing as' is not linguistic. Rather it is in terms of an immanent perceived cognitive object. Rhetorical invention, for example, creates cognitive objects that are shared by speakers and receivers.

Lanigan gives a general and historical introduction to his approach including descriptions of theories of Jaspers, Heidegger, Husserl, Schutz, Habermas and Merleau-Ponty.

*Peter Storkerson*

## 17

**Philosophical Tools for Technological Culture — Putting Pragmatism to Work***Hichman, Larry A.**Bloomington: Indiana University Press, 2001*

Technology is parsed into: techniques, tools and artifacts; systems; applications of science; and techniques of inquiry. This very broad and inclusive understanding of technology based on human physical and intellectual extensions anchors its meaning in human activities. Within this viewpoint, philosophy has a unique role in reconstructing and tuning up technology. The role of the philosopher is to challenge technological determinism and provide fresh ideas to help technical specialists determine whether their cherished ideas and values are in fact appropriate to changing life circumstances. Strong reference is made to Peirce, James and Dewey. Philosophies of action (praxis philosophies) and philosophies of production (productive pragmatism and pragmatic instrumentalism) are examined as tools for cultural renewal. While the text is accessible, Hickman cites many contemporary philosophers. This is either a source of frustration for the reader or an impetus to further exploration using the bibliography at the end.

*Sharon Poggenpohl*

## 18

**Philosophy in the Flesh***Lakoff, George and Johnson, Mark**New York: Basic Books, 1999*

This is an attempt to heal centuries of mind-body dualism in Western philosophy. Lakoff, a linguist, and Johnson, a philosopher, team up in this sizeable book (600 pages) to explore the philosophical past and the cognitive and neuroscience present to effect an understanding and readjustment in thinking. Taking on the classic philosophical problem of 'what is real,' the authors establish knowledge of the world through our existence as embodied creatures with sensorimotor contact with the world as well as mental reflection in relation to it. Metaphor figures prominently in the analysis, as physical relationships are mapped to more subtle and abstract ones, linking bodily experience to mind. The last section of the book clearly compares and contrasts previous philosophical approaches to a more cognitive and biological science approach: disembodied reason is compared to embodied reason; literal reason to metaphoric reason; radical freedom to limited freedom; and objective morality to embodied morality.

The extensive reference list at the end divides into five sections: Cognitive Science and Cognitive Linguistics; Neuroscience and Neural Modeling; Philosophy; Other Linguistics; and Miscellaneous. Some sections are more finely divided.

*Sharon Poggenpohl*

## 19 **Of Problematology, Philosophy, Science and Language**

*Meyer, Michael*

*Chicago: University of Chicago Press, 1995*

Questions are fundamental to philosophical pursuits according to this author. Reason is identified with the question-answer process. The author argues that after Socrates, Western philosophy became mistakenly engaged with answers. The author critiques Socrates, Plato, Aristotle, Heidegger, Wittgenstein and Foucault in the process of making of his argument.

"...recent work in rhetoric points toward a theory of radical questioning and claims that the methods of rhetoric and argumentation must be turned back on philosophy itself in order to recover the original significance of metaphysics as the science of ultimate questions." Written from a strong philosophical perspective, the chapters on What is a Philosophical Problem, Dialectic and Questioning and From Propositional Rationality to Interrogative Rationality are a useful foundation for those formulating design research questions.

*Sharon Poggenpohl*

## 20 **Practical Reason, On the Theory of Action**

*Bourdieu, Pierre*

*Palo Alto, CA: Stanford University Press, 1998*

Based on three fundamental concepts:

1) habitus, the global social space characterized by forces and struggles in which agents confront each other with various means and ends; 2) field, a space of dispositions in which groups are relationally located; and 3) capital, various kinds of investment concentration as in economic, cultural, symbolic, political, public, etc.; Bourdieu is interested in a science of social relations. His approach to sociology is to challenge naive realist readings of social life and instead to examine each practice as an instance in a pattern of substitutable practices.

He is concerned with patterns of consumption and lifestyle and uses his ethnological fieldwork in many countries to establish pattern. The overall goal is a philosophy of action that reveals often hidden patterns of social relationship from the institution down to the individual. He is at his best when revealing tacit agreements between institutions and individuals or among individuals.

The book consists of seven essays based on lectures and addresses given between 1988 and 1994. Chapters of considerable interest to design and particularly those engaged in planning are: chapter 1, Social Space and Symbolic Space; chapter 2, The New Capital; and chapter 5, The Economy of Symbolic Goods.

*Sharon Poggenpohl*

## 21 Representation and Reality

*Putnam, Hilary*

*Cambridge: MIT Press, 1988*

This book starts from Putnam's rejection of the computational model of human cognition proposed by Chomsky and others. Putnam wishes to establish the connection between meaning and the fixation of belief as a holistic and social process and to demonstrate that meanings cannot be isolated from each other. Meaning is a general judgment relying on our domain beliefs, and is a series of negotiations including equivocations, benefit of the doubt, and 'charity' by which we negotiate between concepts as paradigms or frames for the perception of particular events or entities as ostensions.

Putnam asserts and refutes three major assumptions of representation theory: 1) Every word one uses is associated in the mind of the speaker with a certain mental representation; 2) Two words are synonymous (have the same meaning) just in case they are associated with the same mental representation by the speakers who use those words; 3) The mental representation determines what the word refers to, if anything.

Putnam proposes a pragmatic realism: "The important thing, it seems to me, is to find a picture that enables us to make sense of the phenomena from within our world and our practice, rather than to seek a god's-Eye-View." He calls this 'internal realism.' Internal realism is an epistemic relation between conceptualization and ostension which can be at any time stable, but which can also be subject to stepwise transformation as either can change and force adaptations in the other. It is historical, dependent upon behavior and context.

*Peter Storkerson*

## 22

### **Return to Reason**

*Toulmin, Stephen*

*Cambridge: Harvard University Press, 2001*

From the perspective that rhetoric and logic represent an inseparable practice in which the former is situational and the latter is intellectual, Toulmin argues that the current dominance of rationality needs to be counterbalanced with reasonableness. Rationality is based on scientific method, mathematics and abstraction, while reasonableness is based on humane judgments relating to personal experience and practice. The argument is set in an historical context that explores the invention of disciplines, developments in philosophy and science, ideas of ethical theory and moral practice and the quest for certainty. There are strong ties to John Dewey and Donald Schön and to the foundation of user-centered design running through this book.

*Sharon Poggenpohl*

## 23

### **The Sciences of the Artificial**

*Simon, Herbert A.*

*Cambridge: MIT Press, 1969*

Herbert Simon pioneered the study of the artificial. Natural sciences describe 'natural' objects and phenomena. The sciences of the artificial describe artifacts that result from human intervention in the natural world. According to Simon, artifacts are not exempt from natural law but are adapted to the environments in which they operate. Artifacts are aimed at satisfying human purposes and they are conceived in the human activity called design. Simon defines design as the human capacity concerned with envisioning how things ought to be and devising artifacts to attain goals. Based on this definition, everyone who devises courses of action aimed at changing existing situations into preferred ones is practicing design. This understanding not only challenges traditional definitions of design as a technical activity, but also puts design at the core of all professional training. Simon suggests that schools of engineering, as well as schools of architecture, business, education, law and medicine, are all centrally concerned with the process of design.

*Carlos Teixeira*

## 24 The Symbol System

*Elias, Norbert*

*Newbury Park, CA: Sage Publications, 1991*

Elias builds a constructive, historical and evolutionary sociology of knowledge based on social systems and social organization. Human beings are at all times, sensory, behavioral, symbol using, social and cultural. The analysis of behavior and the design of artifacts must encompass all of these domains.

There are three major themes: language, knowledge and thought. Communication is viewed as embedded in behavior, especially social behavior as a non-coercive method for coordinating action. The separation of the symbolic and behavioral worlds, and the social and natural worlds is denied through a historical, evolutionary bio-sociology. Elias' view is embodied — language is sounds and gestures and emerges out of earlier forms of behavior. This is demonstrated by the importance of sound and gesture in early childhood language acquisition and the relative difficulty of learning languages in later life. Language extends perception to the experiences of others. The integration of behavior, language and thought builds an historical sociology of knowledge as a social artifact. He sees his role as following Comte and Hegel, to "break away from the stationary character of the philosophical view of knowledge."

*Peter Storkerson*

## 25 The Tacit Dimension

*Polanyi, Michael*

*Gloucester, MA.: Peter Smith, 1983*

In recent years, a reaction against the dominant emphasis on quantitative methodology in some disciplines has been reflected in growing awareness of the value of tacit knowledge. Michael Polanyi's book is generally acknowledged as the major source of this awareness. In its opening pages, he writes: "... we know more than we can tell. ... So most of this knowledge cannot be put into words." Polanyi juxtaposes tacit with coded knowledge, the kind that can be written down and communicated, that is also valuable, but not the whole story. Tacit knowledge is embodied in skills acquired through learning by doing, which cannot be explained adequately or replaced by theory. For example, we know how to ride a bicycle but have difficulty in describing how to do it for someone else. It is difficult to underestimate the importance of this book for understanding the nature and value of much design knowledge. It is much more than a tract for designers, however, for Polanyi writes profoundly of a vision of how knowledge can lead to personal fulfillment in the context of social commitment. Read it, and return to it, often!

*John Heskett*

## 26 **Technology and the Lifeworld: From Garden to Earth**

*Ihde, Don*

*Bloomington: Indiana University Press, 1990*

The purpose of this book is to make visible the ways in which technologies create new experiences which shape human beings as sentient and cognitive creatures. This view is in opposition to the product design notion of artifacts as tools employed by humans, or even as mere cultural artifacts or expressions.

There are three programs: 1) phenomenology of technology as a mode of individual experience; 2) cultural embedding of technology relations; 3) postmodern multicultural topography as a techno-cultural byproduct. Technology is the man-built universe in which we live, and in which all experience becomes enmeshed. From this standpoint non-technological experiences are transformed as, for example, in nature 'museums' or parks. But, technology has always been integral to human existence. While Ihde does not accept the natural-artificial distinction, he accepts that technology changes the nature of the human being by producing new modes of thinking. The technological mediation is experiential – behavioral - pragmatic and hermeneutic - semiotic. Experience is always of something. Technologies create and organize perceptions as experiences and in semiotic terms function as mediators between human beings and the world.

*Peter Storkerson*

## 27

**Understanding Computers and Cognition:  
A New Foundation for Design**

*Winograd, Terry and Flores, Fernando  
Norwood, NJ: Addison Wesley, 1987*

This book provides a new environment for understanding not only what computers do, but also how they function in the context of human language, thought and action. The authors present three important parts: 1) the theoretical background dealing with fundamental questions in relation to essential understanding of computers and cognition from philosophical and biological standpoints; 2) an understanding about computation, thought and language through illustrating what is currently being done and in anticipation of future developments in terms of what computers do; and 3) the orientation to design based on the theoretical background they develop. The authors view designing as ontological. Interventions take place through designing and changing existent ways of being in the world. Through the collaboration of two authors with totally different backgrounds, one is in computer science and artificial intelligence research while the other is in social and political organization, this book goes beyond the specific issues of what computers can or can't do. It offers an extended viewpoint from the traditional engineering-based foundations that have provided a fertile background for developing new technology to an adequate understanding of what computer devices do in the human context.

*Youn-kyung Lim*

**Affect and the Construction of Social Action***Heise, David R.**Cambridge: Cambridge University Press, 1979*

Human behavior, including communication and human computer interaction, is determined by institutional contexts: activities, roles, projects and outcomes, as interpreted and carried out by participants according to their understandings, as cognitively processed by them as individuals.

Interpretive sociology — ethnomethodology, symbolic interactionism, etc. — operationalize situational conduct into events and actions by individuals, often according to 'turn taking' patterns of interaction by which participants collaborate to construct the activities they perceive as transcendental. One major issue is the integration of affect with non-affective process, i.e., logic. According to Affect Control Theory, affect appears in the context of turn-taking behavior as the method for steering interaction according to institutional context or activity.

Heise's goal is "development of an interpretive sociology formulated with mathematical rigor, grounded in empirical procedures, and permitting complex and subtle analysis of social relationships." Analysis includes cognitive psychology focusing on situational definitions, mechanisms controlling interaction and the role of affect in constructing reactions. A mathematical model is proposed for quantitatively operationalizing affect control theory as an observational and experimental framework for objectively analyzing roles and role oriented behavior within specific contexts.

*Peter Storkerson*

## 29

**Understanding Media - the Extensions of Man***McLuhan, Marshall**Cambridge: MIT Press, 2001*

Originally published in 1964, the author was widely regarded as a visionary. Now many editions later, the media McLuhan so enthusiastically discussed, print, photography, games, telegraph, typewriter, telephone, phonograph and television to mention a few, seem quaint. However his thesis about media being extensions of human sensory systems remains important. Also important is his observation that "In the electric age we wear all mankind as our skin." The discussion of cultural transformations from tribal to civilized and the effect media has on our nervous system and intellectual life remain provocative. Perhaps Negroponte is to the digital age what McLuhan was to the electronic. For the media now are quite different, but the effects remain formidable. This book is best read with a view to history as the author's pseudoevent can be seen to foreshadow the postmodern spectacle; mass media can be seen to yield to interactivity; and an early form for the information society can be glimpsed. It is entertaining to consider what McLuhan would make of cellular phones, email, video games, the web, media convergence and star wars.

*Sharon Poggenpohl*

30

**Utility Reassessed:**

**The Role of Ethics in the Practice of Design  
(Studies in Design and Material Culture)**

*Attfield, Judy, editor*

*Manchester: Manchester University Press, 2001*

This collection of essays defines and reassesses the concept of Utility. Using it as a touchstone for consideration of the place of ethics in the recent history of design, the collection offers an entrance into the issues that concern design decision-makers today. It reveals a fresh perspective on the philosophy behind the concept of Utility, and as a design theory, it offers a critique of the dangers of 'good design.' Rather than arguing about the inadequacies of modern functional design, it approaches the subject as a continuing history that has attempted to improve the human condition, through a process of rational thought in the construction of the material world. Using the history of utility as a design theory, the book suggests ways in which the past can teach us something of the present, and reveals why, on the cusp of the new millenium, utility is so relevant. The contributors are distinguished design historians and specialist researchers from some of the leading centers of design studies in Britain, Scandinavia and the United States, including Jonathan Bell, Julian Holden, Pat Kirkham, Paddy McGuire, Graham McLaren, David Crowley and Jonathan Woodham.

*Carlos Teixeira*

Transforming Qualitative Information; Thematic Analysis and Code Development  
 Real World Research: A Resource for Social Scientists and Practitioner-Researchers  
 Redefining Designing: From Form to Experience  
 Research Design: Qualitative and Quantitative Approaches  
 Protocol Analysis: Verbal Reports as Data  
 Qualitative Data Analysis: An Expanded Sourcebook  
 Qualitative Research Methods for Social Science  
 Notes on Synthesis of Form  
 A Practical Guide to Behavioral Research  
 How to Write and Publish a Scientific Paper  
 Inquiry by Design: Tools for Environment-Behavior Research  
 Investigating Communication: An Introduction to Research Methods  
 Grounded Theory Methodology: An Overview  
 Handbook of Visual Analysis  
 How Designers Think: The Design Process Demystified  
 Developments in Design Methodology  
 Engineering Design Method: Strategies for Product Design  
 Ethnography: Principles in Practice  
 Content Analysis: An Introduction to Its Methodology  
 Contextual Design: Defining Customer-Centered Systems  
 The Craft of Research  
 Design Methods  
 Case Study Research: Design and Methods  
 Collecting and Interpreting Qualitative Materials  
 Constructing Social Research: The Unity and Diversity of Method  
 Against Method  
 Analyzing Design Activity  
 Against Method  
 Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory  
 Analyzing Design Activity

# P r i n c i p l e s

**Building a Foundation for Design Research Methods is one of the three sections of the Annotated Design Research Bibliography. Design is a hybrid activity that encompasses many disciplines beyond itself, which blend depending on the nature of the research project. To support a range of design research activities, thirty books listed in this section embrace research principles and methods from general to specific research content and practice across three levels of design research: basic research, applied research and clinical research. The content in the book lists demonstrate methodologies from many design research perspectives, from those with a social science focus to those with a science orientation, to those that build method from a design perspective. The research method guidance in these books is useful for both design researchers and design practitioners who are interested in building a body of design knowledge.**

*and*

# Methods

**Perspectives on Building a Foundation  
for Design Research**

*Chujit Jeamsinkul and Napawan Sawasdichai*

**&**

**Annotated Principles and Methods  
of Design Research List**

# Perspectives on Building a Foundation for Design Research

**OVERVIEW**

## Definitions, perspectives and roles of design research

Design is an especially broad field with a mixture of both practical activities and theoretical knowledge overlapping several professions and sciences. Design research is as faceted as design itself, and varies according to what aspects of design are investigated (Sevaldson, 2000). Research is systematic enquiry, the goal of which is knowledge (Archer, 1981). Many perspectives on design research are explored methodologically in this section from those with a social science focus to those with a science orientation to those that build method from a design perspective.

According to Nigel Cross in his article: Design/Science/Research: Developing a Discipline, design research must be the development, articulation and communication of design knowledge. His taxonomy of the field of design research has three categories, those based on people, processes and products. The first one is design epistemology, which is the study of designerly ways of knowing. The second is design praxiology, which is the study of the practices and processes of design. The third is design phenomenology, which is the study of the forms and configurations of artifacts.

One focus of design research is the scientific study of processes and knowledge of design. Another focus is to develop theories, methods and tools to enhance the quality of design practice based on the body of knowledge developed by the scientific study (Sato, 2000). Theory, method, and tool are interrelated; they stand in either weak or strong relationship to each other. For example, methods are implicitly or explicitly based on theory, or in some cases, untheorized observation of practice, while the building of a tool requires a methodological basis. Theory develops abstract principles that explain a set of facts in relation to one another. Method sets a systematic procedure, technique or mode of inquiry, tool is an instrument that assists in the performance of an operation (Poggenpohl, 2000). Theories, methods and tools are all legitimate outcomes of design research.

### **Classification of design research**

From the article *Design Research and the New Learning* (Buchanan, 2001) and also the conversation in PhD-Design listserv led by Ken Friedman with participation by William Gilles, Terrence Love, Chris Rust, and others, (PhD listserv, 2001), three levels of design research can be identified: basic research, applied research and clinical research. They are defined as follows.

Basic research, also called pure research, is a search for fundamental knowledge. This level of research seeks theories or laws explaining why things operate as they do, or even why they are as they are (Friedman, 2001). The focus of developing the research instrument is to gather information in as generalizable a manner as possible, without taking into account specific applications for the findings. Basic research produces general theories that must be reworked for use in applied situations (Love, 2001). Because it seeks to establish significant facts and connections in our experience of design, this level is the most difficult and critical to the future of the design field (Buchanan, 2001).

Applied research focuses on how to do things in general (Friedman, 2001). This level of research undertakes to find results that are useable across many situations. The intention of undertaking applied research is to develop theories that can be used to help practitioners predict the future in particular situations (Love, 2001). With the disposition that this applied research could establish connections among many individual cases, this level is critical to advance understanding of design (Buchanan, 2001).

Clinical research is the examination of specific cases (Friedman, 2001). This level of research examines a particular situation to solve a problem in that situation. Clinical research is applied research in a specific context. The findings of clinical research are specific to the particular 'case' or project in which it is undertaken. The research instruments are created to gather information specific to the problem being addressed. The findings of clinical research cannot usually be directly applied to other situations because of the specificity of the situation from which information is gathered and the limitations of the research instrument(s) (Love, 2001). This research level is most recognized by designers and design researchers and is the most used (Buchanan, 2001).

However those three levels may interact and influence each other. Some research may fulfill both basic and applied functions, or applied and clinical. Clinical problems can suggest basic questions. Basic discoveries can inform applications. Applications feed queries to basic research and to clinical research, as well as provide solutions to problems (Friedman, 2001).

## Focus and scope of principles and methods of design research

Even though the design discipline has some design method literature that is largely used to facilitate the creation of a solution or product in practice, there is little literature that establishes methods for design research to use in its construction of design knowledge. Design is a hybrid activity that encompasses many disciplines beyond itself, which blend depending on the nature of the research project. A rich diversity of research methods is available for the field of design, but they are adapted from other fields such as natural science, social science, technology and the humanities; new methods developed expressly for design are under development.

The issue of using research methods developed for and in other fields without examining their transfer to design is a cause for concern among some design researchers. The underlying philosophical perspective, the original research goals of the host discipline and the relation to design research needs are all opportunities to more deeply understand research paradigms in general and design's research orientation in particular.

This section concentrates on selecting books that contain appropriate methods for design research. Methods for use only in design practice do not appear in this section. However, methods for design research and practice can and do overlap as there is often no clear distinction between them. The degree to which practice engages in research is variable; likewise some research quickly seeks practical demonstration of its findings to establish its validity.

## RESULT AND DISCUSSION

The initial books were selected from several sources as follow;

- References from articles in Section 2: Principles and Methods of Design Research, *Proceedings of the conference: Doctoral Education in Design: Foundations for the Future* 8-12 July 2000, La Clusaz, France, edited by David Durling, Ph.D. and Ken Friedman, Ph.D.
- *A Bibliography of Design Research Methods and Applied Methodology* by Charles L. Owen, June 1995
- Library search engine at the Illinois Institute of Technology and the University of Illinois at Chicago
- Commercial search engines such as Amazon.com, Barnes & Noble.com and publisher websites

For the initial list of forty-eight books, the following criteria was used for evaluation:

1. Book content has potential relevance for use in design research activities
2. Both general and specific research methods are covered
3. Books are frequently mentioned and referred to by design researchers

Seventy-five participants in the design community ranked the list of forty-eight books selected for the methodology section. The result of the ranking showed that not many designers are interested in the domain of design research methods. They are more concerned with methods for design practice. This is no doubt why the ranking results are higher for books about methods that could also be used in design practice than methods that focus only on design research. Moreover, particular methods for design research are not well established. Most of the methods are borrowed from other disciplines such as science, technology and engineering, and business depending on what aspect of research is in question. These are possible factors for the results in this section being lower than in the other two sections.

## Results from ranking

High ranking involved a positive response to the following four categories: read the book, heard about the book, know the author(s) and recommend the book.

The books that participants ranked highest in this section are:

1. *Design Methods* by Jones (1970, 1981, 1992)
2. *Notes on the Synthesis of Form* by Alexander (1964)
3. *Developments in Design Methodology* by Cross (1984)
4. *Contextual Design: Defining Customer-Centered Systems* by Beyer and Holtzblatt (1997)

**Design Methods** by J. Christopher Jones is both the most read and most highly recommended by the design community. He is known as a founder of the design methods movement. This book has been praised and widely translated into Japanese, Russian and Spanish. According to the field-keyword analysis, the fields that would strongly benefit from this book are technology engineering, architecture and industrial design. Intentionally focused on creative projects, the book is applicable to design research as well.

**Notes on the Synthesis of Form** by Christopher W. Alexander is highly ranked in all four categories: read, heard, known author and also recommended by design community. He explored a method of dealing with complexity in design by organizing structure through relationship and hierarchy. His theory underpins many computer-aided design programs. The author also had another high-ranking book, *A Pattern Language*, in the Theory and Practice section.

**Developments in Design Methodology** by Nigel Cross, a well known author, is highly read and recommended by the design community. Engaged in design research since the 1960s, his lectures and publications have received worldwide attention in the design community. Beside having an outstanding reputation, this book might be highly ranked because it can serve as a guide for researchers who are interested in developing design methodology. According to the field-keyword analysis, the fields that relate to this book are architecture and industrial design.

**Contextual Design** by Hugh Bever and Karen Holtzblatt is highly regarded in the design community. This book provides underlying principles and methods for how to apply a user-centered approach to business and design by showing how data gathered from one's work can drive the definition of a product or process. This important bridge between knowledge from researchers and designers and its transfer to practice might be the reason why this book is considered relevant by the design community. According to the field-keyword analysis, the fields that strongly relate to this book are technology, engineering, business and communication design.

From the ranking result, most books that have high ranking are classic with the exception of *Contextual Design* which is very new, but despite this the authors are remarkably well known and respected in the design community.

## Field-keyword analysis

The percentage of the field-keyword distribution in this section is as shown below:

	Natural science	Social science	Technology science	Business	Education	Architecture	Industrial design	Visual design
Original list	18.64	42.37	16.94	8.47	1.69	3.38	1.69	6.77
On-line ranking	14.28	38.09	14.28	9.52	0	9.52	4.76	9.52
Recommended books	0	75	0	0	0	0	25	0
Added-recommended	0	50	0	0	0	0	50	0
Added by experts	10.52	36.84	5.26	5.26	21.05	5.26	0	15.78
Final list	10	32.50	10	2.50	10	12.50	10	12.50

**Table 1** Field-keyword Analysis

Based on the field-keyword analysis, the books in the original list are highly related to social science, natural science and technology. Since these disciplines have a well established body of knowledge, most of the research method books found from a literature reference perspective fall into these fields. Other books included in the original list relate to business, visual communication, architecture, industrial design and education respectively.

The web survey included as participants those interested in design at an advanced education or research level, consequently their response was substantial with regard to books related to design disciplines, with less response to books related to science. As a result, books in the design discipline as well as business and education were intentionally selected in the first round of bibliography development in an attempt to even the distribution of books among different disciplines.

The books included in the final list relate strongly to social science. Since most of the research methods used in design research, particularly in user-centered design, are borrowed from social science, these books are recognized by many scholars practicing design research. Other selected books are distributed among architecture, visual communication, technology, education, natural science, industrial design and business respectively. (See table 2, p. 172-173.)

### Observation on the methods

As this section had a relatively low response in the ranking process, additional books were needed to complete the list. These additional books were recommended by those actively engaged in design research such as the Ph.D. community at the Institute of Design, IIT and other scholars who work in design research or education. Most of these books relate to social science and education; some fall into the category of visual communication and natural science.

## Final book selection

The final selection includes fifteen highly ranked books among a total of thirty books. Few of them are in the design discipline, most are in social research. Another fifteen books were added that are in the design discipline. The additional books came from book recommendations from participants in the original recommendation process on the web and from the Institute of Design's "Search[re]Search" website ([www.ir.iit.edu/id](http://www.ir.iit.edu/id)). The final book list was refined by consulting experts in the domain of design research and balancing the entries equally to various design research methods and disciplines. Eleven books in natural science, twenty-five books in social science, ten books in technology and engineering, four books in business, one book in education and seven books in creative and applied art (note: some books are in more than one discipline) are on the final list. Related to Nigel Cross's taxonomy of the field of design research mentioned earlier, some of the books listed in this section can crossover in all three categories: design epistemology, design praxiology and design phenomenology. Some books relate more to specific categories depending upon the research content and the levels of design research in terms of basic research, applied research or clinical research.

**CONCLUSION**

# Design

From our study of the book ranking survey and book recommendation process by the design community, the highest percentage-ranking books in this section are in social science. This could be interpreted in two ways; either we have few methods established to directly support design research or those methods are not explicitly published and widely accessible to design researchers. As a result, to conduct design research, we need to borrow research methods from other disciplines that have more expertise in research activity such as social science and natural science. However, different disciplines have different goals and philosophy regarding research and the research methods needed to approach their goals, let alone differences in subject or content. If design researchers rely only on borrowed methods from other disciplines, the knowledge obtained from the research results might not directly be applicable to designers in practice. Some methods might need to be modified and adapted in order to be more suitable to the content and goals of design research.



Therefore, the research methods used particularly for design research activity should be structurally established and documented, which can be achieved by the collaboration of designer-researchers with various expertise from different disciplines such as design, social science, natural science or business. In order to develop design research methods that serve this discipline's particular needs, we need to observe: what research questions design researchers explore and how design researchers structure and conduct their research in order to develop research methods that are more appropriate to design in terms of its context, process and goal. In the end this would unite research with design practitioners more seamlessly.

Furthermore, since each research contains particular goals and processes that lead to different method use, these methods should be developed with contemplation of their appropriateness in different categories of design research activity: design epistemology, design praxiology and design phenomenology, as well as considering their effectiveness as applied to different design research levels: basic research, applied research and clinical research.

In order to structurally establish the principles and methods of design research, this dilemma calls for contribution from both design practitioners and researchers. Understanding this need in design culture, researchers could position their research interest in a direction valuable to the world of practice as also discussed in the Theory and Practice section.

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	<b>Title: The final list</b>	<b>Author</b>
1	Against Method	Feyerabend, Paul K.
2	Analyzing Design Activity	Cross, Nigel; Christians, Henri, editors
3	Basics of Qualitative Research: Techniques and Procedures for Developing...	Strauss, Anselm; Corbin, Juliet.
4	Case Study Research: Design and Methods	Yin, Robert K.
5	Collecting and Interpreting Qualitative Materials	Denzin, Norman K.; Lincoln, Yvonna S., editors
6	Constructing Social Research: The Unity and Diversity of Method	Ragin, Charles C.
7	Content Analysis: An Introduction to Its Methodology	Krippendorff, Klaus
8	Contextual Design: Defining Customer-Centered Systems	Beyer, Hugh; Holtzblatt, Karen
9	The Craft of Research	Booth, Wayne C., et al
10	Design Methods	Jones, John Christopher
11	Developments in Design Methodology	Cross, Nigel, editor
12	Engineering Design Method: Strategies for Product Design	Cross, Nigel
13	Ethnography: Principles in Practice	Hammersley, Martyn; Atkinson, Paul
14	Grounded Theory Methodology: An Overview	Strauss, Anselm, et al, editors
15	Handbook of Visual Analysis	van Leeuwen, Theo; Jewitt, Carey
16	How Designers Think: The Design Process Demystified	Lawson, Bryan
17	How to Write and Publish a Scientific Paper	Day, Robert A.
18	Inquiry by Design: Tools for Environment-Behavior Research	Zeisel, John, et al, editors
19	Investigating Communication: An Introduction to Research Methods	Frey, Lawrence R., et al
20	Notes on Synthesis of Form	Alexander, Christopher W.
21	A Practical Guide to Behavioral Research	Sommer, Barbara; Sommer, Robert
22	Protocol Analysis: Verbal Reports as Data	Ericsson, K. Anders; Simon, Herbert A.
23	Qualitative Data Analysis: An Expanded Sourcebook	Miles, Matthew B.; Huberman, A. Michael
24	Qualitative Research Methods for Social Science	Bero, Bruce Lawrence
25	Real World Research: A Resource for Social Scientists and Practitioner-Researchers	Robson, Colin
26	Redefining Designing: From Form to Experience	Mitchell, C. Thomas
27	Research Design: Qualitative and Quantitative Approaches	Creswell, John W.
28	Scenario-based Design: Envisioning Work and Technology in Systems Development	Carroll, John M.
29	System Thinking: Managing Chaos and Complexity: A Platform for Designing...	Gharajedaghi, Jamshid
30	Transforming Qualitative Information: Thematic Analysis and Code Development	Boyatzis, Richard E.

**Table 2** Foundations for Design Research Book List

## Field-keyword Analysis

## On-line Survey \*

	Nature Science	Social Science	Technology Science	Business	Education	Architecture	Industrial Design	Visual Communication	Heard	Known Author	Read	Recommend
	■						■		○	○	○	○
	■	■							•	•	○	○
		■							○	○	○	○
		■							•	•	•	•
					■			■				
			■		■			■	○	○	○	○
			■			■	■		○	○	●	●
			■			■	■		○	○	○	○
		■					■		○	○	○	○
		■						■				
		■							○	○	○	○
		■			■				○	○	○	○
		■			■			■	•	•	•	•
		■				■	■		○	○	○	○
		■						■				
		■			■				○	○	○	○
		■							○	○	○	○
	■	■				■			○	○	○	○
			■					■				
	■			■								
		■										

\* The on-line survey produced limited information regarding the Foundations for Design Research selection

### Legend

- 
- 
- 
- 
- 

### Response

- 0
- 1-3
- 4-6
- 7-9
- 10-13

# Methods

## Annotated Principles and Methods of Design Research List

### 1 Against Method Feyerabend, Paul K. London: Verso, 2000

In its seventh printing, *Against Method* continues to be a lightning rod for controversy. The author is a philosopher of science, able to examine the history of science with a critical eye as well as launch a serious argument. He argues that scientific discovery does not proceed by strict rules: "...the history of science will be as complex, chaotic, full of mistakes, and entertaining as the ideas it contains, and these ideas in turn will be as complex, chaotic, full of mistakes, and entertaining as the minds of those who invented them."

His discussion ranges across the relationships between hypothesis and observation, observation and appearance, observation and its representation, fact and experimental result, theory and fact. Social aspects of acceptance or rejection of new ideas is not ignored. Likewise the hidden influence of past ideas that unwittingly color fact or cloud judgment are also acknowledged. His extended example is the development of the Copernican point of view from Galileo to the twentieth century. (Without at least a little knowledge of astronomy and history, the example may be hard to follow.)

Feyerabend enthusiastically cites John Stuart Mill's *On Liberty* several times — so he can't be all bad — but he is a provocateur.

Sharon Poggenpohl

## 2 Analyzing Design Activity

*Cross, Nigel and Christians, Henri, editors  
New York: John Wiley & Sons, 1997*

A collection of Protocol Workshops in the area of research in Design Thinking, this book states that there is no general understanding of protocol studies as a standard procedure. As a result, the book assembles different views of protocol analysis from many leading researchers. They combine different types of methods, techniques, tools and frameworks for protocol analysis and use activity based models, linkography, decision trees, observation, neural networks, design rationales, function-behavior-structure models and others for investigation. This book illustrates that the protocols seem to be a general method that can be used with different concepts and techniques and both qualitative and quantitative data. Written in a research style and using the same case study throughout, a mountain bicycle and backpack, it compares different research approaches. The authors include a discussion of the properties and limitations of protocol analysis as a research technique for analyzing design activity and accumulating design knowledge.

*Sakol Teeravarunyou*

## 3 Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory

*Strauss, Anselm; Corbin, Juliet.  
Thousand Oaks, CA: Sage Publications, 1998*

Anselm Strauss with Barney Glaser wrote the book that defined and established Grounded Theory as one of the more used methodological strategies in qualitative research. This work represents Anselm Strauss' ideas on what Grounded Theory is and how it should be carried out. (After their initial collaboration, Strauss and Glaser each developed their own version of this theory.)

The intent of Grounded Theory is to create theory through the analysis of qualitative data. The emphasis of the book lies in giving the reader the necessary analytical tools to step through the process of making theory. "...We are referring not to the quantifying of qualitative data but rather to a nonmathematical process of interpretation, carried out for the purpose of discovering concepts and relationships in raw data and then organizing these into a theoretical explanatory scheme..."

The book is divided into three parts: the first covers what is necessary for doing this form of grounded theory; the second part deals with specific analytic techniques and procedures; and the last part contains issues that relate to what comes after completing the analysis.

*Roberto Holguin*

## 4 Case Study Research: Design and Methods

*Yin, Robert K.*

*Thousand Oaks, CA: Sage Publications, 1994*

Design researchers sometimes find themselves dealing with current phenomenon when the boundaries between context and phenomenon are not clear. Case study is a method appropriate for such situations. It uses multiple sources of evidence in order to answer 'how and why' questions. As the researcher has little or no control over events, case study as a scientific research method has been viewed with suspicion. Yin provides guidelines for case study as a reliable and valid research method that can be used for theory building and testing. All stages of case study research from research problem definition through reporting are thoroughly described and exemplified. The author also points to different strategies for single and multiple case studies. Lacking a clear and common understanding of what should constitute design case study, Yin's framework is highly valuable for design researchers.

*Suzan Boztepe*

## 5 **Collecting and Interpreting Qualitative Materials**

*Denzin, Norman K. and Lincoln, Yvonna S., editors  
Thousand Oaks, CA: Sage Publications, 1998*

Part of a collection of what was formerly the *Handbook of Qualitative Research*, this version was divided to make it a better fit for the teaching environment. The purpose of this volume is to introduce the basic methods of gathering and analyzing qualitative data. The methods included are the expected fundamental ones for qualitative research; this is not an exhaustive collection or description of all possible methods. In two parts, part one moves from interviewing to observation; covers the use of artifacts, documents and records from the past; visual, personal experience; data management and computerized, narrative content and semiotic methods of analysis. Part two focuses on interpretation, evaluation and presentation.

Part one's emphasis is the most practical. A chapter on interviewing, includes the history of interviewing and a description of the range of structured and unstructured interviews. A chapter on observation describes the different techniques and different observational paradigms (formal sociology, dramaturgical sociology, studies of the public realm, auto observation and ethnomethodology) as well as the problems inherent in these methods. Two chapters of particular interest to beginning researchers deal with issues of data management and analysis methods as well as the use of computers in qualitative methods.

*Roberto Holguin*

## 6 **Constructing Social Research: The Unity and Diversity of Method**

*Ragin, Charles C.  
Thousand Oaks, CA: Pine Forge Press, 1994*

Social research is a construction of a 'representation of social life.' What distinguishes social researchers from others who represent social life, such as a journalist, is her use of scientific methods. It is the dialogue between theory and evidence that brings unity to the diversity of evidence in social research. Indeed the goal of social researchers may range from identifying patterns and testing theories to giving voice to a group. Pairing the goal and objective to a method is the key in choosing appropriate research strategies. Qualitative research looks for commonality by examining many aspects of a small numbers of cases in depth. The comparative method is useful for understanding diversity in a moderate number of cases in a comprehensive manner. Quantitative research is focused on revealing broad patterns and investigates a small number of variables across many, many cases. By supplying an overview of social research rather than focusing on techniques in detail, the book is best used as a starting point for any researcher.

*Suzan Boztepe*

## 7 Content Analysis: An Introduction to Its Methodology

*Krippendorff, Klaus*

*Newbury Park CA.: Sage Publications, 1980*

This book introduces the research technique of content analysis — analyzing data as symbolic communications and making valid inferences from the data to their context. Content analysis is most commonly associated with analysis of mass media — for instance, a study in which portrayals of race in television programming are scrutinized for the extent to which they are representative of the racial make-up of a regional population, or a study of sexual images in the press and what they indicate about national consciousness. Citing numerous examples, the author provides an historical overview of the method's development and the domains to which it has been applied. The bulk of the text is devoted to a detailed discussion of the procedures involved in constructing rigorous and reliable studies. The final chapter is an abbreviated guide to planning and executing a content analysis.

*Jay Melican*

## 8 Contextual Design: Defining Customer-Centered Systems

*Beyer, Hugh and Holtzblatt, Karen*

*San Francisco, CA: Morgan Kaufmann Publishers, 1997*

This is a practical guidebook that supports system development team members to effectively reflect the way customers want to do their work throughout the development process. The method, contextual design, developed by the authors, enables the team members to gather detailed data about how people work and use systems through contextual interviews. It develops a coherent picture of a whole customer population and generates systems designs from knowledge of customer work. Many examples that apply this method are explained to enhance the understanding of the benefits. Diagrams and illustrations presented in this book are well combined to describe work structure, system environment and their relationships. They reveal the way to find the problems in existing systems, which are targets for new system development.

*Youn-kyung Lim*

# 9

## The Craft of Research

*Booth, Wayne C.; Colomb, Gregory G.; Williams, Joseph M.*  
*Chicago: University of Chicago Press, 1995*

The research process is an elaborate dialogue between the researcher, the data, the written drafts and questions and issues that emerge as the project moves forward. The writer learns through the process of writing, reading and an iterative approach in preparing various drafts, outlines and visual presentations of data. Carefully crafted arguments and reliable evidence are essential components of every research project. Such arguments provide a challenging experience for both the writer and the reader. A substantive claim is essential to good research and must be contestable, yet plausible. Revisions of the final draft are not limited to superficial editing, but must include a thorough analysis of the structure of the paper from the hypothetical perspective of the reader. The conversational tone, stepwise recommendations for each research stage and layer of information provide a useful tool for both novice and expert researchers in any discipline.

*Barbara Martinson*

# 10

## Design Methods

*Jones, John Christopher*  
*New York: John Wiley & Sons, 1992*

The author was part of the design methods movements of the 1960s. At that time, industrial designers, engineers and architects faced the problem of cooperative work among many designers and stakeholders. His work is a collection of many methods or 'recipes' that grew from group design work. The book first evaluates traditional methods such as design-by-drawing and shows how this method does not adequately address the complex demands of the contemporary design context. He sets to work re-designing the design process itself so that intuition and rationality co-exist rather than exclude each other. The book then provides thirty-five methods including logical, data gathering, taxonomic and evaluative procedures. *Design Methods* is a landmark of the design methods movement and it was widely appreciated. This book has had a tremendous impact on many designers.

*Sakol Teeravarunyou*

# Design

## 12 Engineering Design Method: Strategies for Product Design

*Cross, Nigel*

*London: John Wiley & Sons, 1994*

The author concentrates on fundamental approaches to design for a wide variety of engineered products. Emphasis is placed upon problem formulation, concept and embodiment in design through a mix of creative and systematic methods that together can be used to resolve design problems and develop successful solutions. This strategic approach to design means that the book is of value to those studying, teaching and practicing design across a wide range of engineering-related disciplines. The book is organized in three parts. The first part deals with the nature of engineering product design with models and methods of both creative and rational approaches to design. The second part explores seven powerful systematic design methods which are discussed in detail and illustrated with a wide range of examples. The third part examines how to combine methods for a successful strategic approach to engineering product design.

*Youn-kyung Lim*

## 11 Developments in Design Methodology

*Cross, Nigel, editor*

*Bath, UK: Pitman Press, 1984*

A collection of articles from a twenty-year period, it contains the writings of many distinguished methodologists like J. Christopher Jones, Christopher Alexander, Herbert A. Simon and others. The management of design process involves the borrowed techniques of problem solving, management and operational research. Many authors propose solutions to solve ill-structured problems. Understanding how designers tackle such problems in design activity is another approach. In the philosophy of design method section, reflective methods draw upon the knowledge gained. Some principles are borrowed from the philosophy of science, from Popper's and Kant's views. The book ends with the History of Design Methodology that refers to many generations of design methods and their chronological development. Nevertheless the book still lacks consensus on design methodology and a proof for the ideologies as many authors debate the application of a scientific approach to design problems. This book provides a significant foundation for the formation of design methodology.

*Sakol Teeravarunyou*

## 13 **Ethnography: Principles in Practice**

*Hammersley, Martyn and Atkinson, Paul  
London: Routledge, 1995 (Second edition)*

Hammersley and Atkinson define ethnography, its origins and discrepancies with positivistic reasoning. A great portion of the book delves into the more practical aspects of carrying out ethnographic research (research design, gaining access, analysis and ethics). The goal as described by the authors is to steer a course between an abstract methodological treatise and a practical cookbook. Methodology and method, like social theory and empirical theory, feed into each other. Neither can be discussed effectively in isolation.

The methods and the principles presented are guided by the concept of reflexivity, which is the central theme of the book. Reflexivity provides the basis for a reconstructed knowledge of inquiry that shares much with positivism and naturalism, but goes beyond them in important aspects: "By including the researcher's role within the research focus, and perhaps even systematically exploiting their participation in the settings under study as researchers." (Naturalistic inquiry was ethnography's answer to positivist tenets, the social world should be studied in its 'natural state.')

*Roberto Holguin*

# Design

## 14 Grounded Theory Methodology: An Overview

*Strauss, Anselm; Corbin, Juliet; Denzin, Norman K.; Lincoln, Yvonna S., editors  
Thousand Oaks, CA: Sage Publications, 1998*

Grounded theory is a general methodology for developing theory founded in data systematically gathered and analyzed. Theory evolves during actual research and it does this through continuous interplay between analysis and data collection. A central feature of this analytic approach is a general method of [constant] comparative analysis (Glaser and Strauss, 1967); the approach is also referred to as the constant comparative method. The term is also used for theoretical elaboration. Conceptual density refers to richness of concept development and relationships — which rest on great familiarity with associated data and are checked out systematically with these data. (This is different from Geertz's thick descriptions where emphasis is on description rather than conceptualization.) Grounded theory methodology is designed to guide researchers in producing theory that is conceptually dense — that is with many concept relationships. Presented in the context of descriptive and conceptual writing, this discursive presentation captures the density and conveys the substantive content of a study better than the natural science form of propositional presentation (typically framed as if-then statements).

*Roberto Holguin*

## 15 **Handbook of Visual Analysis**

*van Leeuwen, Theo and Jewitt, Carey*  
*Thousand Oaks, CA: Sage Publications, 2001*

Images as data; data as images. Images need not be relegated to the role of supporting research, but are in themselves a valuable source of knowledge. Visual information is frequently the subject of qualitative and quantitative research. Cultural and situational contexts influence perception and identification with images. This handbook presents analytic frameworks from varying disciplines such as cultural studies, anthropology, communication studies and psychoanalysis. Research examples range from content analysis, semiotic analysis and ethnomethodology. The integration of theory with how-to information creates a useful resource for both beginning and experienced visual researchers.

*Barbara Martinson*

## 16 **How Designers Think: The Design Process Demystified**

*Lawson, Bryan*  
*United Kingdom: Butterworth Architecture, 1990*

Though written more for a lay public, this book nevertheless presents a complete theory of design thinking and is an interesting book. Attention to the notion of primary generator, an organizing principle or theme that may run through design development and deliberation and a theory of design constraints is presented as ways to define solutions. While 'users' are mentioned categorically, ideas relating to user observation or prototype testing are noticeably missing. Lawson focuses more on the beginnings — problem setting and understanding, and endings, the solution based on criteria and its assessment — than on the middle design development phase. The author has much interest in creativity.

*Luis Pereira*

Design

## 17 How to Write and Publish a Scientific Paper

*Day, Robert A.*

*Philadelphia: ISI Press, 1988*

This book carries an explanation of all the details that go into making a scientific paper acceptable as well as the larger issues related to research dissemination. The first chapter holds general views on purpose, organization and language of a scientific paper, but then launches into very detailed recommendations for preparing titles, listing authors, writing up results and discussions, designing effective tables and illustrations and developing the materials and methods sections. In addition to those details, this book covers the editorial review process, manuscript submission and the publication process. Although this author writes from a biological science background, his recommendations for scientific paper preparation are among the best. In addition, design students who read this book will know they are receiving credible information when they discover the amount of detail and attention recommended for a publishable scientific paper.

*Lorraine Justice*

## 18 Inquiry by Design: Tools for Environment-Behavior Research

*Zeisel, John; Stokols, Daniel;*

*Altman, Irwin, editors*

*Cambridge: Cambridge University Press, 1984*

This collection of essays explores how to apply sociological, psychological and anthropological methodologies to the study of human behavior and the physical environment, where design and planning are crucial. Oriented to a multi-disciplinary audience — social scientists, designers, urban planners and architects — the author discusses many interesting relationships between research and design. He combines the process of research with the process of design.

The book is in two parts. In part one, he explores the empirical study of conducting research through learning and testing. This includes concept development, hypothesis building, research and design in cooperation and the side effects of cooperation. In part two, multiple-method research for solving complex problems such as observing physical traces, observing behavior and others are discussed. The book provides a good foundation for designers who want to know about social science research or researchers who want to know about design.

*Sakol Teeravarunyou*



# 19

## **Investigating Communication:**

### **An Introduction to Research Methods**

*Frey, Lawrence R.; Botan, Carl H.; Friedman, Paul G.; Kreps, Gary L.  
New York: Prentice Hall, 1991*

Understanding the culture of research is a daunting task for the beginning researcher, and certainly more so for those working in multidisciplinary fields such as Communication. Increased understanding can be facilitated through an examination of the three general research cultures: the physical sciences, the humanities and the social sciences. Frequently an integrated approach, using multiple methods from each of the different cultures, is most effective. Rejecting the notion of researcher-as-scientist for the more active researcher-as-detective, the research process includes conceptualization, planning, method, analysis and interpretation and reconceptualization. The researcher must recognize the interrelationship of theory and practice, and select the appropriate method for the specific research question. To help the researcher accomplish these tasks, the authors present a comprehensive overview of methods applicable to communication inquiry.

*Barbara Martinson*

# Design

# TEXT

## 20

**Notes on Synthesis of Form***Alexander, Christopher W.**Cambridge: Harvard University Press, 1964*

Starting from a concept of fitness (problem to solution) that design intends to develop and solve, Alexander explores design complexity in terms of the structural configurations among problem elements, their relationships and hierarchies. He describes his main task as "...to show that there is a deep and important underlying structural correspondence between the pattern of a problem and the process of designing a physical form that answers that problem." He focuses on encapsulating each element of a form into its own investigation and then later combines all elements into the whole form. His method involves algorithms used to organize the structure. These are important underlying elements and principles of product architecture and complexity theory. This is a short and beautifully written book in which he outlines his design theory. The author is the 1960s architect who later developed 'pattern language.'

*Sakol Teeravarunyou*

PATTERN LANGUAGE

# 21

## **A Practical Guide to Behavioral Research**

*Sommer, Barbara and Sommer, Robert  
New York: Oxford University Press, 1997*

*A Practical Guide to Behavioral Research* is a very easy and informative read on behavioral research without a lot of dry content and examples. It works very well for undergraduate industrial design students who are first introduced to research as a tool to enhance the design process. The book covers ethics, literature reviews, observation, experiments, survey designs, content analysis, sampling, statistics and report writing. One of the better facets of this book is the promotion of a multi-method approach to behavioral research and its recommendation of qualitative and quantitative methods. The limitation of this book is that it is an overview of the methods. Other research method books are needed by the advanced student if they want in-depth coverage on any particular research method such as hypotheses and experimentation or questionnaire design. This book emerges from the behavioral sciences and is very applicable to the design profession, especially in relation to user representation for product needs and perceptions.

*Lorraine Justice*

# Design

# FAABO

## 22

**Protocol Analysis: Verbal Reports as Data***Ericsson, K. Anders and Simon, Herbert A.**Cambridge: MIT Press, 1993*

An in-depth discussion of the issues associated with the use of subjects' verbal reports as representative of their cognitive processes, this book should be considered required reading only for researchers who are considering employing this technique (or some variation of it). Together with the preface, the introductory chapter provides a comprehensive overview of the 'think aloud' approach — in which subjects verbalize their thought processes as they perform specific tasks. The following chapters go into depth on issues including: the effects of verbalization on the subjects' performance of the task, the validity of verbal reports and specific techniques for their analysis. Each section of the book is concisely summarized with its conclusion. Protocol analysis is significant to design research as a technique that has been fairly widely adopted in studying the cognitive processes involved in design problem solving.

The first edition of this book was heralded as the bible of cognitive science methodology. It stimulated a strong body of research. But due to its importance and many suggestions, many researchers went beyond its prescriptions. This later edition provides a more complete and current theoretical view of connections between focal task processes and reporting processes, especially in regard to the many situations in which retrospective protocols are necessary. Protocol analysis is put on a firm footing — verbalization is seen as any other kind of behavior.

*Jay Melican*

## 23 **Qualitative Data Analysis: An Expanded Sourcebook**

*Miles, Matthew B. and Huberman, A. Michael*

*Thousand Oaks, CA: Sage Publications, 1994*

The authors concentrate on addressing what they feel is one of the major problems facing qualitative researchers: how to draw valid meaning from qualitative data. They identify that the most serious and central difficulty in the use of qualitative data is that methods of analysis are not well formulated. Like the title suggests, there are multiple methods of analysis presented throughout the book. Data collection methods are not part of this handbook as there are better sources for this. The authors clearly present their bias to analysis and compare it to other existing forms of interpretation and analysis. Qualitative data analysis contains a nonlinear process of doing: data reduction — selecting, focusing, simplifying, abstracting and transforming the data; data display — compressing and organizing information that permits a conclusion and action; verification — carefully documenting analytical sets and making them useful to others.

*Roberto Holguin*

## 24 **Qualitative Research Methods for Social Science**

*Berg, Bruce Lawrence*

*Boston, MA: Allyn & Bacon, 2001*

Offering a comprehensive view of qualitative field techniques, this book provides information in a way that novice researchers can easily follow. Berg describes seven different data collection strategies including interviews, focus group interviews, ethnographic field strategies, action research, archival strategies and historiography and oral traditions. A chapter on the ethical dimension of field research is new to this fourth edition; here Berg stresses the importance of ethics in research and in taking the time to properly design and think through any research endeavor. He also discusses the value of combining 'research-before-theory' and 'theory-before-research' approaches in a 'spiraling' pattern, in comparison to the 'linear' research pattern from literature review to data collection. This book is useful for design practitioners and researchers who need to develop qualitative research skills, especially data collection techniques. After reading this book, design practitioners or researchers should be able to design, collect and analyze data and then present their results to the community (scientifically).

*Praima Chayutsahakij*

## 25

**Real World Research: A Resource for Social Scientists  
and Practitioner-Researchers***Robson, Colin**London: Blackwell, 1993*

Researchers faced with 'real world' challenges like limited time and money and the need to address a pressing problem or issue will find this book valuable. Written for psychology and social science researchers, this book is also useful in design. The chapters cover everything from how to write a research proposal, act on your research findings and get research results published. In between these topics, the reader is offered overviews on different data collection and analysis methods covering both quantitative and qualitative approaches. It is comprehensive enough to suit people who want to learn about a particular methodology, but do not want to commit themselves to one approach. The book is useful for both general research and design research. Some methods can be applied to specific design problems such as case studies.

*Sakol Teeravaranyou*

## 26 **Redefining Designing: From Form to Experience**

Mitchell, C. Thomas

New York: Van Nostrand Reinhold, 1993

This book offers a comprehensive user-centered design perspective focusing on design in terms of human experience rather than physical form. Mitchell discusses how design philosophies since industrialization, including modernism, late modernism, post-modernism and deconstruction, have emphasized only style and failed to fulfill users needs and wishes. He also cites many examples of design projects, especially in architecture, that fail to suit intended purposes, including award winning ones. He then points out how design research is important to user-centered design or what he calls 'user-responsive design' or 'design turned inside-out' in this book. In the second half of the book, he explores collaborative, contextual and intangible design along with examples for each. *Redefining Designing* demonstrates user-centered methods that could be applied in any design field. This book is of interest to architects, planners and landscape architects, as well as interior, communication, product and industrial designers.

Praima Chayutsahakij

## 27 **Research Design: Qualitative and Quantitative Approaches**

Creswell, John W.

Thousand Oaks, CA: Sage Publications, 1994

*Research Design* is similar to Sommer and Sommer's *Practical Guide to Behavioral Research* because it also is a very easy read about a potentially dry topic. This book seeks to engage and inform the reader and imparts why one would use qualitative or quantitative methods. It brings value because it involves an inquiry into the very nature of research design and all its intricacies. A highlight of this book is the discussion on questions, objectives and hypothesis construction as well as a discussion on the use of a theory. This information is presented in a way that is very applied — something that lends itself very well to the design profession.

Lorraine Justice

## 28

**Scenario-based Design: Envisioning Work and Technology  
in Systems Development***Carroll, John M.**New York: John Wiley & Sons, 1995*

On behalf of enhancement in the development of software systems, applications and user interfaces, the leading figures in the field of human-computer interaction and object-oriented software engineering contribute to provide the cases for discussion in an array of scenario-based design approaches in this book. Here scenario-based design demonstrates practical applications across the system development life cycle, from requirements analysis and software design, to documentation, training and prototype evaluation. It brings the work processes of users to a focused concern in development instead of attention to the product itself. These aspects are supported by the scenarios that describe activities and sequences of actions in the user context. Introducing this perspective as the main concept of the scenario-based approaches, the case studies are presented along with clearly explained illustrations and diagrams.

*Youn-kyung Lim*

29

**System Thinking: Managing Chaos and Complexity: A Platform for Designing Business Architecture**

*Gharajedaghi, Jamshid*

*Washington, D.C.: Library of Congress, 1999*

The imperative of organizational interdependency requires reducing endless complexity in order to produce manageable simplicities. This requires a change in mode of thinking to a holistic frame of reference that allows one to focus on relevant issues and avoid the endless search for more detail. While organizations as a whole are becoming more and more interdependent, their parts display choice and behave independently. This is the dilemma this book tries to resolve. The author introduces a general system philosophy and theories including systems principles, organizational dimensions and a sociocultural model. A system framework and methodology, understood as an iterative process, is discussed. The book deals with all three dimensions: structure, function and process, and their containing environment, which together define the whole. The book demonstrates how to apply this methodology to system architecture through five case studies. In the conclusion, the author claims that modular design is the most potent and practical means of handling change and implementing complex designs without getting lost in the process.

*Sakol Teeravarunyou*

30

**Transforming Qualitative Information: Thematic Analysis and Code Development**

*Boyatzis, Richard E.*

*Thousand Oaks, CA: Sage Publications, 1988*

Boyatzis focuses on the search for insight or making sense from data collected in this book. The author presents a process for segmenting and relating data in order to develop themes. A theme is a pattern found in the information that at the minimum describes and organizes possible observations or at the maximum interprets aspects of the phenomenon. Themes might be identified at a manifest level (directly observable in the information) or at a latent level (underlying the phenomenon). Thematic analysis is a process that requires the labeling or coding of qualitative information in order to construct the themes. Thematic analysis occupies an interesting place somewhere between qualitative data and quantitative data; the author even argues that this process is potentially a bridge or transition between the two.

*Roberto Holguin*

# Theory

Building a Discourse between Design Theory and Practice is one of the three sections of the Annotated Design Research Bibliography. Theoretical knowledge is simultaneously generated and accumulated through reflective practice and judging of results. To support the partnership of practitioner-researchers and research-practitioners, thirty theory and design practice books are selected in both directions regarding how knowledge is used and accumulated, and how knowledge is built through design research. The 'theory building' selection includes books on both reflective research concepts and those with reflective research examples. The 'theory using' selection ranges from the broad and general use of theories in design to the more specific use of theories in different design fields and the integration of design with other disciplines. The selected books are useful for the development of design theory, design research, design practice, design intellectual culture and design discipline.

Creativity: Flow and the psychology of Discovery and Invention  
Case Study: Research: Design and Methods  
About Face: The Essentials of User Interface Design  
The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm  
The Viable System Model: Interpretations and Applications of Stafford Beer's VSM  
Winning at New Products: Accelerating the Process from Idea to Launch  
Situating Learning: Legitimate Peripheral Participation  
Theory in Practice: Increasing Professional Effectiveness Practising Interdisciplinarity  
Programming for Design: From Theory to Practice  
The Reflective Practitioner: How Professionals Think in Action  
Pattern Language: Towns, Buildings, Construction  
The Power of Product Platforms: Building Value and Cost Leadership  
Of Bicycles, Baskets, and Bulbs  
On Line and on Paper: Visual Representations, Visual Culture, and Computer Graphics in Design Engineering  
The Logic of Practice  
Manufactured Pleasures: Psychological Responses to Design  
The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation  
Knowledge for Action: A Guide to Overcoming Barriers for Organizational Change  
The Logic of Architecture: Design, Computation and Cognition  
The Innovator's Dilemma  
Instructional Design Theories and Models: An Overview of Their Current Status  
Design Thinking  
Fluid Concepts & Creative Analogies: Computer Models of the Fundamental Mechanisms of Thought  
Dealing with Complexity: An Introduction to the Theory and Application of Systems Science  
Design for the Real World: Human Ecology and Social Change  
The Design of Everyday Things  
Context and Consistency: Activity Theory and Human-Computer Interaction  
Creating Minds: An Anatomy of Creativity seen Through the Lives of Freud, Einstein, Picasso, Stravinsky, Eliot, Graham and Gandhi  
Creativity: Flow and the Psychology of Discovery and Invention  
Case Study: Research: Design and Methods  
About Face: The Essentials of User Interface Design  
The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm

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# P r a c t i c e

**Perspectives on Building a Discourse  
Between Design Theory and Practice**

*Praima Chayutsahakij*

**&**

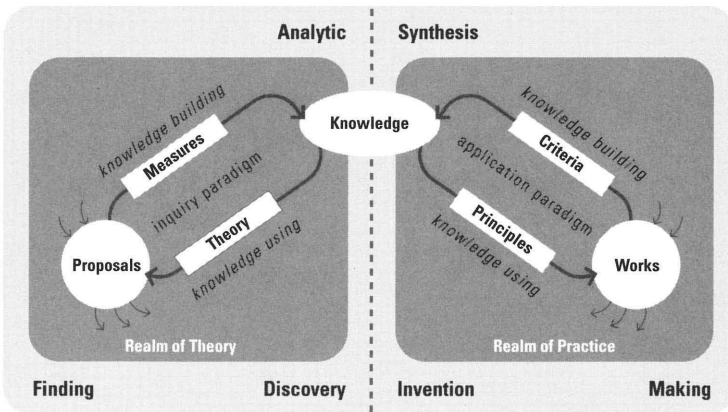
**Annotated Theory and  
Practice in Design List**

# Theory Practice

## Perspectives on Building a Discourse between Design Theory and Practice

### DESIGN THEORY AND PRACTICE OVERVIEW

Design Theory refers to the general principles or ideas of design, or the set of rules on which a design practice or design skill is based. Theory and practice are related—they feed and feedback on each other. In the analytic/synthetic, theory/practice model (see figure 1), Owen (1994) has illustrated how design knowledge is generated and accumulated in the realm of theory and practice. In the research diagram, the existing theoretical knowledge is used to generate proposals or hypotheses that are tested to build knowledge. In the diagram of practice (on the right of the diagram below), the realm of practice, knowledge generated from the realm of theory is used to produce applications to test the appropriateness of the knowledge previously built. A similar notion is developed by Routio (1997), who maintains that design researchers should normally work simultaneously within these two realms.



**Figure 1** Analytic/Synthetic, Theory/Practice Model Redrawn from the original in *Design Process Newsletter*, 5:6, 1994.

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Design theory can be generated through practice. Doing something and judging the results is the general model, which is called 'reflective' research by Schon (1983) in his book *The Reflective Practitioner*. From his perspective, 'an epistemology of practice is implicit in the artistic, intuitive processes which some practitioners bring to situations of uncertainty, instability, uniqueness and value conflict.' Schon proposes four types of reflective research which can be undertaken outside the immediate context of practice in order to enhance the practitioner's capability for reflection-in-action ranging from frame analysis, repertoire building research, research on fundamental methods of inquiry and overarching theories, to the study of reflection-in-action.

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Frame analysis is the study of the way in which practitioners frame problems and roles. The frames determine their strategies of attention and thereby set the directions in which they will try to change the situation. This sort of frame analysis would convey the experience of problem setting and solving, the self-definitions and the definitions of success and failure, that are inherent in a particular choice of frame.

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Repertoire-building research serves the function of accumulating and describing the practice situations, cases or precedents in ways useful to reflection-in-action. Description and analysis of images, category schemes, cases, precedents and exemplars can help to build the repertoires which practitioners bring to a unique situation. However repertoire-building research, which is widely practiced, tends to focus only on the starting situation, the actions taken and the results achieved without revealing the path of inquiry which leads from an initial framing of the situation to the eventual outcome.

Research on fundamental methods of inquiry and overarching theories may fall into two categories. Researchers may try to discover how the process of recognition and restructuring works by examining episodes of practice. This sort of research may help other practitioners to enter into a way of seeing, restructuring and intervening which they may wish to make their own. The other category of research on fundamental theories and methods takes the form of an 'action science,' concerning itself with situations of uniqueness, uncertainty and instability which do not lead themselves to the application of theories and techniques derived from science in the mode of technical rationality. It aims at the development of themes from which, in these kinds of situations, practitioners may construct theories and methods of their own.

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Research on the process of reflection-in-action refers to research done by practitioners. It is triggered by features of the practice situation, undertaken on the spot and is immediately linked to action. When the theory-testing experiments of the practitioner simultaneously transform the practice situation, the exchange between research and practice is immediate. There is no question of the implementation of research results.

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Similar to Schon's first three kinds of reflective research, a taxonomy of the field of design research was proposed by Cross (2001) as design epistemology, design phenomenology, and design praxiology. 'Design epistemology,' the study of 'designerly' ways of knowing, is very similar to 'frame analysis.' 'Design-phenomenology,' the study of the form and configuration of artifacts, is a form of repertoire-building research. And in parallel to the research on fundamental methods of inquiry, 'Design praxiology' refers to the study of the practices and processes of design. As discussed in the Foundations for Design Research section (*see page 159*), Ken Friedman (2001) also urges design research culture to embrace three forms of research: basic, applied and clinical, ranging from pure research to discover generalized design principles to direct experiment in single cases. To a degree, these parallel Schon's fundamental methods and repertoire-building research.

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Related to reflection-in-action, the last type of reflective research proposed by Schon, there is recently an increasing debate about research as a discipline in design (Frayling, 1993; Cray and Pirie, 1995) as design practitioners become increasingly involved in research. There is a growing awareness of the intrinsic strengths and appropriateness of design thinking within its own context, of the validity of 'design intelligence' (Cross, 1999). Bruce Archer (1979) urges design to develop its own distinct "things to know, ways of knowing them, and ways of finding out about them" and Owen (1994) suggests "there are areas of knowledge and ways of proceeding that are very special to design, and it seems sensible that there should be ways of building knowledge that are especially suited to the way design is studied and practiced." There is no need to treat design as a mysterious ineffable art, nor to turn it into an imitation of science. However, we can not completely ignore the other disciplines and cultures with stronger histories of enquiry, scholarship and research than we have in design. We need to draw upon those histories and traditions where appropriate (Cross, 2001). In an interdisciplinary way, design also has to detect the interfaces to other disciplines and has to demonstrate how the disciplinary knowledge can be integrated and applied to other disciplines (Buerdek, 2001). Developing design research with a 'designerly way of knowing' (Cross, 1982) by designer-researchers, will be helpful, in the long run, to design practice, design education, the growth of an intellectual culture in design and its development as a discipline.

## DESIGN THEORY AND PRACTICE LITERATURES

To support the partnership of practitioner-researchers and researcher-practitioners, it is probably best to look at the book selection in both directions regarding how knowledge is used and accumulated, and how knowledge is built through design research. In this Design Theory and Practice section, the books selected, range from 'theory using' to 'theory building.'

The 'theory building' selection includes both the books on reflective research concepts, and those with reflective research examples in fields different from design. The books that describe reflective research concepts are, for example, *The Reflective Practitioner*, *Theory in Practice*, *Action Science* and *Case Study Research*. And the example of reflective research can be found in such books as the *Logic of Architecture*, *The Design of Everyday Things* and *The Knowledge-Creating Company*.

The 'theory using' selection ranges from the broad and general use of theories in design such as *Dealing with Complexity*, *Creativity* and the *Visible System Model* to more specific use of theories in different design fields such as *Design Thinking*, *On line and on Paper* and *About Face*. This section also includes the theory-practice books that illustrate the integration of design with other disciplines such as *Managing the Design Factory*, *The Power of Product Platforms*, *Winning at New Products* and *Manufactured Pleasures*.

The books in this section are useful for the development of design theory, design research, design practice, design intellectual culture and design discipline.

## RESULT AND DISCUSSION

### Results from ranking

The books with highest overall ranking in this section are

1. *The Design of Everyday Things* by Norman (1998)
2. *A Pattern Language* by Alexander (1977)
3. *Design for the Real World* by Papanek (1999)
4. *The Reflective Practitioner* by Schon (1983)

**The Design of Everyday Things** by Donald A. Norman is read most and received the highest recommendation by the design community. Norman is also rated as one of the best known authors by the design community. According to the field-keyword analysis, this book represents the combination of social science, technology and industrial design. The book gives up-to-date practical approaches to understanding basic user-centered design from physical products to computer programs to conceptual tools, which can be widely used in the design community.

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**A Pattern Language** by Christopher Alexander is one of the books that is read most and is highly recommended by the design community. It is a classic book, first published in 1977 and a key source for architectural and environmental design and development since its first appearance. It bridges design theory and design practice by offering a practical language (each consisting of a design problem, discussion, illustration and solution) for building and planning based on natural considerations.

**Design for the Real World** by Victor Papanek is a book that is widely read in the design community. Besides being written by Papanek, a well-known author in the design community, this book explores his practical approach to socially-responsible design. It illustrates both the designer's responsibility and the potential to effect real change in the world through design. According to the field-keyword analysis, this book represents technology and industrial design in combination.

**The Reflective Practitioner** by Schon is also ranked as one of the most read and is highly recommended by the design community. A classic, written in 1983, it is known for its deep theoretical character. The book discusses the history and theory of professional learning and provides a framework, which may be applied to the practice of any profession. According to the field-keyword analysis, this book represents the combination of social science and business approaches.

## Field-keyword analysis

The percentage of the field-keyword distribution in this section is shown below:

	<i>Natural science</i>	<i>Social science</i>	<i>Technology science</i>	<i>Business</i>	<i>Education</i>	<i>Architecture</i>	<i>Industrial design</i>	<i>Visual design</i>
<b>Original list</b>	0	28.57	15.7	20	8.75	12.86	12.86	1.43
<b>On-line ranking</b>	0	18.18	24.24	21.21	9.09	12.12	12.12	3.03
<b>Recommended books</b>	0	37.5	31.25	9.38	12.5	0	6.25	3.13
<b>Added-recommended</b>	0	35.29	17.65	17.65	11.76	0	11.76	5.88
<b>Final list</b>	0	24	23	20	10	8	12	4

**Table 1** Field-keyword Analysis

According to the field-keyword analysis, the books in this section are highly related to Social Science, Technology, Business and Industrial Design. Some books are related to Education, Architectural and Visual Communication. But none of the books fall into a natural science discipline.

P r a c

# Discipline

The on-line ranking survey shows the design community's greatest interest in Technology Science and Business related books. While the number of books related to Social Science is slightly greater on the recommended book list, the books related to architecture and industrial design showed equal interest on the ranking survey. Interestingly, no architecture related books appeared on the added recommended list. The books related to education and visual communication showed the lowest interest on the ranking survey. However, a few more books related to these two disciplines were recommended by the community.

As this section received a high response by the design community through the on-line survey, the ranking result is reliable and complete (*see table 2, p.210-211*). The decision on the discipline distribution of the final book list is straightforward and parallel to the on-line survey results.

Most of the recommended books in this section (90%) are related to creativity. To keep the appropriate discipline distribution and to prevent content repetition, creativity related books are selected by content, disciplinary coverage, known author and literature reference.

Similarly the number of books related to situated learning is limited with the books selected based on the ranking scores.

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## Observation on the methods

As the response to this section is high, the findings of the two approaches work well and no further research was conducted specific to this section.

## Final book selection

Since the Design Theory and Practice list has received the greatest response from the design community, nineteen books are selected from the original list of fifty-five books from the conference reference, based on the design community ranking system (*table 1*). Another eleven books are selected from community recommendations based on the field-keyword analysis for appropriate discipline distribution (*table 2*).

Observations from the data collected from the online bibliographic survey, while not highly substantiated, are suggestive of the state of design as a discipline. The books familiar to the design community are those closer to design practice. Most of the in-depth theoretical books have not been ranked very high unless they are old and classic such as *A Pattern Language* or *The Reflective Practitioner*. Other highly ranked books relate to social science, technology, business and industrial design, while books related to design education, architecture and visual communication are of less interest.

## CONCLUSION

As design theory is generated through practice, design literature should encourage reflective research and support design researcher-practitioner partnerships. Design literature should open opportunities for design practitioners to reveal ways of thinking in practice and draw on reflective research as an aid, while it also supports the reflective researcher to gain an inside view of the experience of practice. Design researcher-practitioner partnerships could take various forms from practitioners supporting one another in reflective research, to the researcher taking a role of consultant to the practitioner or becoming a part of continuing education for practitioners, to those practitioners who do both — moving in and out of research and practice careers. Design literature should cover the concepts and examples of reflective research at different levels and from different point of views, allowing both researcher and practitioner to draw on the literature from their perspective and feel comfortable with later shifting the roles.

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The on-line bibliographic survey, where the books range from 'theory building' to 'theory using' in this section, shows that the easy to follow, practical design books are much more familiar to the design community than the in-depth theoretical books. This finding leads to an interpretation of the state of design theory building corresponding to Ken Friedman's (2001) statement in which he noted that design research is dominated by practical experiments and technical applications. Most design research is undertaken in single cases as unreported 'clinical research.' Although the 'applied research' that permits application of case findings by class is fairly common in design, 'basic research' to discover and communicate broad, generalized design principles is still rare. Friedman also recommends that design shift the ratio among these kinds of practice and research dramatically to generate a better research culture. Schon also mentions research on fundamental methods of inquiry and overarching theories as most important to the discipline. In essence, the design community needs to be encouraged to read and pay more attention to fundamental design method and theory.

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	<b>Title: The final list</b>	<b>Author</b>
1	About Face: The Essentials of User Interface Design	Cooper, Alan
2	Case Study Research: Design and Methods	Yin, Robert K.
3	The Art of Innovation: Lessons in Creativity from IDEO, America's Leading...	Kelley, Tom
4	Context and Consciousness: Activity Theory and Human-Computer Interaction	Nardi, Bonnie A.
5	Creating Minds: An Anatomy of Creativity Seen Through the Lives of Freud...	Gardner, Howard
6	Creativity: Flow and the Psychology of Discovery and Invention	Csikszentmihalyi, Mihaly
7	Dealing with Complexity: An Introduction to the Theory and Application of...	Flood, Robert L.; Carson, Ewart R.
8	Design for the Real World: Human Ecology and Social Change	Papanek, Victor
9	The Design of Everyday Things	Norman, Donald A.
10	Design Thinking	Rowe, Peter G.
11	Fluid Concepts & Creative Analogies: Computer Models of the Fundamental...	Hofstadter, Douglas R. and FARG
12	The Innovator's Dilemma	Christensen, Clayton M.
13	Instructional; Design Theories and Models: An Overview of Their Current Status	Reigeluth, Charles M.
14	The Knowledge-Creating Company: How Japanese Companies Create the...	Nonaka, Ikujiro, et al
15	Knowledge for Action, A Guide to Overcoming Barriers for Organizational Change	Argyris, Chris.
16	The Logic of Architecture: Design, Computation and Cognition	Mitchell, William J.
17	The Logic of Practice	Bourdieu, Pierre; Nice, Richard
18	Managing the Design Factory: The Product Developer's Toolkit	Reinertsen, Donald
19	Manufactured Pleasures: Psychological Responses to Design	Crozier, Ray
20	Of Bicycles, Bakelites, and Bulbs	Bijker, Wiebe E.
21	On Line and on Paper: Visual Representations, Visual Culture, and Computer...	Henderson, Kathryn
22	Pattern Language: Towns, Buildings, Construction	Alexander, Christopher
23	The Power of Product Platforms: Building Value and Cost Leadership	Meyer, Marc H.; Lehnerd, Alvin
24	Practising Interdisciplinarity	Weingart, Peter; Stehn, Nico, editors
25	Programming for Design: From Theory to Practice	Cherry, Edith
26	The Reflective Practitioner: How Professionals Think in Action	Schon, Donald A.
27	Situated Learning: Legitimate Peripheral Participation	Lave, Jean; Wenger, Etienne
28	Theory in Practice: Increasing Professional Effectiveness	Argyris, Chris; Schon, Donald A.
29	The Viable System Model: Interpretations and Applications of Stafford Beer's VSM	Espejo, R; Harnden, R., editors
30	Winning at New Products: Accelerating the Process from Idea to Launch	Cooper, Robert Gravlín

**Table 2** Design Theory and Practice Book List



## **About Face: The Essentials of User Interface Design**

*Cooper, Alan*

*New York: IDG Books Worldwide, 1995*

Alan Cooper, a respected software designer, shares his own real-world experience and design principles so designers can develop intuitive and effective user interfaces. Cooper offers excellent insight into what is wrong with many common user interface paradigms. He also makes a strong case for evaluating designs not from a programmer's viewpoint, but from the user's. This is an important message and he delivers it in an engaging manner. He looks mainly at Word, PowerPoint and Windows, explaining the elements of graphic-user interface and why it does or does not work well. Further, he gives suggestions regarding how things can be done better. Unfortunately he does not touch upon issues regarding more dynamic applications such as games or groupware.

The first thirteen chapters address global issues: programmers' versus users' mental models of program operation and file systems. The middle chapters deal with technical aspects of application "affordances" — buttons, menus, cursors, dialog boxes and so on. The last seven chapters return to more philosophical musings on errors, exception handling, installations, personalization, undo facilities and the future of user interfaces.

*Chujit Jeamsinkul*

## 2

### **Case Study Research: Design and Methods (Applied Social Research Methods, Volume 5)**

*Yin, Robert K.*

*Thousand Oaks, CA: Sage Publications, 1994*

Design researchers sometimes find themselves dealing with current phenomenon when the boundaries between context and phenomenon are not clear. Case study is a method appropriate to such situations. It uses multiple sources of evidence in order to answer 'how and why' questions. As the researcher has little or no control over events, case study as a scientific research method has been viewed with suspicion. Yin provides guidelines for case study as a reliable and valid research method that can be used for theory building and testing. All stages of case study research from research problem definition through reporting are thoroughly described and exemplified. Different strategies for single and multiple case studies are discussed. Lacking a clear and common understanding of what should constitute a design case study, the author's framework is highly valuable for researchers in the design domain.

*Suzan Boztepe*

## 3

### **The Art of Innovation: Lessons in Creativity from IDEO, America's Leading Design Firm**

*Kelley, Tom*

*New York: Currency Book, 2001*

In contrast to the academic books on this list, this book is from a purely practitioner viewpoint. IDEO is a well-known and respected international design office. If the reader can get beyond the public relations tone of the writing, there are many practical ideas presented with regard to creativity and innovation. These are ideas that often get lost in an academic environment and they surely temper the other books on this list. The chapters on fostering creativity among design team members through brainstorming and prototype building, as well as the problems of introducing innovation in the marketplace and the development of the idea of experience design alone make this book worthwhile. Full of anecdotes, the firm's philosophy is firmly rooted in a human-centered design perspective. Light reading, this book reminds us of the joy of design and its contribution to everyday life.

*Sharon Poggenpohl*

#### 4 **Context and Consciousness: Activity Theory and Human-Computer Interaction**

*Nardi, Bonnie A.*

*Cambridge: MIT Press, 1996*

In the course of seeking a theory of practice in human-computer interaction studies, activity theory is introduced as one that is satisfactory for this purpose. Developed in the Soviet Union during the 1920s in the work of Lev Vygotsky, activity theory is a psychological theory that provides a hierarchical framework for describing activity. The need to understand how people actually use computers in their everyday lives has been well documented through use of activity theory in practice. An international community of researchers contributes to the effort of applying activity theory to problems of human-computer interaction in this book through providing comprehensive collections in various subjects. Among these are: activity theory as a framework for understanding human-computer interaction, comparison among representative research areas in the study of context, activity theory in practical design with case studies and theoretical development. Diagrams and tables well support the understanding of the various concepts introduced.

*Youn-kyung Lim*

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## 5 **Creating Minds: An Anatomy of Creativity Seen Through the Lives of Freud, Einstein, Picasso, Stravinsky, Eliot, Graham and Gandhi**

*Gardner, Howard*

*New York: Basic Books, 1993*

Through his comparative study of prominent individuals in the fields of psychoanalysis, physics, art, music, poetry, dance and politics, Gardner provides illustrative rather than definitive support for the proposition that creative human activity should be understood as a function of interaction among various personal and contextual elements. Gardner groups these elements together in a framework comprising the individual and his or her capabilities and qualities, the individual's domain of expertise and the field or fields charged with judging the quality of work created. In this respect, the book, informed by the traditions of social science and humanism, is one of the few that adopts a multi-dimensional approach in the conceptualization of thinking and creating. It challenges some traditional notions by identifying links between creativity and activities not necessarily associated with the arts or design. In this respect, it also informs the arts and design by inviting an alternative conceptualization of innovation and innovative thinking; one where aspects external to the individual are understood to be as significant as aspects internal to the individual.

*Jill Franz*

## 6 **Creativity: Flow and the Psychology of Discovery and Invention**

*Csikszentmihalyi, Mihaly*

*New York: HarperCollins Publishers, 1996*

Human creativity is a mysterious process by which men and women come up with new ideas and new things. This book is an effort to demystify this process; it provides a systematic study of creative individuals, to understand what the force of creativity is and how it works. The author states his point of view that creativity results from the interaction of a system composed of three elements: a culture that contains symbolic rules, a person who brings novelty into the symbolic domain, and a field of experts who recognize and validate the innovation. These three necessary components for a creative idea to emerge are uncovered in this book through a research project involving interviews with ninety-one creative people. The book starts with a description of what creativity is, and reviews the way creative people work and live, then ends with ideas about how to make one's life more like that of the creative exemplars discussed in the book.

*Napawan Sawasdichai*

7

**Dealing with Complexity: An Introduction to  
the Theory and Application of Systems Science***Flood, Robert L. and Carson, Ewart R.**New York: Plenum Publishing, 1993*

Designing involves changing human futures: a complex activity addressing complex problems spanning different social, natural, technical and informatic systems and different domains. Flood and Carson skillfully review key approaches of systems science to address problems involving complexity. They include many case studies and practical examples. The book is multi-layered, with three themes: addressing complexity (chapters 1-11), using different system models in the technical world and natural sciences (chapters 3-10) and addressing problems in systems that additionally include complexity from human behavior, learning and cognition (chapters 5-7).

This is the second edition and it benefits by practitioner and researcher feedback. For designers, it describes many useful techniques, some of which also address philosophical issues, as well as complex systemic problem solving approaches and some that utilize mathematical procedures and concepts. This book is likely to be useful in raising the quality of output of design in most domains.

*Terence Love*

## 8

**Design for the Real World:  
Human Ecology and Social Change***Papanek, Victor**Chicago: Academy Publishers, 1992*

The completely revised second edition of this book has now become a classic. Although rejected by several publishers and derided by the design establishment for using such unfamiliar concepts as 'ecology,' 'ethology' or 'Third World,' when it made its first American appearance in the late 1960s and early 1970s, it has truly proved itself and become a required text in design and architectural schools. It is also widely used in anthropology, behavioral science and industrial-management courses at many universities. Victor Papanek, with his integrated background in product design, architecture and anthropology, focuses particularly on the user-centered approach to industrial design. He argues that "Design must become an innovative, highly creative, cross-disciplinary tool responsive to the true needs of men." He encourages designer's ethics and responsibility to effect radical changes in the world through design. The book provides principles and a new perspective for sensible, sustainable and responsible design, which he illustrates in two parts: How it is — How it could be. Illustrations and diagrams accompany the text throughout the book.

*Napawan Sawasdichai*

## 9

**The Design of Everyday Things***Norman, Donald A.**New York: Doubleday/Currency, 1988*

Valuable cases of unsuccessful design results are effectively described in terms of human-centered design. The failure to achieve the goals of use in simple products such as VCRs, remote controls or even doors, is not the user's fault but the fault of the design of the products. The patterns of users' actions are explained based on the seven-stage action model Norman provides. The seven stages of action support understanding the mechanisms of processing human action; forming goals; forming intentions; specifying an action; executing the action; perceiving the world; interpreting the perception; and evaluating the interpretations. Based on this model, many insightful thoughts about mental processes and the external actions of human beings are expressed in relation to various kinds of products we face in everyday life. Besides the list of references for his text, Norman suggests several important readings with brief annotations related to the issues he brings out in this book.

*Youn-kyung Lim*

## 10

**Design Thinking***Rowe, Peter G.**Cambridge: MIT Press, 1995*

Providing a systematic account of the process of designing in architecture and urban planning, the author examines multiple and often dissimilar theoretical positions and whether they prescribe forms or simply provide procedures for solving design problems. While the book uses architectural examples and case studies, much of the discussion translates easily to other design disciplines. The book has four sections. Beginning with *Designers in Action*, case studies are presented. This is followed by *Procedural Aspects of Design Thinking* in which various theoretical positions and design models are examined. The next section is *Normative Positions That Guide Design* in which classification systems and doctrinaire approaches are examined. The final section is *Architectural Positions and Their Realms of Inquiry* in which nature and architectural historical reference are identified as alternative positions. The bibliography is excellent, including architectural practitioners and theorists, design methodologists, philosophers of language and phenomenology, perceptual psychologists, linguists and historians to mention a few. This is a veritable list of who's worth knowing as a guide for deeper thinking about design.

*Sakol Teeravarunyou*

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11

**Fluid Concepts & Creative Analogies: Computer Models of the Fundamental Mechanisms of Thought**

*Hofstadter, Douglas R. and FARG*

*New York: HarperCollins Publishers, 1995*

n

FARG (Fluid Analogies Research Group) and the FARGonauts (the nickname for the collaborators) have collected a series of articles that were originally written between 1977 and 1991 and have reworked them for this collection. The topics are Concepts, Cognition and Creativity. The book addresses studies in cognitive science and the nature of thinking and being conscious, which is how Hofstadter defines artificial intelligence. The book is broken into chapters, each concerned with a particular project area where FARG was working and doing research. Hofstadter prefaces each chapter to put it into context and allow each chapter to be read on its own.

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The work of FARG pursues two distinct paths; one using computer modeling to represent concepts and analogical thinking in micro-domains, the other a theoretical discussion on the observation, classification and speculation about mental processes. This book is primarily concerned with the first path, describing computer-modeling projects.

The material is of interest to designers because of its efforts to understand human activities of cognition, analogy making, discovery, perception and composition. The book describes projects involving the translation of poetry and wordplay, the collection and classification of speech errors, the discovery process in physics and mathematics, musical perception and composition and the classification and analysis of jokes. He uses the creation of typography as an example of a computer-modeling effort.

*Kay Burnett*

e

## 12 The Innovator's Dilemma

*Christensen, Clayton M.*

*Thousand Oaks, CA: Sage Publications, 1994*

Great companies run by great managers fail precisely because of their logical and competent management focused on listening to their customers and sustaining profit and growth. Those companies are involved in delivering increased value to known markets through improving their products. Over time they become a 'captive' of their customers and value networks. They go on practicing sustaining innovation. On the other hand, disruptive innovation comes with a completely new value proposition and it creates totally new markets, new products and new customers. The innovator's dilemma resides here. Disruptive innovation is risky — it doesn't have a market and its returns are not yet visible. Strategic design planning and user-centered design offer great opportunities, unexplored by this author, to reduce the risks of navigating in unknown markets.

*Suzan Boztepe*

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13

**Instructional-Design Theories and Models:  
An Overview of Their Current Status (Volume 1)  
Instructional Design Theories and Models:  
A New Paradigm of Instructional Theory (Volume 2)**

*Reigeluth, Charles M.*

*Mahwah, NJ: Lawrence Erlbaum Associates, 1983 and 1999*

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Instructional design theories help us understand how to facilitate learning and are design-oriented in that they should be useful in the teaching process. Education theories are often viewed as mutually exclusive or competing. Reigeluth argues that there is a complementarity between the various theories and models of instructional design. The theories should be woven together to develop a comprehensive knowledge base. The two volumes demonstrate changes in education theory between 1983 and 1999, resulting from the shift away from standardization to more flexible forms of teaching and learning. This development of theory and models is in response to new educational needs based on new knowledge about learning and the increased use of technology. The two volumes demonstrate this shift: Volume 1 consists of a linear presentation of specific theories while Volume 2 presents theory integrated with practice. A useful summary provided in Volume 2 helps to acquaint the reader with the complex issues to be covered. The sheer volume of material presented may seem daunting — this resource is best suited for scholars whose resulting research will inform practitioners.

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*Barbara Martinson*

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## 14 **The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation**

*Nonaka, Ikujiro; Takeuchi, Hirotaka; Takeuchi, Hiro  
Oxford: Oxford University Press, 1995*

The context for this book is the field of knowledge management. The authors demonstrate how 'knowledge' is vital in Japanese firms with a clear distinction between 'tacit' and 'explicit' knowledge. Tacit knowledge is learned only by experience and is communicated only indirectly through metaphor and analogy, while explicit knowledge is contained in manuals and procedures. The Japanese focus on tacit knowledge (subjective insights and intuition), while U.S. managers focus on explicit knowledge (view the organization as a machine for information processing, developed by theorists from Frederick Taylor to Herbert Simon). Many case studies, such as Matsushita's development of the Home Bakery, show how tacit knowledge (i.e., how to knead dough) can be converted into explicit knowledge (i.e., bread-making machine). It provides significant insight into how organizations can manage and accumulate knowledge. This book also presents a clear link between theory (epistemology and ontology) and practice (knowledge conversion, socialization, externalization, combination and internalization).

*Sakol Teeravarunyou*

15

**Knowledge for Action, A Guide to Overcoming Barriers  
for Organizational Change***Argyris, Chris.**San Francisco: Jossey-Bass Publishers, 1993.*

*Knowledge for Action* is a tool book. It offers a practical framework in which to apply the conceptual and methodological program developed in Argyris's earlier work on action science. The purpose of this book is creating organizations based on valid knowledge, stewardship and personal responsibility for effective learning and action. This purpose is embedded in a philosophical and conceptual framework of research methods that produce valid actionable knowledge. Argyris's framework allows participants to work in genuine partnership with researchers in a joint research for valid knowledge in which research results are applied and their validity tested in daily life. The book includes an important appendix in which the author discusses the theoretical and methodological implications of his work. What he sees as outdated distinctions between basic and applied research are also discussed.

*Ken Friedman*

16

**The Logic of Architecture:  
Design, Computation and Cognition***Mitchell, William J.**Cambridge, MA: MIT Press, 1990*

Computer technology is revolutionizing the way that design is done and there is an urgent need for a comprehensive, rigorously developed computational theory of design that can provide an adequate basis for practical software development. In *The Logic of Architecture*, Mitchell explores the quest for architectural theory. He proposes a relationship of criticism to design as a critical language semantics to the design world. Then he shows how design worlds may be specified by formal grammars and argues that the rules of such grammars encode knowledge of how to put together architectural buildings. Besides being of interest to architects, this book is also likely to be useful in raising the development of systematic computation theory in design.

*Praima Chayutsahakij*

## 17 The Logic of Practice

*Bourdieu, Pierre and Nice, Richard  
Palo Alto, CA: Stanford University Press, 1990*

This book presents a theoretical description of the practical logic of everyday action and the objective structures within which such action takes place. It explains individual and group activities as the interplay of objective structures and the practice of conduct in everyday life. Activities are described as a practical mode of knowledge, which is the basis of ordinary experience in the social world. Bourdieu's findings are based on insights from his own fieldwork and others' ethnographic and anthropological studies. His analysis of everyday actions and their logical structures provides the field of design useful theoretical mechanisms with which to understand how the utility and meaning of objects relates to individuals and groups.

*Carlos Teixeira*

## 18 Managing the Design Factory: The Product Developer's Toolkit

*Reinertsen, Donald  
New York: Free Press, 1997*

The premise of this book is that the product development process is similar to the manufacturing process and hence the same management principles can be applied. Reinertsen presents two types of tools for the management of the design factory: thinking tools, which provide analysis capabilities and action tools, which provide management tools for organization and execution. The primary thinking tools are economic analysis, queuing theory and information theory. The author stresses the point that there is no 'best practice' solution as they tend to be extremely contextual. He also makes the point that managing the design process requires one to design the right type of organization to support the product development function. A hard-nosed project management approach to design management, the book provides effective tools with a good explanation of the theory behind them.

*Pradeep Sharma*

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19

**Manufactured Pleasures: Psychological Responses to Design  
(Studies in Design and Material Culture)**

*Crozier, Ray*

*Manchester, UK: Manchester University Press, 1994*

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Design makes many connections with psychology to create a world that enhances our lives. The author, a lecturer in the Psychology of Education, provides a comprehensive account of psychological responses to the designed world. He offers a broad generalization of theories, approaches and findings from empirical studies in order to understand and explain why things are designed as they are and why they give pleasure.

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This book considers two broad perspectives on psychology, the biological and the social with three factors that influence responses to design: form, meaning and function. Beside biological explanations, it demonstrates background and process regarding how to apply appropriate theories to design from such formal ideas as beauty, gestalt, complexity and familiarity. Various perspectives on design's meaning are explored such as the meanings of objects in terms of emotions and representations. Because design and function are inseparable, the last chapter offers various ergonomic and perceptual guidelines for designing visual displays more effectively. Overall the book reveals and recommends how designers can apply a body of knowledge from a user-centered point of view to the practical world of design.

*Chujit Jeamsinkul*

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20

**Of Bicycles, Bakelites, and Bulbs***Bijker, Wiebe E.**Cambridge: MIT Press, 1995*

This book could be read as fascinating histories of technology. However, Bijke's intention is to use the three detailed case studies to suggest theoretical concepts that create a basis for science, technology and social change that uncovers the social roots of technology and makes it agreeable with democratic politics. He integrates the detailed case studies with theoretical generalizations and political analyses to offer a fully rounded treatment both of the relations between technology and society and of the issues involved in sociotechnical change. The stories of safety bicycles, the first truly synthetic plastic and the fluorescent light bulb, which form the core of this book focus on the actual design process of technology, on the detail of technical machine and process, while providing relatively broad based empirical generalizations. This book is valuable with regard to the development of design theory involving case study method.

*Praima Chayutsahakij*

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21 **On Line and on Paper: Visual Representations, Visual Culture,  
and Computer Graphics in Design Engineering**  
(Inside Technology Series)

*Henderson, Kathryn*

*Cambridge: MIT Press, 1999*

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Design is a process of achieving consensus among participants in various disciplines who bring different perspectives to their work. Visual representation is a significant tool to allow intangible ideas to become concrete. It also serves as social glue both between individuals and between groups to allow ideas to be reworked and renegotiated. As we are shifting from the paper world to the electronic, this book explains how these technologies effect and change the way we design.

The author, a sociologist and art critic, examines the factors and requirements in design process through interviews and two case studies from her own participatory observation. In both cases she describes the messy realities of design practice, including the mixed use of worlds of paper and computer graphics. She compares the benefits and limitations of using paper and electronic tools then develops the concept of "meta-indexicality" — the ability of a visual representation, used interactively, to combine many diverse levels of knowledge, and thus, to serve as a meeting ground for many types of workers. For design researchers and computer-aided design developers, this book is a good resource in terms of laying out a practice-informed groundwork for the creation of more usable computer tools.

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*Chujit Jeamsinkul*

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## 22

**Pattern Language: Towns, Buildings, Construction***Alexander, Christopher**Oxford: Oxford University Press, 1977*

The author is the 1960s architect who developed 'pattern language,' which is a practical language for architecture, building and planning. Two-hundred and fifty patterns dealing with common structural and spatial elements are the units of this language based on the nature of a design problem, its context and solution. By understanding recurrent design problems in our environment, readers can identify extant patterns in their own design projects and use these patterns to create a language of their own. This book is not only a manual or guideline of building for architecture, but it is also a unique way of looking at architecture from a social perspective, as social environment from the standpoint of spirituality, beauty and living communities. Alexander's work has subsequently been rediscovered by object-oriented software designers making him a cult hero. This book demonstrates how design plays a role across disciplines. *Pattern Language* supports diverse approaches: issues of reusability; novice designer's guide; communication tools to better inform project participants; or structural component base to better grapple with complex and often competing design requirements.

*Sakol Teeravarunyou*

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23

**The Power of Product Platforms:  
Building Value and Cost Leadership**

*Meyer, Marc H. and Lehnerd, Alvin  
New York: Free Press, 1997*

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The authors describe how to build entire families of strong products from a single platform that shares a common structure. The book is written in the field of business planning and product development, but it contributes to the field of product design. The examples are drawn from different types of products including physical, software and information products. The book reveals a useful methodology, step-by-step development and case studies with successful companies such as Hewlett Packard, EMC and Boeing. From a design point of view, product platform refers to a higher level of product architecture and it is used to manage the complexity of product structure and organization. The book includes the concept of design from a business standpoint with regard to such things as commonality, compatibility, standardization or modularization among different products. By supplying an overview of product development, the book provides a foundation for extension and the development of more sophisticated concepts.

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*Sakol Teeravarunyou*

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## 24 Practising Interdisciplinarity

*Weingart, Peter and Stehn, Nico, editors*

*Toronto: University of Toronto Press, 2000*

Focusing on the intriguing debate between specialization of scientific disciplines and interdisciplinarity, the book itself turns out to be a good example of interdisciplinary practice. Based on the experience of two conferences ("Centers for Interdisciplinary Research – A Model for Institutional Innovation in Science in Europe," Germany, 1995 and "Practising Interdisciplinarity," Canada, 1997), the editors' intention is to get to an informed discussion and understanding of the subject of interdisciplinarity through contributions from scholars representing a wide spectrum of scientific background.

Through the description of changes happening both in academia and science policy in Europe, Australia and North America, the book acknowledges renewed interest in the practice of interdisciplinarity, its potentials and its institutional obstacles. The book does not explicitly refer to interdisciplinarity in the field of design, still its two major messages are significant stimuli for those who work within radical innovation processes driven by design:

- 1) Disciplines, as intellectual structures, have framed the system of education and, as a consequence, the system of occupations. In recent decades the world of practice sees disciplinary boundaries as constraints towards innovation and asks for a renewal of the academic agenda.
- 2) Despite radical and sometimes utopian visions, interdisciplinarity does not mean production of knowledge without organizing patterns. Those patterns work as reference points in the communication flow among practitioners and they are not eliminated by interdisciplinarity, but repositioned.

*Simona Maschi*

25

**Programming for Design: From Theory to Practice***Cherry, Edith**New York: John Wiley & Sons, 1999*

This book provides an introductory guide for novice programmers through the transition from written theory to practical application. The book is divided into two parts. The first part, *Preparing for Architectural Programming*, introduces theoretical issues involved in dealing with problems. Architectural programming is defined as a process of problem analysis and identification. Types of thinking processes and approaches to problems are examined with architectural context in mind, where the role and the importance of clients are also described. The second part of the book, *The Architectural Programming Project*, links theory and practice with step-by-step descriptions of methods and extensive use of examples. Emphasizing user-centered design, the book offers strategies and techniques for goal setting, information gathering and analysis, concept development, program synthesis and communication with clients, which is useful for architects, planners and other design professions.

*Praima Chayutsahakij*

26

**The Reflective Practitioner:  
How Professionals Think in Action***Schon, Donald A.**New York: Basic Books, 1983*

In a world dominated by science, professions struggle to be accepted. The limitations of technical rationalism and the systematic use of knowledge is challenged in this book. In the context of design, reflection-in-action is the balancing perspective the author recommends. This is a material conversation with the forms, substances and concepts of a design situation as they are being created and used. It is 'talk back' in the process of making a solution. Besides a general argument promoting reflection-in-action, several professions are examined in terms of their reflective practice: architecture, psychotherapy, science, town planning and management. This book is a classic that every designer needs to read.

*Luis Pereira*

27

**Situated Learning: Legitimate Peripheral Participation***Lave, Jean; Wenger, Etienne**Cambridge: Cambridge University Press, 1991*

Situated learning or learning by doing is a concept based on the idea that people's thoughts and actions are located in space and time. Written from a social science perspective on learning and knowledge, the authors believe that learning is a process of participation in communities of practice. They explore legitimate peripheral participation with a description of apprenticeship in five communities of practice including midwives, tailors, quartermasters, butchers and alcoholics. The authors identify the characteristics of meaning in the participants, activity, knowledge and social world. The transformations of these characteristics focus on a newcomer becoming an old-timer, situated learning activity as legitimate peripheral participation, transformation of identities among practitioners and the social processes of practices in the process of reproduction respectively. The book is short and difficult to follow.

*Sakol Teeravarunyou*

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28 **Theory in Practice: Increasing Professional Effectiveness**  
(**Jossey-Bass Higher and Adult Education Series**)

*Argyris, Chris and Schon, Donald A.*  
*San Francisco; Jossey-Bass Publishers, 1974.*

n

*Theory in Practice* makes a seminal contribution to a rich literature. Exploring the relationship between personal and interpersonal learning, it establishes what would become the research field of organizational learning. Examining the ways in which professionals learn and act, it leads to the concept of reflective practice. The theory of action it presents became the basis of an approach to management practice and organizational research. Finally, it develops the concept and method of action research. In this book, Argyris and Schon begin what would become a quarter century of central work in organizational learning, management education and knowledge management. This book establishes central distinctions between espoused theories and theories in use, as well as the concepts of single-loop and double-loop learning that form the basis of the two models of learning. The political economics of industrial democracy suppose an environment in which pursuit of profit is linked to individual choice, commitment to truth and freedom of inquiry. This book offers a system through which effective organizations can operationalize those values.

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*Ken Friedman*

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29

**The Viable System Model:  
Interpretations and Applications of Stafford Beer's VSM***Espejo, R and Harnden, R., editors  
New York: John Wiley & Sons, 1989*

Important considerations in designing complex products are "Which elements need to be included in developing a design?" "What are the essential pathways of control and communication?" "What are the characteristics of how things will go wrong?" These control and communication issues are central to designing in most areas of human endeavor and apply to all products and contexts. Beer's cybernetic Viable System Model (VSM) addresses these questions directly across disciplinary boundaries.

In this book, Espejo and Harnden bring together analyses and case studies from second generation practitioners using Beer's VSM. These papers draw attention to the practical and theoretical issues involved in using VSM, especially in complex organizational environments. They point to the importance of understanding and managing the requisite variety in the behavior and responses of design elements. This book supports designers in avoiding design failures, minimizing the cost of designing and maximizing the elegance of solutions.

*Terence Love*

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30

**Winning at New Products:**

**Accelerating the Process from Idea to Launch**

*Cooper, Robert Gravlin*

*Perseus Books Group, 2001*

n

Around for a long time, this book is recently updated to include more recent examples. Cooper makes a strong case for the importance of new product development and outlines specific strategies for: assessing risk; marshalling the appropriate resources; engaging customers in the pre-development discovery phase; evaluating the project portfolio; ensuring true cross-functional collaboration; and most importantly, applying a rigorous process for making sound business decisions at every step from idea generation to launch. The context of the book is very much larger corporations, with examples from multi-national companies such as 3M, Guinness and Exxon Chemicals. The books consequently does not really cover service development, but does, nonetheless provide a good series of arguments and pointers for middle and senior management involved with managing new product development portfolios.

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*Pradeep Sharma*

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ISSN 0022-2224  
 Published continuously since 1967.  
 Index included in last issue of volume year.

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