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
Situated 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, Bakelites, 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 Consciousness: 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

a n d

Practice

Perspectives on Building a Discourse Between Design Theory and Practice

Praima Chayutsahakij

&

Annotated Theory and Practice in Design List

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.

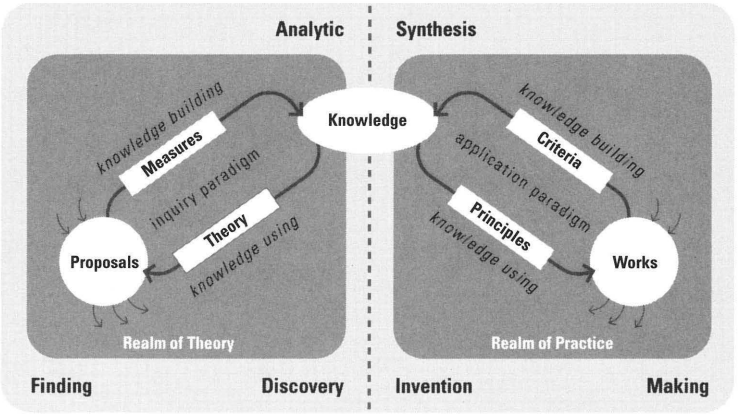


Figure 1 Analytic/Synthetic, Theory/Practice Model Redrawn from the original in *Design Process Newletter*, 5:6, 1994.

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.

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.

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 repertories 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.

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.

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.

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*.

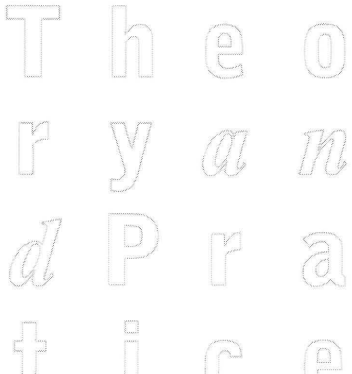
The books in this section are useful for the development of design theory, design research, design practice, design intellectual culture and design discipline.

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.



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:

	Natural science	Social science	Technology science	Business	Education	Architecture	Industrial design	Visual design
Original list	0	28.57	15.7	20	8.75	12.86	12.86	1.43
On-line ranking	0	18.18	24.24	21.21	9.09	12.12	12.12	3.03
Recommended books	0	37.5	31.25	9.38	12.5	0	6.25	3.13
Added-recommended	0	35.29	17.65	17.65	11.76	0	11.76	5.88
Final list	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.

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.

T h e o
r y *a* *n*
d P r a
t i c e

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.

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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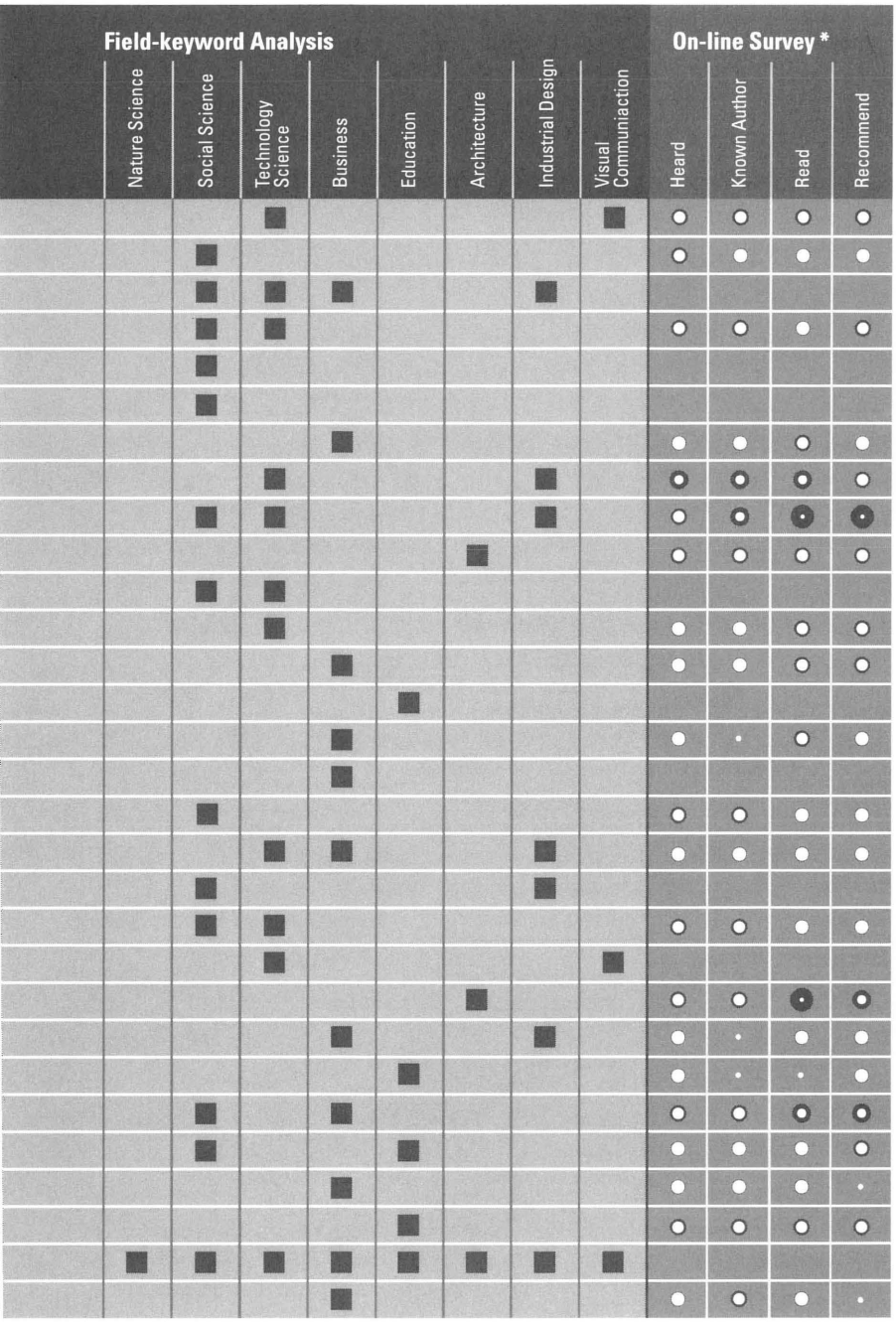
	Title: The final list	Author
1	About Face: The Essentials of User Interface Design	Cooper, Alan
2	Case Study Research: Design and Methods	Yin, Robert K.
3	The Art of Innovation: Lessons in Creativity from IDEO, America's Leading...	Kelley, Tom
4	Context and Consciousness: Activity Theory and Human-Computer 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 Gravlin

Table 2 Design Theory and Practice Book List



* The on-line survey produced substantial information regarding the Theory and Practice selection

Legend	Response
○	0
○	1-3
○	4-6
◎	7-9
◉	10-13

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

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 be 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

11 **Fluid Concepts & Creative Analogies: Computer Models of the Fundamental Mechanisms of Thought**
Hofstadter, Douglas R. and FARG
New York: HarperCollins Publishers, 1995

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.

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

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

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

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.

Barbara Martinson

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. Reinerstein 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

19 **Manufactured Pleasures: Psychological Responses to Design (Studies in Design and Material Culture)**
Crozier, Ray
Manchester, UK: Manchester University Press, 1994

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 pychological 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.

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

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

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

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.

Chujit Jeamsinkul

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

23 **The Power of Product Platforms: Building Value and Cost Leadership**
Meyer, Marc H. and Lehnerd, Alvin
New York: Free Press, 1997

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.

Sakol Teeravarunyou

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

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.

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.

Ken Friedman

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

30 **Winning at New Products:**
Accelerating the Process from Idea to Launch
Cooper, Robert Gravlin
Perseus Books Group, 2001

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.

Pradeep Sharma