

# Analysing Design Activity

Design encompasses some of the highest cognitive abilities of human beings, including creativity, synthesis and problem solving. A substantial and varied range of research methods has been developed and adopted for the analysis of design activity, but until now it has been difficult to compare the work of different researchers using different methods. This book contains the results of an international workshop held in Delft, The Netherlands, which focused on one particular research method, that of protocol analysis. Researchers from seventeen different leading centres around the world were invited to analyse the same video recordings of designers working on an engineering product design. The 20 chapters in this book are the records of that workshop, providing rich insights into the design process and an overview of accumulated knowledge on design from these researchers. There is also a discussion of the properties and limitations of protocol analysis as a research technique for analysing design activity. The book is a substantial contribution to developing understanding of the nature of design activity, and is of value to researchers, teachers and practitioners of design.

This volume aims to provide the reader with a broad cross-section of empirical research being carried out into engineers at work. The chapters provide pointers to other relevant studies over recent decades – an important aspect, we believe, because this area has only recently begun to coalesce as a field of study and up to now relevant empirical research has tended to be published across a range of academic disciplines. This lack of readily available literature might explain why contemporary notions of engineering have drifted far from the realities of practice and are in urgent need of revision. The principal focus is on what empirical studies tell us about the social and technical aspects of engineering practice and the mutual interaction between the two. After a foreword by Gary

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Lee Downey, the research presented by the various chapter authors is based on empirical data from studies of engineers working in a variety of global settings that include Australia, Ireland, Portugal, South Asia, Switzerland, the UK and the US The following groups of readers are addressed: •researchers and students with an interest in engineering practice, •professional engineers, particularly those interested in research on engineering practice, •engineering educators, •people who employ, recruit or work with engineers. Providing a much clearer picture of engineering practice and its variations than has been available until now, the book is of interest to engineers and those who work with them. At the same time it provides invaluable resource material for educators who are aiming for more authentic learning experiences in their classrooms. Further information, visit the website Engineering Practice in a Global Context Online: <http://epr.ist.utl.pt/EPGC/>

Analysing Design Activity Wiley

A revised and edited collection of key parts of Professor Cross's published work, this book offers a timeline of scholarship and research over the course of 25 years, and a resource for understanding how designers think and work. Coverage includes the nature and nurture of design ability; creative cognition in design; the natural intelligence of design; design discipline versus design science; and expertise in design.

11th Joint Conference, JCKBSE 2014, Volgograd, Russia, September 17-20, 2014. Proceedings

Software Architecture: A Case Based Approach

Innovations in Mobile Educational Technologies and Applications

Design Computing and Cognition '16

Design Expertise

Interior Design: Conceptual Basis

**This is the second volume of the new conference series Design Computing and Cognition (DCC), successor to the successful series Artificial**

**Intelligence in Design (AID).** The conference theme of design computing and cognition recognizes not only the essential relationship between human cognitive processes as models of computation but also how models of computation inspire conceptual realizations of human cognition.

The current educational system continues to face challenges in the wake of new technological advancements in our society. Continuous advances in education technology have provided the mobile learning community with inquiries on how these innovative devices may be used for teaching. **Innovations in Mobile Educational Technologies and Applications** presents a collection of knowledge on the developments and approaches of mobile educational technology. Bringing together points of view from both technological and pedagogical practices, this book aims to enhance interest in nontraditional approaches to learning.

This book provides an overview of how to approach computer science education research from a pragmatic perspective. It represents the diversity of traditions and approaches inherent in this interdisciplinary area, while also providing a structure within which to make sense of that diversity. It provides multiple 'entry points'- to literature, to methods, to topics Part One, 'The Field and the Endeavor', frames the nature and conduct of research in computer science education. Part Two, 'Perspectives and Approaches', provides a number of grounded chapters on particular topics or themes,

written by experts in each domain. These chapters cover the following topics: \* design \* novice misconceptions \* programming environments for novices \* algorithm visualisation \* a schema theory view on learning to program \* critical theory as a theoretical approach to computer science education research Juxtaposed and taken together, these chapters indicate just how varied the perspectives and research approaches can be. These chapters, too, act as entry points, with illustrations drawn from published work.

The impact of design development on the overall success of a business positions the area as an important performance improvement opportunity. However, design development is exemplified by novelty and non-repeatability, characteristics which provide particular challenges in the definition, measurement and management of performance with a view to improvement. Design Performance scrutinizes the support for improvement in design development provided by research into general business processes and design in particular. The nature of design development in industrial practice is explored and requirements for its modelling and analysis are highlighted. The methods employed encapsulate a formalism composed of three models: E2 formalises and relates the effectiveness and efficiency of a design; Design Activity Management distinguishes design and design management in terms of the knowledge processed in each activity; Performance Measurement and Management

**describes how these activities relate to each other within the milieu of measurement and management. A computer-based tool that enables the industrial implementation of the PERFORM approach (analysing the influence of resources on an aspect of design performance) and the identification of appropriate means of design improvement is presented. Design Performance illustrates its methodological principles with worked examples and details of industrial practice making it suitable for an academic teaching and research readership as well as for commercial designers and managers. The impact of design development on the overall success of a business positions the area as an important performance improvement opportunity. However, design development is exemplified by novelty and non-repeatability, characteristics which provide particular challenges in the definition, measurement and management of performance with a view to improvement. Design Performance scrutinizes the support for improvement in design development provided by research into general business processes and design in particular. The nature of design development in industrial practice is explored and requirements for its modelling and analysis are highlighted. The methods employed encapsulate a formalism composed of three models: E2 formalises and relates the effectiveness and efficiency of a design; Design Activity Management distinguishes design and design management in terms of the knowledge processed in each activity;**

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**Activity Systems Analysis Methods**

**Analyzing Design Review Conversations**

**The Block Reader in Visual Culture**

**Understanding Complex Learning Environments**

**Analysing Design Activity**

**Technology and Organization (RLE: Organizations)**

Artificial intelligence provides an environmentally rich paradigm within which design research based on computational constructions can be carried out. This has been one of the foundations for the developing field called "design computing". Recently, there has been a growing interest in what designers do when they design and how they use computational tools. This forms the basis of a newly emergent field called "design cognition" that draws partly on cognitive science. This new conference series aims to provide a bridge between the two fields of "design computing" and "design cognition". The papers in this volume are from the "First

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International Conference on Design Computing and Cognition" (DCC'04) held at the Massachusetts Institute of Technology, USA. They represent state-of-the art research and development in design computing and cognition. They are of particular interest to researchers, developers and users of advanced computation in design and those who need to gain a better understanding of designing.

Design is ubiquitous. Speaking across disciplines, it is a way of thinking that involves dealing with complex, open-ended, and contextualized problems that embody the ambiguities and contradictions in everyday life. It has become a part of pre-college education standards, is integral to how college prepares students for the future, and is playing a lead role in shaping a global innovation imperative. Efforts to advance design thinking, learning, and teaching have been the focus of the Design Thinking Research Symposium (DTRS) series. A unique feature of this series is a shared dataset in which leading design researchers globally are invited to apply their specific expertise to the dataset and bring their disciplinary interests in conversation with each other to bring together multiple facets of design thinking and catalyze new ways for teaching design thinking. Analyzing Design Review Conversations is organized around this shared dataset of conversations between those who give and those who receive feedback, guidance, or critique during a design review event. Design review conversations are a common and prevalent practice for helping designers develop design thinking expertise, although the structure and content of these reviews vary significantly. They

make the design thinking of design coaches (instructors, experts, peers, and community and industry stakeholders) and design students visible. During a design review, coaches notice problematic and promising aspects of a designer's work. In this way, design students are supported in revisiting and critically evaluating their design rationales, and making sense of a design review experience in ways that allow them to construct their design thinking repertoire and evolving design identity.

Design occurs in a rich social context where the effectiveness and efficiency of social interaction and collective performance are key to successful outcomes. Increasingly, design is being explored and developed as a collective, collaborative, participatory, and even community process. The heightened recognition of designing as a social process has stimulated interest in collaborative design. This book contains the proceedings of the international conference "CoDesigning 2000" held in Coventry, England, September 2000. During this meeting exponents from a wide range of design domains came together to present and discuss perspectives on and new knowledge and understanding of collaborative design, and the evidence for enhanced design performance through collaboration. Within this volume different motivations for, conceptions of, and findings about collaborative design are addressed in 50 contributions by different research groups. Structured into 6 sections according to the main fields of interest, it provides a survey of the state of scientifically based knowledge and trends emerging from collaborative

design research and their implications for a wide range of domains.

This book constitutes the refereed proceedings of the 11th Joint Conference on Knowledge-Based Software-Engineering, JCKBSE 2014, held in Volgograd, Russia, in September 2014. The 59 full and 3 short papers presented were carefully reviewed and selected from 197 submissions. The papers are organized in topical sections on methodology and tools for knowledge discovery and data mining; methods and tools for software engineering education; knowledge technologies for semantic web and ontology engineering; knowledge-based methods and tools for testing, verification and validation, maintenance and evolution; natural language processing, image analysis and recognition; knowledge-based methods and applications in information security, robotics and navigation; decision support methods for software engineering; architecture of knowledge-based systems, including intelligent agents and softbots; automating software design and synthesis; knowledge management for business processes, workflows and enterprise modeling; knowledge-based methods and applications in bioscience, medicine and justice; knowledge-based requirements engineering, domain analysis and modeling; intelligent user interfaces and human-machine interaction; lean software engineering; program understanding, programming knowledge, modeling programs and programmers.

Design Knowing and Learning: Cognition in Design Education

User-Developer Cooperation in Software Development

### Urban Activity Analysis as an Urban Design Method

A review of current practice

Communication, Cooperation, and Application Design

Design Computing and Cognition '14

*This book is aimed at researchers and students who would like to engage in and deepen their understanding of design cognition research. The book presents new approaches for analyzing design thinking and proposes methods of measuring design processes. These methods seek to quantify design issues and design processes that are defined based on notions from the Function-Behavior-Structure (FBS) design ontology and from linkography. A linkograph is a network of linked design moves or segments. FBS ontology concepts have been used in both design theory and design thinking research and have yielded numerous results.*

*Linkography is one of the most influential and elegant design cognition research methods. In this book Kan and Gero provide novel and state-of-the-art methods of analyzing design protocols that offer insights into design cognition by integrating segmentation with linkography by assigning FBS-based codes to design moves or segments and treating links as FBS transformation processes. They propose and test information entropy as a means to capture the information carried by a linkograph and correlate it with the design outcomes.*

*The outcome of DTRS 10 held at Purdue University in 2014.*

*A collection of papers from a conference held at Kings College, London. Computer-based Design focuses on all areas of design using computational methods and examines how all these individual tools can be integrated to produce a coherent design process. This volume also covers areas of manual design methods and modelling that are vital to the continuing development and evolution of the computer-aided*

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*design process. TOPICS COVERED INCLUDE Product design and modelling Design process Decision-making models Computer-assisted design systems Computer-assisted conceptual design Computer-assisted detailed design Computer assisted design for manufacture Design knowledge manipulation Engineering change Engineering design issues Fuzzy design Computer-aided design Industrial applications of design Advanced design applications Computational fluid dynamics Computer-based Design provides an excellent opportunity for an update on the latest techniques and developments from concept to advanced application in the design arena.*

*Design is becoming a recognised academic discipline, and design research is the driving force behind this transformation. Design Research Now – Essays and Selected Projects charts the field of design research with introductory essays and selected research projects. The authors of the essays, all leading international design scholars, stake out positions on the most important issues of design research. They locate the significance of design research at the interface with technological development, describe what makes it a necessary ingredient of the continued development of the design disciplines, and assign it a seminal role in the relevant developments of society. The essays are supplemented by the presentation of recently completed research projects from universities in the Netherlands, theUK andItaly.*

*Design Research Now*

*Style and Creativity in Design*

*The Routledge Companion to Design Research*

*Proceedings of CoDesigning 2000*

*Building Innovation Eco-Systems*

*This book details the state-of-the-art of research and*

development in design computing and design cognition. It features more than 35 papers that were presented at the Sixth International Conference on Design Computing and Cognition, DCC '14, held at University College, London, UK. Inside, readers will find the work of expert researchers and practitioners that explores both advances in theory and application as well as demonstrates the depth and breadth of design computing and design cognition. This interdisciplinary coverage, which includes material from international research groups, examines design synthesis, design cognition, design creativity, design processes, design theory, design grammars, design support and design ideation. Overall, the papers provide a bridge between design computing and design cognition. The confluence of these two fields continues to build the foundation for further advances and leads to an increased understanding of design as an activity whose influence continues to spread. As a result, the book will be of particular interest to researchers, developers and users of advanced computation in design and those who need to gain a better understanding of designing that can be obtained through empirical studies. In the last two decades, there has been growing interest in pursuing theoretical paradigms that capture complex learning situations. Cultural Historical Activity Theory (CHAT) is one of several theoretical frameworks that became very popular among educational researchers because it conceptualizes individuals and their environment as a holistic unit of analysis. It assumes a non-dualistic ontology and acknowledges the complexities involved in human

activity in natural settings. Recently, reputable journals such as the *American Psychologist*, *Educational Psychologist*, and *Educational Researcher* that are targeted for a wide-range of audience have included articles on CHAT. In many of such articles, CHAT has been referred to as social constructivism, sociocultural theory, or activity theory. Activity systems analysis is one of the popular methods among CHAT researchers for mapping complex human interactions from qualitative data. However, understanding the methods involved in activity systems analysis is a challenging task for many researchers. This difficulty derives from several reasons. First the original texts of CHAT are in Russian and there have been numerous authors who report on the difficulties of reconciling translation problems of the works of original authors' such as Vygotsky and Leontiev. Second, in North America activity systems analysis has deviated from the Russian scholars' intentions and Engeström's original work using the triangle model to identify tensions to overcome and bring about sociopolitical change in participant practices. Third, to this date there are numerous publications on the theoretical background of activity theory and studies reporting the results of using activity systems analysis for unpacking qualitative data sets, but there have been no methodological publications on how researchers engage in activity systems analysis. Thus, there is a dearth of literature in both book and journal publications that guide researchers on the methodological issues involving activity systems analysis.

Wide aspects of a university education address design: the

conceptualization, planning and implementation of man-made artifacts. All areas of engineering, parts of computer science and of course architecture and industrial design all claim to teach design. Yet the education of design tends to follow tacit practices, without explicit assumptions, goals and processes. This book is premised on the belief that design education based on a cognitive science approach can lead to significant improvements in the effectiveness of university design courses and to the future capabilities of practicing designers. This applies to all professional areas of design. The book grew out of publications and a workshop focusing on design education. This volume attempts to outline a framework upon which new efforts in design education might be based. The book includes chapters dealing with six broad aspects of the study of design education:

- Methodologies for undertaking studies of design learning
- Longitudinal assessment of design learning
- Methods and cases for assessing beginners, experts and special populations
- Studies of important component processes
- Structure of design knowledge
- Design cognition in the classroom

This volume, one of a two volume set, is from the August 1999 HCI International conference papers presented in Munich, Germany. Human Computer Interaction: Communication, Cooperation, and Application Design focuses on the informative and communicative aspects of computer use. A larger number of contributions is concerned with computer-supported cooperation using a wide variety of different techniques. In keeping with the increased focus of HCI International '99 on internet issues

and aspects of the global information society, many papers in this volume are centered around information and communication networks and their implications for work, learning, and every-day activities. Due to the growing number and diversity of groups utilizing modern information technologies, issues of accessibility and design for all are becoming more and more pertinent. A range of papers in this volume address these issues and provide the latest research and development results.

Designerly Ways of Knowing

Design Performance

Human Behaviour in Design

Interdisciplinary Design in Practice

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Understanding the Technical and the Social

The BLOCK Reader is a collection of essays from the pages of BLOCK, encompassing key cultural and critical debates between artists, art and design historians and cultural theorists throughout the last decade.

In this important MBA text the authors adopt a highly integrated approach. Using the three conceptual lenses of power, meaning and design they explore fully the many different ways in which technology and organizations interact. They highlight the major debates within these competing perspectives and argue that the flow of knowledge and ideas

within and between organizations is crucial in shaping technologies and organizations alike.

vi The process is important! I learned this lesson the hard way during my previous existence working as a design engineer with PA Consulting Group's Cambridge Technology Centre. One of my earliest assignments involved the development of a piece of laboratory automation equipment for a major European pharmaceutical manufacturer. Two things stick in my mind from those early days – first, that the equipment was always to be ready for delivery in three weeks and, second, that being able to write well structured Pascal was not sufficient to deliver reliable software performance. Delivery was ultimately six months late, the project ran some sixty percent over budget and I gained my first promotion to Senior Engineer. At the time it puzzled me that I had been unable to predict the John Clarkson real effort required to complete the automation project – I had Reader in Engineering Design, genuinely believed that the project would be finished in three weeks. It was some years later that I discovered Kenneth Cooper's Design Centre papers describing the Rework Cycle and

realised that I had been the victim of “undiscovered rework”. I quickly learned that project plans were not just inaccurate, as most project managers would attest, but often grossly misleading, bearing little resemblance to actual development practice.

This book looks at causative reasons behind creative acts and stylistic expressions. It explores how creativity is initiated by design cognition and explains relationships between style and creativity. The book establishes a new cognitive theory of style and creativity in design and provides designers with insights into their own cognitive processes and styles of thinking, supporting a better understanding of the qualities present in their own design. An explanation of the nature of design cognition begins this work, with a look at how design knowledge is formulated, developed, structured and utilized, and how this utilization triggers style and creativity. The author goes on to review historical studies of style, considering a series of psychological experiments relating to the operational definition, degree, measurement, and creation of style. The work conceptually summarizes the recognition of individual style in products, as well as the creation of such styles as a process before

reviewing studies on creativity from various disciplines, presenting case studies and reviewing works by master architects. Readers will discover how creativity is initiated by design cognition. A summary of the correlations between creativity and style, expressed as a conceptual formula describing the cognitive phenomenon of style and creativity concludes the work. The ideas presented here are applicable to all design fields, allowing designers to comprehend and improve their design processes to produce creative, stylistically unique products.

Computer-Based Design

Empathy, Creativity, Collaboration, and Seven More Cross-Disciplinary Skills

Quantitative Methods for Studying Design Protocols

Design Process Improvement

Engineering Practice in a Global Context

Design Computing and Cognition '04

Maximizing reader insights into interior design as a conceptual way of thinking, which is about ideas and how they are formulated. The major themes of this book are the seven concepts of planning, circulation, 3D, construction, materials, colour and lighting, which covers the entire spectrum of a designer's activity. Analysing design concepts from the view of the range of possibilities that the

designer can examine and eventually decide by choice and conclusive belief the appropriate course of action to take in forming that particular concept, the formation and implementation of these concepts is taken in this book to aid the designer in his/her professional task of completing a design proposal to the client. The purpose of this book is to prepare designers to focus on each concept independently as much as possible, whilst acknowledging relative connections without unwarranted influences unfairly dictating a conceptual bias, and is about that part of the design process called conceptual analysis. It is assumed that the site, location, building and orientation, as well as the client's brief of activities and needs have been digested and analysed to provide the data upon which the design process can begin. Designed as a highly visual illustrative book, as the interior design medium demands, the hands-on creative process of designing is detailed with original drawn illustrations. Concentrating on the conceptual process of designing interiors, and defining what these concepts are, this book will help the designer to organise his/her process of designing and to sharpen the links between the various skill bases necessary to do the job. This book will be stimulating for students and instructors alike and is aimed at any student who maybe majoring in interior design, interior

architecture, architecture, design thinking or furniture design. It could also be a useful reference for students of design management and design leadership.

Human Behaviour in Design addresses important aspects of creative engineering design. The main topics are the interaction between two complementary modalities - "image" and "concept", internal and external components of design thinking, and design strategies - both for individual designers and design teams. The goal is to improve and evaluate tools and methods that support design. Although this book is the outcome of an international workshop held in March 2003, it is more than just a collection of its contributions. The papers are arranged into three main topics: Individual Thinking and Acting; Interaction Between Individuals; Methods, Tools and Prerequisites. There are summaries of the discussions of the respective topics written by the chairpersons, conclusions, and an outlook to future issues in design research.

This book gathers the peer-reviewed and revised versions of papers from the Seventh International Conference on Design Computing and Cognition (DCC'16), held at Northwestern University, Evanston (Chicago), USA, from 27-29 June 2016. The material presented here reflects cutting-edge design research with a focus on artificial

intelligence, cognitive science and computational theories. The papers are grouped under the following nine headings, describing advances in theory and applications alike and demonstrating the depth and breadth of design computing and design cognition: Design Creativity; Design Cognition - Design Approaches; Design Support; Design Grammars; Design Cognition - Design Behaviors; Design Processes; Design Synthesis; Design Activity and Design Knowledge. The book will be of particular interest to researchers, developers and users of advanced computation in design across all disciplines, and to all readers who need to gain a better understanding of designing.

Collaborative virtual environments (CVEs) are multi-user virtual realities which actively support communication and co-operation. This book offers a comprehensive reference volume to the state-of-the-art in the area of design studies in CVEs. It is an excellent mix of contributions from over 25 leading researcher/experts in multiple disciplines from academia and industry, providing up-to-date insight into the current research topics in this field as well as the latest technological advancements and the best working examples. Many of these results and ideas are also applicable to other areas such as CVE for design education. Overall, this book serves as an excellent reference for

postgraduate students, researchers and practitioners who need a comprehensive approach to study the design behaviours in CVEs. It is also a useful and informative source of materials for those interested in learning more on using/developing CVEs to support design and design collaboration.

Urban Design by Activity System Analysis

Essays and Selected Projects

Design Computing and Cognition '06

Power, Meaning and Design

Engineering Design Conference 2002

Computer Science Education Research

*The Routledge Companion to Design*

*Research offers a comprehensive examination of design research, celebrating the plurality of design research and the wide range of conceptual, methodological, technological and theoretical approaches evident in contemporary design research. This volume comprises 39 original and high quality design research chapters from contributors around the world, with offerings from the vast array of disciplines in and around modern design praxis, including areas such as industrial and product design, visual communication,*

*interaction design, fashion design, service design, engineering and architecture. The Companion is divided into five distinct sections with chapters that examine the nature and process of design research, the purpose of design research, and how one might embark on design research. They also explore how leading design researchers conduct their design research through formulating and asking questions in novel ways, and the creative methods and tools they use to collect and analyse data. The Companion also includes a number of case studies that illustrate how one might best communicate and disseminate design research through contributions that offer techniques for writing and publicising research. The Routledge Companion to Design Research will have wide appeal to researchers and educators in design and design-related disciplines such as engineering, business, marketing, computing, and will make an invaluable contribution to state-of-the-art design research at postgraduate, doctoral, and post-doctoral levels and teaching across a*

wide range of different disciplines. This book summarizes the results of Design Thinking Research carried out at Stanford University in Palo Alto, California, USA, and Hasso Plattner Institute in Potsdam, Germany. The authors offer readers a closer look at Design Thinking with its processes of innovations and methods. The contents of the articles range from how to design ideas, methods, and technologies via creativity experiments and wicked problem solutions, to creative collaboration in the real world and the connectivity of designers and engineers. But the topics go beyond this in their detailed exploration of design thinking and its use in IT systems engineering fields and even from a management perspective. The authors show how these methods and strategies work in companies, introduce new technologies and their functions and demonstrate how Design Thinking can influence as diverse a topic area as marriage. Furthermore, we see how special design thinking use functions in solving wicked problems in complex fields. Thinking and creating

*innovations are basically and inherently human - so is Design Thinking. Due to this, Design Thinking is not only a factual matter or a result of special courses nor of being gifted or trained: it's a way of dealing with our environment and improving techniques, technologies and life.*

*Cultivating Professional Identity in Design is a nuanced, comprehensive companion for designers across disciplines honing their identities, self-perception, personal strengths, and essential attributes. Designers' identities, whether rooted in education, workforce training, digital technology, arts and graphics, built environment, or other fields, are always evolving, influenced by any combination of current mindset, concrete responsibilities, team dynamics, and more. Applicable to designers of all contexts, this inspiring yet rigorous book guides practitioners and students to progress with ten key traits: empathy, uncertainty, creativity, ethics, diversity/equity/inclusion, reflection,*

*learning, communication, collaboration, and decision-making. Though it details a complete journey from start to finish, this book acknowledges the varying paths of designers' roles and is structured for a flexible, highly iterative reading experience. Segments can be read individually or out of order and revisited for new insights. Current and future stages of development - education experience, early-career opportunities, mid-career accomplishments, and/or career transitions - are factored in without hierarchy. Specific takeaways, activities, and reflection exercises are intended to work across settings and levels of experience. Design hopefuls and experts alike will find a new way to participate in and persevere through their work.*

*I\*PROMS 2005 is an online web-based conference. It provides a platform for presenting, discussing, and disseminating research results contributed by scientists and industrial practitioners active in the area of intelligent systems and soft computing techniques (such as fuzzy*

*logic, neural networks, evolutionary algorithms, and knowledge-based systems) and their application in different areas of manufacturing. Comprised of 100 peer-reviewed articles, this important resource provides tools to help enterprises achieve goals critical to the future of manufacturing. I\*PROMS is an European Union-funded network that involves 30 partner organizations and more than 130 researchers from universities, research organizations, and corporations. \* State-of-the-art research results \* Leading European researchers and industrial practitioners \* Comprehensive collection of indexed and peer-reviewed articles in book format supported by a user-friendly full-text CD-ROM with search functionality Collaborative Design in Virtual Environments Intelligent Production Machines and Systems - 2nd I\*PROMS Virtual International Conference 3-14 July 2006 Cultivating Professional Identity in Design Design Thinking Research Individuals, Teams, Tools*

### ***Building Common Ground and Usable Systems***

*Design Expertise* explores what it takes to become an expert designer. It examines the perception of expertise in design and asks what knowledge, skills, attributes and experiences are necessary in order to design well. Bryan Lawson and Kees Dorst develop a new model of design expertise and show how design expertise can be developed. This book is designed for all students, teachers, practitioners and researchers in architecture and design. To enable all readers to explore the book in a flexible way, the authors' words are always found on the left hand page. On the right are diagrams, illustrations and the voices of designers, teachers and students and occasionally others too. 'Design Expertise' provides a provocative new reading on the nature of design and creative thought.

*Effective teamwork across disciplines is essential to solve the technological and managerial problems associated with today's construction projects. This book promotes interdisciplinary design for the construction industry, and discusses the challenges and rewards involved. It contains contributions from many prominent figures representing*

*different professional viewpoints, among them architects Ian Ritchie and Richard Saxon, engineers Sir Alan Cockshaw, Michael Dickson and Sir Jack Zunz and developer Peter Rodgers. Case studies provide illustrations and examples. The book also presents and reviews recent innovative experiences of education for interdisciplinary design both in the university and practice environments. Further, it includes summaries of best practice in the design process drawn from management studies and academic research. In its focus on the collaborative nature of the design process the book addresses the neglected areas of teamwork and communication. It offers numerous examples where this way of working has achieved outstanding architectural results and project success in line with the Latham and Egan agendas.*

*The topic of the research reported here is direct user participation in the task-based development of interactive software systems. Building usable software demands understanding and supporting users and their tasks. Users are a primary source of usability requirements and knowledge, since users can be expected to have intimate and extensive knowledge of themselves, their tasks and*

*their working environment. Task analysis approaches to software development encourage a focus on supporting users and their tasks while participatory design approaches encourage users' direct, active contributions to software development work. However, participatory design approaches often concentrate their efforts on design activities rather than on wider system development activities, while task analysis approaches generally lack active user participation beyond initial data gathering. This research attempts an integration of the strengths of task analysis and user participation within an overall software development process. This work also presents detailed empirical and theoretical analyses of what it is for users and developers to cooperate, of the nature of user-developer interaction in participatory settings. Furthermore, it makes operational and assesses the effectiveness of user participation in development and the impact of user-developer cooperation on the resulting software product. The research addressed these issues through the development and application of an approach to task based participatory development in two real world development projects. In this*

*integrated approach, the respective strengths of task analysis and participatory design methods complemented each other's weaker aspects.*

*Collaborative Design*

*Knowledge-Based Software Engineering*

*Human-Computer Interaction*