

Human-Computer Interaction and Management Information Systems

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Two Volumes for the
Advances in Management Information Systems Series

Vladimir Zwass, Editor-in-Chief
(<http://mesharpe.com/amis.htm>)

To be published by M. E. Sharpe, Inc.

Topics, Abstracts, and Author Bios

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(Last modified: July 22, 2005)

1 Volume 4. Foundations

Foreword by Ben Shneiderman

“This remarkable volume needs trumpets to accompany the opening of its pages. But I think many readers will hear those trumpets in their mind, signaling the arrival of something new and important. It is with great pride and enthusiasm that I write this introduction to help tell the story of how human-computer interaction (HCI) has become a key component of the discipline of management information systems (MIS).

The thoughtful introduction and 18 compelling chapters in this volume are well worth reading carefully with time for reflection. They competently survey the topic, collectively providing readers with an understandable portrait of this emerging interdisciplinary topic.

In addition to the valuable contents of this volume and the follow-up second volume, Ping Zhang and Dennis Galletta’s leadership has created a lively community of contributors. This gathering of colorful personalities, leaders of the field, and wise commentators can lay claim to being an authoritative panel who are able to define this topic. The benefits of having this volume and community are enormous as we each promote HCI in MIS with our close colleagues and superiors. This volume will smooth the way for new academic courses, curricula, and degree programs. It will

enable industrial researchers to advance their agendas and organizational usability professionals to accelerate their activities.

.....

I close with a restatement of my enthusiasm for this collection of papers and for the community that created them. I see a shared vision of a human-centered approach to HCI in MIS. I'm filled with excitement and enthusiasm and believe that readers will get the message about the importance of human values in HCI in MIS. I believe this volume will motivate colleagues and inspire students to carry out constructive user-centered research. Each of those projects will contribute to the larger goals. There is much to work to be done... let's get on with it!"

1.1 Foundations of Human-Computer Interaction in Management Information Systems: An Introduction

[Ping Zhang](#) and [Dennis Galletta](#)

In this introduction to the first of the two complementary volumes, we begin by providing a general context for both volumes along with a brief historical view of Management Information Systems (MIS) scholars' interest in Human-Computer Interaction (HCI) research. Then we integrate various HCI issues into an overarching framework that can encompass broad HCI concerns from multiple disciplines. A classification of HCI topics is presented, which guides the organization of the collections in this volume. The collected papers in this volume are previewed together with a variety of additional ideas, evidence, and insights. Topics in this volume include perspectives on HCI from different disciplines; the nature and evolution of our understanding of who the users are; theoretical understanding of how to design systems to support humans; theories and models on cognitive and behavioral aspects of using information technology (IT); and fundamental understanding of the affective, aesthetic, value sensitive, and social aspects of HCI. Overall, this introduction paper brings together many literatures and highlights key points of evolution in research over time, thus augments the collected papers to provide readers with a rich picture of the foundations of HCI research.

PART 1. DISCIPLINARY PERSPECTIVES AND THE USERS

1.2 Information Interactions: bridging disciplines in the creation of new technologies

[Andrew Dillon](#)

Designing information tools that meet human and organizational requirements involves skills, methods and theories that are beyond the scope of one field. While the Human-Computer Interaction (HCI) community draws on several disciplines to advance the state of the art, key concepts in the area remain undefined and the image of the user that drives various approaches is often overly limited or unarticulated, rendering communication among researchers problematic and education of future researchers and practitioners unfocused. However, rather than starting with definition at the user or interface level, the concept of information is potentially the most important one for us to agree upon. In the present chapter a view of information as 'product with purposive process' is presented which aims to offer a representation of information that can be shared across MIS and HCI as both disciplines seek to inform interaction design.

Andrew Dillon is Dean and Professor of the School of Information at the University of Texas at Austin. He has also held research and faculty positions at Indiana University and Loughborough University, and served as a consultant on software design to many companies in the US and Europe. He currently serves on the editorial boards of *Interacting with Computers*, *Journal of the American Society for Information Science*, *Journal of Digital Information* and the *International Journal of Digital Libraries*. His research interests include longitudinal analysis of user response to IT, the role of aesthetics in design, and the use of hypermedia systems to enhance learning and decision-making.

1.3 HCI as MIS

Adrienne Olnick Kutzschan and [Jane Webster](#)

Human-computer interaction has traditionally been studied within computer science, engineering, psychology and, to a much smaller degree, business. Each area brings its own unique contributions to the field. Nevertheless, this paper presents the argument that management information systems (MIS) researchers in business schools are distinctively positioned to address HCI issues, as they focus on people, information technologies, and wider contextual issues. MIS researchers' big picture perspective, combined with related theory and rigorous methodologies, support this position. In addition, they have the unique ability to not only study applications during development, but to follow them through to market. For instance, there is a current void within HCI research of large-scale studies which include employee interactions with actual technologies and this represents a substantial opportunity for MIS researchers. This paper identifies issues which may be inhibiting MIS' ability to take full advantage of this opportunity and makes suggestions for speeding up the progress of research in this area.

Adrienne Olnick Kutzschan is a doctoral candidate in MIS at Queen's University in Canada. Her primary research interests are in the area of human-computer interaction and assistive technology. Before resuming studies, she completed an MBA at Simon Fraser University and consulted in IT where she observed first-hand the challenges people face when using technology. She has

published in the following conference proceedings: Administrative Sciences Association of Canada, Second Annual Pre-ICIS Workshop on HCI Research in MIS and Annual Conference of the Administrative Sciences Association of Canada.

Jane Webster received her Ph.D from New York University and currently is a professor in the School of Business at Queen's University in Canada. She investigates the impacts of technologies to support distributed work, organizational communication, employee recruitment and selection, employee monitoring, and training and learning. She also focuses on human-computer interaction issues as they relate to organizational systems. She has served as a senior editor for MIS Quarterly, and has published in a variety of journals including the Academy of Management Journal, Communication Research, Journal of Organizational Behavior, MIS Quarterly, and Organization Science.

1.4 Who is the User? Individuals, Groups, Communities

[Gerardine DeSanctis](#)

The progress of management information systems over the last 50 years has brought an ever-expanding notion of computer “user.” We have witnessed the evolution of computer user from a single person to an interacting group, from a group of people to an entire firm or other organization, and from an organization to a diffuse community with dynamic membership and purpose. The result is a profound expansion in the scope of human-computer interaction (HCI) design and an explosion in the mandate for HCI research. This essay highlights some of the major design and research challenges associated with today’s broad notion of computer user. These challenges do not reduce the earlier HCI agenda. Instead, they expand it and imply a continued need for the study of HCI at multiple levels of analysis.

Gerardine DeSanctis (Ph.D., Texas Tech University) is the Thomas F. Keller Professor of Business Administration at Duke University. Her research focuses on learning in distributed teams and online communities. She has held Visiting Professor appointments on the Faculteit der Wiskunde en Informatica, Technische Universiteit Delft (The Netherlands), Erasmus University (The Netherlands), and INSEAD (in France and Singapore). She is currently or has been affiliated with the following editorial boards: *Information Systems Research*, *MIS Quarterly*, *Management Science*, *Organization Science*, and the *Journal of Organizational Behavior*. She regularly teaches in Duke’s Global Executive MBA Program.

PART 2. IT DEVELOPMENT: THEORIES OF INDIVIDUAL AND GROUP WORK

1.1 Advancing the Theory of DSS Design for User Calibration

[George M. Kasper](#) and Francis K. Andoh-Baidoo

This paper extends, revises, and reports a partial test of the theory of DSS design for user calibration. The Theory prescribes properties of a DSS needed for the users to achieve the goal of perfect calibration. Properties of expressiveness, visibility, and inquirability are posited as requisite

components of the DSS dialog. We extend the original theory of DSS design for user calibration to address the issues of meta-design and critiquing. A test of components of the theory is reported that compared the effects on user calibration of problems depicted using either expressiveness in the form of text or visibility in the form of diagrams. The results of the study support the theory. When problems are new and novel, visual depiction improves calibration. As problems became more familiar and problem novelty decreased, no difference was found in user calibration between subjects exposed to visibility diagrams and those exposed to a traditional text paradigm.

George M. Kasper is Professor of Information Systems at Virginia Commonwealth University. He is the author or co-author of more than two-dozen journal articles and several book chapters on information systems. MIT Press, Sage Publications, and others have reprinted his papers, and professional groups including the Society for Information Management have recognized his work. Kasper has served as Chairman of the Association for Computing Machinery's Special Interest on Management Information Systems, and is currently the USA ACM Representative to the International Federation for Information Processing (IFIP), a United Nations initiative. Recently, he was appointed AIS Representative Director to CSAB, the lead society within ABET for accrediting degree programs in CS, IS, IT, SE and CE.

Francis K. Andoh-Baidoo is a Doctoral Candidate in information systems at Virginia Commonwealth University. He earned the MBA at University of North Carolina – Greensboro. His research interests are in the areas of data mining, decision support and intelligent systems, and knowledge management. He has published in the proceedings of the Americas Conference on Information Systems.

1.2 Decisional Guidance: Broadening the Scope

[Mark Silver](#)

Decisional Guidance was introduced as a design feature of Decision Support Systems (DSS) more than a decade ago. It was originally defined as how a DSS enlightens or sways its users as they choose among and use the system's functional capabilities. Unlike mechanical guidance, the interface feature that helps users with the technicalities of invoking and using functionality, Decisional Guidance provides more substantive support for exercising discretion when choosing which functions to employ and while employing them. During the years since its introduction, Decisional Guidance has been used to study not only DSS but a variety of other information systems, including Group Support Systems, Executive Information Systems, and CASE Tools. This paper begins by summarizing the basic concepts of Decisional Guidance and reviewing how it has been studied empirically over the years. The paper revises the original definition in light of the review and broadens it to apply to information systems more generally. The typology of guidance is also updated. The paper concludes by presenting a more focused agenda for research based on the refined typology.

Mark S. Silver is Associate Professor of Information Systems in the Fordham University Schools of Business. He received his PhD from The Wharton School of the University of Pennsylvania and has been a member of the faculties at UCLA and NYU. He is the author of a book, *Systems That Support Decision Makers: Description and Analysis* (Wiley, 1991), and co-author of "The IT Interaction Model" (*MIS Quarterly*, 1995), among other journal articles. Professor Silver's current

research interests focus on the design features of interactive computer-based systems, especially browser-based systems and other Internet Applications. He is particularly interested in two design features, "System Restrictiveness" (how a system constrains its users) and "Decisional Guidance" (how a system enlightens, sways, or directs its users). The significance of these features emerged from his earlier work in the area of Decision Support Systems.

1.3 Coordination Theory: A Ten Year Retrospective

[Kevin Crowston](#), Joseph Rubleske, and James Howison

Since the initial publication in 1994, Coordination Theory has been referenced in nearly 300 journal articles, book chapters, conference papers and theses. Coordination Theory provides an approach to a core problem in HCI: analyzing group work to suggest alternative approaches involving computer support. Coordination Theory suggests identifying the dependencies between the tasks the different group members are carrying out and the coordination mechanisms the group use to coordinate their work and then considering alternative mechanisms. This chapter will analyze the contribution of this body of research to determine how Coordination Theory has been used for user task analysis and modelling for HCI. Issues that will be addressed include: 1) how the theory has been applied; 2) factors that led to the success of the theory; and 3) identification of areas needing further research.

Kevin Crowston is an Associate Professor in the School of Information Studies at Syracuse University and director of the PhD program. He joined the school in 1996. He received his A.B. (1984) in Applied Mathematics (Computer Science) from Harvard University and a Ph.D. (1991) in Information Technologies from the Sloan School of Management, Massachusetts Institute of Technology (MIT). His current research interests focus on new ways of organizing made possible by the use of information and communications technology. He approaches this issue in several ways: empirical studies of coordination-intensive processes in human organizations; theoretical characterizations of coordination problems and alternative methods for managing them; and design and empirical evaluation of new kinds of computer systems to support people working together. A specific example of the final interest is the application of document genre to the World-Wide Web.

Joseph Rubleske is a doctoral student at Syracuse University's School of Information Studies. He's interested chiefly in the social construction and reconstruction of classification schemes and their intended and actual uses. His teaching interests include information organization and group-based projects. Mr. Rubleske received his baccalaureate in Political Science from Indiana University in 1993 and a Master's in Planning (M.Pl.) from Indiana University in 1996. Prior to his doctoral studies, he worked as a Research Associate for the Center for Urban Policy and the Environment (1995-9), as a Web and Applications Developer for the State of Wisconsin (2000-2) and as a Senior Research Analyst for the State of Wisconsin (2002-3). Mr. Rubleske's research has been published in Public Works Management and Policy, The Professional Geographer, The Journal of Urban Technology and The Journal of Environmental Education.

James Howison is a doctoral student at the Syracuse University School of Information Studies. His research interests include the social science of software engineering and 'wireless grids' (distributed ad hoc resource sharing). For his PhD dissertation he intends to study effective practices for Free and Open software development. In 1998 he received his honors undergraduate degree in economic sociology and politics from the University of Sydney. In 2001 he undertook graduate study in

Software Engineering at the University of New South Wales before transferring to the Syracuse University School of Information Studies Ph.D. program in 2002. He was recently published in IEEE Internet Computing and has presented at the International Conference on Information Systems (ICIS), the annual conference of the Association for Public Policy Analysis and Management (APPAM) and the International Conference on Software Engineering (ICSE).

PART 3. IT DEVELOPMENT: THEORIES OF FIT

1.4 The Theory of Cognitive Fit: One aspect of a general theory of problem solving?

[Iris Vessey](#)

The theory of cognitive fit was first introduced in 1991 to explain the numerous equivocal results from decades of studies on information presentation using graphs and tables (Vessey 1991). At that time, Vessey introduced cognitive fit as part of a general theory of problem solving based on the belief that the theory could be applied both across different domains and different concepts of fit. Here we examine what has happened to the theory since that time. Has the theory withstood the test of time? Has it been extended, deepened? To do so, we undertake an analysis of articles based on the core concept of cognitive fit, viz., matching problem representation to problem-solving task, that have been published since 1991. We classified those studies according to whether they tested concepts found in the two foundational papers that present the theory (Vessey, 1991 1994), whether they applied the theory to new domains of investigation, and whether they used dimensions of fit other than the spatial-symbolic dichotomy addressed in the foundational studies.

In addition to identifying further studies similar to those on which the theory of cognitive fit was built, we found that the theory has been applied quite extensively to a further two domains, that of multi-attribute judgments, largely in the domain of accounting, and multi-criteria decision making in map-related domains. The theory has also been applied to new dimensions of fit. Certain studies have investigated the traditional concept of fit, that is, the match-mismatch dichotomy, using new dimensions, while others have applied the notions of fit to the complexity of the relationship between the problem-solving task and the problem representation. Instead of addressing the match-mismatch dichotomy, therefore, the latter approach addresses the degree of match between task and problem representation. In all instances, the findings largely support the theory of cognitive fit. There are two provisos: 1) it appears that problem solvers may solve very simple spatial problems better with tables than with graphs because they are more familiar and therefore more effective with tables in those settings; and 2) accuracy/time trade-off remains equivocal due to the numerous factors that may influence the outcome.

We then present recent extensions to the model of cognitive fit itself and to the situation in which the concurrent solution of two tasks is essential to problem solving. In the latter, dual-task situation, we further distinguish between problem solving in well- and ill-defined tasks.

The analysis presented here supports the notion that the theory of cognitive fit is, indeed, one aspect of a general theory of problem solving.

Iris Vessey is Professor of Information Systems at Indiana University's Kelley School of Business, Bloomington. She received her M.Sc., MBA, and Ph.D. in Management Information Systems from the University of Queensland, Australia. Her current research interests focus on the evaluation of emerging information technologies from both cognitive and analytical perspectives, knowledge

management systems, and the management and organization of enterprise resource planning systems (ERPs). She has served on the editorial boards of *MIS Quarterly*, *Information Systems Research*, *Management Science*, *Journal of Management Information Systems*, and the *Journal of Database Management* and the Executive Board of *Information Systems Frontiers*. During the first eight years of its life, she served as Secretary of the Association for Information Systems (AIS), as well as of the International Conference on Information Systems (ICIS) following its merger with AIS. She is an inaugural Fellow of the AIS.

1.5 Task Technology Fit: A Critical (But Often Missing!) Construct in Models of Information Systems and Performance

[Dale L. Goodhue](#)

This paper makes the case that Task Technology Fit is a critical construct that is often missing in models of information systems and performance. Its importance is deceptively obvious – a technology can only have positive performance impacts if it “fits” the task that is being supported. Unfortunately, not all technology does fit the tasks for which it is being used. However, some of the most frequently cited models in MIS individual research can be characterized as utilization focused and are missing this key fit construct. Limitations of such models are explored, and the case is made for including both task technology fit and utilization in models of performance. An approach for measuring task technology fit is also described, followed by a selection of published empirical evidence involving task technology fit. Finally, some potentially interesting new ways of conceptualizing task technology fit are described.

Dale L. Goodhue is the Department Head of the MIS Department, and the C. Herman and Mary Virginia Terry Chair of Business Administration at the University of Georgia’s Terry College of Business. He has published in *Management Science*, *MIS Quarterly*, *Decision Sciences*, *Sloan Management Review* and other journals. His research interests include measuring the impact of information systems, the impact of task-technology fit on individual performance, the management of data and other IS infrastructures and resources, and the impact of ERP systems on organizations.

1.6 Designs that fit: An overview of fit conceptualizations in HCI

[Dov Te’eni](#)

It has been argued that fitting the human-computer interface to the user and the task enhances performance. This chapter reviews these claims and asks whether such claims have theoretical and practical value. It begins with an overview of three types of fit: physical, cognitive and affective. Each type of fit is assessed for its value. The analysis then expands to consider dynamic aspects of fit to increase its value both in changing the practice of design and providing more powerful explanations of user behavior. The analysis concludes that there is value in the notion of fit in HCI design, yet the current fragmented and incomplete treatment of fit and the current shortcomings in its measurement hinder progress in this area.

Dov Te’eni is Professor of Information Systems in the faculty of management at Tel-Aviv University, Israel. He is also the chairman of Meital - Israel’s Higher Education E-learning center.

Dov studies several related areas of information systems: human-computer interaction, computer support for communication, knowledge management, systems design and non-profit organizations. His research usually combines model building, laboratory experiments and development of prototypes like Spider and kMail. Dov serves as Senior Editor for *MIS Quarterly* and is on the editorial boards of *Journal of AIS*, *Information and Organizations*, and *Internet Research*. He has published in journals such as *Management Science*, *MISQ*, *Organization Science*, *Communications of the ACM*, and in more specific journals of HCI such as *IJHCS*, *Behaviour and Information Technology*, *Computers in Human Behavior* and *IEEE Transactions*. Together with Jane Carey and Ping Zhang, Dov awaits their forthcoming book entitled *Human-Computer Interaction: Developing Effective Organizational Information Systems*.

PART 4. IT USE AND IMPACT: BELIEFS AND BEHAVIOR

1.7 Computer Self-Efficacy: A Review

[Deborah Compeau](#), [Jane Gravill](#), [Nicole Haggerty](#), and [Helen Kelley](#)

-efficacy (CSE) has become an important construct in information systems research. CSE has been shown to influence both user acceptance of technology and user learning about technology in a variety of settings across a wide range of technologies. This paper first reviews existing studies in the MIS literature on CSE to present the current state of knowledge regarding this influential construct and key antecedents. The paper then identifies important issues facing researchers in this area such as determining clarity in CSE definition and CSE measurement with respect to the context of task and technology domain. Several ongoing research programs aimed at furthering our understanding of the formation of CSE in phases of the computer software learning process within organizations are discussed, followed by suggestions regarding key avenues for future research on CSE. Review of the literature indicated that most studies on CSE have focused on the impact of CSE, with relatively less attention paid to its formation. The ongoing research programs presented in this paper, and the future research directions suggested, focus on important steps we believe are required to begin to fill the gap in our knowledge of how CSE develops in the workplace, and what influences this development. If our goal as researchers is to understand how and why a behavior develops and to extend an influence on future behavior, understanding the role of CSE (and other less immediate antecedents of behavior) remains important. This paper aims to assist in achieving this goal, and to provide important direction regarding future research on CSE.

Deborah R. Compeau is Associate Professor of Management Information Systems in the Richard Ivey School of Business at the University of Western Ontario. Her research focuses on the individual user of information and communications technologies, viewed from a social cognitive perspective. In particular she is interested in understanding what organizations can do to facilitate individual adoption of and learning about information technologies. Her research has been published in [Information Systems Research](#), [MIS Quarterly](#), [Information & Management](#) as well as other journals. Dr. Compeau is a member of the Editorial Board of *MIS Quarterly*.

Jane Gravill is a Ph.D. graduate in Management Information Systems from The University of Western Ontario, Richard Ivey School of Business, London, Ontario. She currently holding a part-time position at York University, Schulich School of Business, Toronto, Ontario. Her research

addresses the self-regulated learning process, individual differences such as self-awareness and goal-orientation, end-user adoption of information systems, and user competence. Her research has been published in the ICIS proceedings and Information & Management. Prior to becoming a Ph.D. Candidate, Gravill worked for over 10 years in a variety of MIS management positions.

Nicole Haggerty is an Assistant Professor at the Ivey Business School. Her research interests center on the intersection of technology and learning. She is particularly interested in research on the influence of organizational support mechanisms on post-training, post-adoption individual learning about technology and individual learning through technology in computer-mediated learning environments. Her research has been published in various conference proceedings including the International Conference on Information Systems, the Journal of Computer Information Systems, the Journal of Informatics, Education and Research and Canadian Public Policy.

Helen M. Kelley is Assistant Professor of Information Systems in the Faculty of Management at the University of Lethbridge. Her research focuses on the individual user of information and enterprise resource planning technologies, viewed from social cognitive and attributional perspectives. Her current interests investigate understanding what management of organizations can do to enhance individual adoption of and learning about information systems technologies plus Information Systems effectiveness in small businesses. Her research has been published in Information Systems Research, Journal of Global Information Management, and Business Quarterly.

1.8 Behavioral Information Security: An Overview, Results, and Research Agenda

[Jeff Stanton](#), [Kathryn Stam](#), Paul Mastrangelo, and Jeffrey Jolton

Information security is a multibillion-dollar problem faced by commercial, non-profit, and government organizations around the world. Because of their adverse effects on organizational information systems, viruses, hackers, and malicious insiders can jeopardize organizations' capabilities to pursue their missions effectively. Although technology-based solutions help to mitigate some of the many problems of information security, even the best technology cannot work successfully unless effective human-computer interaction occurs. Information technology professionals, managers, and end users all play a significant role in determining whether the behavior that occurs as people interact with information technology will support the maintenance of effective security or undermine it. In the present paper we try to apply behavioral science concepts and techniques to understanding problems of information security in organizations. We analyzed a large set of interviews, developed a set of behavioral categories, and conducted three survey studies (N=1167, N=298, and N=414) to explore whether and how behavioral science could apply to the complex, contemporary set of organizational problems surrounding information security. We report these results and provide a future research agenda for researchers who wish to support organization's efforts to ensure security of their information assets.

Jeffrey M. Stanton, Ph.D. (1997, University of Connecticut, Industrial/Organizational Psychology) is an associate professor in the School of Information Studies at Syracuse University and director of the Syracuse Information Security Evaluation project. He has developed an extensive funded research program at the intersection of behavioral science and information technology and has published more than 50 refereed articles and papers on this and related topics. Dr. Stanton's

research interest in the area of information security lies in understanding the role of work motivation in guiding the security-related behaviors of employees and managers in organizations, an area of research entitled behavioral information security.

Kathryn Stam, Ph.D. is assistant professor at the SUNY Institute of Technology and associate director of the Syracuse Information Security Evaluation project. She earned her Ph.D. in Social Science (Anthropology and Sociology) from Syracuse University's Maxwell School of Citizenship and Public Affairs. Her background and research interests are related to information technology, health and social services, and organizational culture. She has published a range of qualitative research on the topics of work organizations, community health, and teaching, and has received financial support for her research from the National Science Foundation.

Paul M. Mastrangelo, Ph.D., has been a consultant at Genesee Survey Services since 2002, where he works with large-scale organizations in the design, implementation, and analysis of employee surveys. Previously, Paul was a tenured associate professor at the University of Baltimore, where he focused on the measurement of attitudes, personality, and biographical information. He received his Ph.D. in Industrial and Organizational Psychology from Ohio University in 1993 and his B.A. in Psychology from the University of Rhode Island in 1989, where he was inducted into the Phi Beta Kappa Honor Society.

Jeffrey A. Jolton, Ph.D., is a senior consultant with Genesee Survey Services in Rochester, NY where he has worked with a variety of organizations helping them with the design, implementation and analyses of large-scale employee surveys. He has over 10 years' experience in the design, implementation, and analysis of individual, group, and organization-level assessments. He holds a Ph.D. in Industrial and Organizational Psychology from Ohio University and a B.A. in Psychology from Lawrence University. Jeff is a member of the Society for Industrial and Organizational Psychology and has presented and published in numerous conferences and publications.

1.9 Interpreting Security in Human-Computer Interactions: A Semiotic Analysis

[Gurpreet Dhillon](#) and Jeff May

Although there has been extensive research in the area of information systems security and human-computer interaction (HCI), security in the context of HCI has not been well understood. This paper proposes a framework for identifying and interpreting the deep-rooted human and technical issues that deal with security in the context of HCI. The concepts are grounded in semiotics. This paper argues that analyzing security in the context of HCI from the semiotic perspective transcends existing organizational and computer-technical knowledge thus allowing HCI designers a better ability to incorporate a more rounded design solution that seeks to minimize actual security threats and maximize user satisfaction when it comes to feeling secure.

Gurpreet Dhillon is a professor in the School of Business, Virginia Commonwealth University, Richmond, USA. He holds a Ph.D. in information systems (1995) from the London School of Economics and Political Science, UK. He is an author of five books and has published in several journals including *Information Systems Research*, *Communications of the ACM*, *Information & Management*, *Computers & Security*, *European Journal of Information Systems*, *Information Systems Journal*, and *International Journal of Information Management* among others. His research

interests include management of information security, ethical and legal implications of information systems and aspects of information systems planning and project management.

Jeffrey May is currently a faculty member at Virginia Commonwealth University where he concentrates on teaching programming and logical design. He holds a BS degree in Mechanical Engineering from Wright State University, an MS degree in Environmental Engineering from Virginia Polytechnic Institute and State University, and an MS degree in Information Systems at Virginia Commonwealth University. He currently is pursuing his PhD in Information Systems at Virginia Commonwealth University.

PART 5. IT USE AND IMPACT: AFFECT, AESTHETICS, VALUE, AND SOCIALIZATION

1.10 The Role of Affect in IS Research: A Critical Survey and a Research Model

[Heshan Sun](#) and [Ping Zhang](#)

While most existing models or theories in IS focus on the cognitive and behavioral aspects of human decision-making processes and individual level reactions to using technologies in organizations and other contexts, the influence of affect or emotion is traditionally neglected. The affective aspect, however, is considered crucial and has gained attention in psychology, marketing, organizational behavior, and other fields. Recently, affect and related emotional concepts have attracted attention from researchers in Information Systems (IS) and Human-Computer Interaction (HCI). Yet, studies of affect have been scattered and less systematic. This paper first examines the theoretical advancement of affect studies in several referencing disciplines to IS: psychology, organizational psychology and behavior, and marketing and consumer behavior. An abstract model of the individual interacting with an object (IIO) is developed to represent the important contributors to behavior intention and behavior of interacting with objects. Then the chapter continues with a comprehensive survey of existing studies on affect in the IS discipline to demonstrate the current status of the research stream, some conceptual discrepancies and limitations, and some potential areas for future research. An IT-specific model of IIO, a model of Individual Interaction with IT (IIIT), is constructed as both a framework and a theoretical model to interpret and predict individual IT user behavior. This study is an attempt to highlight and systematically analyze the influence of affect in IS and therefore has great implications for both researchers and practitioners.

Heshan Sun is currently a doctoral candidate in information science and technology in the School of Information Studies at Syracuse University. He received his MS in information management from Peking University and BA in international business from Nankai University, China. His research interests include human computer interaction, IS performance, e-commerce, information system analysis and design, and cross-cultural IS. He has presented his work at conferences such as AMCIS, HICSS, and Pre-ICIS Annual Workshops on HCI in MIS. In addition, he participated in several workshops and panel discussions such as the “Webshop” workshop sponsored by the University of Maryland, College Park, and the CIR workshop in Academic of Management’04. His work also appeared in journals such as *Journal of Information Studies: Theory & Application*,

China Information Review, and book chapters. He received the Best Paper awards at the pre-ICIS Annual Workshop on HCI Research in MIS (2004).

Ping Zhang is Associate Professor at School of Information Studies, Syracuse University. She earned her Ph.D. in Information Systems from The University of Texas at Austin. Her research appears or will appear in journals such as *Behaviour & Information Technology (BIT)*, *Communications of ACM*, *Communications of AIS (CAIS)*, *Computers in Human Behavior*, *Decision Support Systems*, *International Journal of Human-Computer Studies (IJHCS)*, *International Journal of Electronic Commerce*, *Journal of American Society for Information Science and Technology*, *Journal of AIS (JAIS)*, among others. With Dov Te'eni and Jane Carey, she co-wrote a HCI textbook for non-Computer Science students, *HCI: Designing Effective Organizational Information Systems* (John Wiley and Sons, 2005). Dr. Zhang received several Best Paper awards at IS conferences, an excellence in teaching award from The University of Texas at Austin, and an outstanding service award from AIS SIGHCI. She is Associate Editor for IJHCS and CAIS, and a guest co-editor for JAIS, JMIS, IJHCS, IJHCI, and BIT. She is the founding chair (2001-2004) of the AIS SIGHCI.

1.11 Aesthetics in Information Technology: Motivation and Future Research Directions

[Noam Tractinsky](#)

Researchers in the fields of management information systems (MIS) and human-computer interaction (HCI) have largely ignored the aesthetics dimension of information technology. This paper argues that aesthetics should be conceived as an integral part of information technology just as it is in other aspects of our lives. Four reasons are provided for this premise. (1) In many cases, aesthetics becomes a major differentiating factor between IT products. (2) Our evaluations of the environment, including IT, are primarily visual. (3) Aesthetics satisfies basic human needs, and human needs are increasingly supplied by information technology. (4) Aesthetic considerations are becoming increasingly important in our society, in large part thanks to IT. The paper proposes research directions for the study of aesthetics in information technology and provides some examples of research questions to illustrate the viability of this topic.

Noam Tractinsky is a Senior Lecturer at the Department of Information Systems Engineering at BGU. He received his Ph.D. in Information Systems from the University of Texas at Austin. His HCI-related research appeared in journals such as *Behavior & Information Technology*, *Human-Computer Interaction*, *Interacting with Computers*, *International Journal of Human-Computer Studies*, and *MIS Quarterly*. His recent research projects involved the study of consumer behavior in e-commerce and the effects of time pressure and time delays on decision making and user behavior. He is currently interested in the study of the aesthetic aspects of information technology.

1.12 Value Sensitive Design and Information Systems

[Batya Friedman](#), [Peter Kahn](#), and [Alan Borning](#)

Value Sensitive Design is a theoretically grounded approach to the design of technology that accounts for human values in a principled and comprehensive manner throughout the design process.

It employs an integrative and iterative tripartite methodology, consisting of conceptual, empirical, and technical investigations. We explicate Value Sensitive Design by drawing on three case studies. The first study concerns information and control of web browser cookies, implicating the value of informed consent. The second study concerns using high-definition plasma displays in an office environment to provide a “window” to the outside world, implicating the values of physical and psychological well-being and privacy in public spaces. The third study concerns an integrated land use, transportation, and environmental simulation system to support public deliberation and debate on major land use and transportation decisions, implicating the values of fairness, accountability, and support for the democratic process, as well as a highly diverse range of values that might be held by different stakeholders, such as environmental sustainability, opportunities for business expansion, or walkable neighborhoods. We conclude with direct and practical suggestions for how to engage in Value Sensitive Design.

Batya Friedman is a Professor in the Information School and an Adjunct Professor in the Department of Computer Science and Engineering at the University of Washington. She is also Co-Director of the Value Sensitive Design Research Laboratory at the University of Washington and Co-Director of The Mina Institute in Covelo, CA. She received both her BA (1979) and Ph.D. (1988) from the University of California, Berkeley. Dr. Friedman’s research interests include human computer interaction; social, legal and cultural aspects of information systems; and design methodology. Her 1997 edited volume (Cambridge University Press) is titled *Human Values and the Design of Computer Technology*. Her work on Value Sensitive Design (see, e.g., <http://www.ischool.washington.edu/vsd/>) has engaged such technologies as web browsers, large-screen displays, urban simulation, robotics, open-source code bases, and location enhanced computing.

Peter H. Kahn, Jr. is Associate Professor in the Department of Psychology and Adjunct Associate Professor in the Information School at the University of Washington. He is also Co-Director of the Value Sensitive Design Research Laboratory at the University of Washington. He received his Ph.D. from the University of California, Berkeley in 1988. His publications have appeared in such journals as *Child Development*, *Developmental Psychology*, *Developmental Review*, *Human Development*, *Environmental Values*, and *Journal of Systems Software*. His 1999 book (MIT Press) is titled *The Human Relationship with Nature: Development and Culture*. His edited volume (MIT Press, 2002) with Stephen Kellert is titled *Children and Nature: Psychological, Sociocultural, and Evolutionary Investigations*. His research lies at the intersection of human wellbeing, nature, and computational technologies, especially large-screen displays, robotics, and location enhanced computing. His research projects are currently funded by The National Science Foundation.

Alan Borning is a Professor in the Department of Computer Science & Engineering at the University of Washington. He is also Co-Director of the Center for Urban Simulation and Policy Analysis, Adjunct Professor in the Information School, and a member of the Interdisciplinary PhD program in Urban Design and Planning (all at the University of Washington), and a Fellow of the Association for Computing Machinery. He received a BA degree from Reed College in mathematics 1971, and a PhD from Stanford University in Computer Science in 1979. After spending a year in Edinburgh, he moved to the University of Washington in 1980. His current research interests are in human-computer interaction, particularly as applied to land use, transportation, and environmental modeling, and in integrating considerations of human values with computer system design. He has also done work in constraint-based languages and systems, other aspects of human-computer interaction, and in object-oriented programming.

1.13 Socializing Consistency: From Technical Homogeneity to Human Epitome

[Clifford Nass](#), Leila Takayama, and Scott Brave

Consistency is a major issue in user interface design. While graphical user interfaces have benefited tremendously from a focus on the cognitive aspects of consistency, advances in computer technologies now allow for more socially demanding interfaces incorporating more realistic artificial intelligence agents and new modes of interaction (e.g., voice). This paper demonstrates that as interfaces become more social, *social consistency* becomes as important as the more traditional cognitive consistency. This paper presents experimental studies of human-computer interaction that are theoretically grounded in social psychology and the computers are social actors (CASA) paradigm. Each study is used to inform design guidelines for social consistency and to open new areas of research on social responses to computers in important areas such as personality, gender, ethnicity, emotion, and the use of “I.”

Clifford Nass is a Professor at Stanford University. His primary appointment is in the Department of Communication with appointments by courtesy in Computer Science, Science, Technology, and Society, Sociology, and Symbolic Systems. He is Director of the Communication between Humans and Interactive Media (CHIME) Lab. He has written two books, *The Media Equation: How People Treat Computers, Televisions, and New Media Like Real People and Places* (New York: Cambridge University Press) and *Wired for Speech: How Voice Activates and Enhances the Human-Computer Relationship* (Cambridge: MIT Press). He has also written over 80 papers in the areas of human-computer interaction, statistical methodology, and organization theory. Nass’s primary research area is how people use social rules and heuristics to assess and respond to interfaces. His current foci are automobiles, natural language, robots, and voices.

Leila Takayama is a PhD Student at Stanford University, who is advised by Professor Clifford Nass in the Department of Communication. As a member of the CHIME Lab, she uses experiments to study the social and cognitive aspects of human interaction with computing systems. Leila also works as a research assistant for Palo Alto Research Center (PARC) with Dr. Stuart Card and Dr. Peter Pirolli in the User Interface Research (UIR) group. She holds B.A. degrees in Cognitive Science and Psychology from the University of California, Berkeley. With Professor James Landay in the Group for User Interface Research (GUIR) of the UC Berkeley Computer Science Division, she did undergraduate research in low-fidelity prototyping and ubiquitous computing systems. Leila is currently interested in how and why people use computers to augment their thinking, use joint imagination to interact with computers, and perceive computers as communication sources.

Scott Brave is a Postdoctoral Scholar at Stanford University. He is co-author (with Clifford Nass) of *Wired for Speech: How Voice Activates and Enhances the Human-Computer Relationship* (Cambridge: MIT Press). He received his Ph.D. in Communication from Stanford University, with a specialization in Human-Computer Interaction. As part of the CHIME Lab, Scott studied user responses to emotion in embodied agents and non-verbal communication in virtual spaces. In 1998, Scott received his M.S. degree in Media Arts and Sciences from the MIT Media Lab. As a member of Professor Hiroshi Ishii's Tangible Media Group, he focused on the application of force-feedback to human-computer interaction and interpersonal communication. Scott received his B.S. degree in Computer Systems Engineering from Stanford University, where he worked with Professor John

Koza and Professor Nils Nilsson exploring genetic programming, an artificial intelligence technique inspired by Darwinian evolution in nature.

PART 6. REFLECTIONS

1.14 On The Relationship Between HCI and Technology Acceptance Research

[Fred Davis](#)

This paper examines the relationship between Human-Computer Interaction (HCI) research and Information Systems research on technology acceptance. The technology acceptance model (TAM) is a motivational model of the user that traces the effects of system design characteristics (functionality and interface features), through perceived ease of use and perceived usefulness, on peoples' intentions to use the system. TAM was introduced in the 1980's to predict and explain user acceptance of new information systems based on usage intentions of potential users measured after a brief trial experience using a prototype of the new system. Influenced by early HCI research, TAM extends traditional user interface testing methodologies, which emphasize objective usability criteria (e.g., task performance times and error rates). Whereas HCI emphasizes how best to design the user interface to improve task performance when using a system, TAM focuses on how to increase people's willingness to use a system. Since both user acceptance and task performance are vital to a systems' success, HCI and TAM offer complementary perspectives. The paper concludes by discussing the evolution and current status of TAM research.

Fred D. Davis is Professor and David D. Glass Chair in Information Systems, and serves as Chair of the Information Systems Department at the Sam M. Walton College of Business at the University of Arkansas. Dr. Davis earned his Ph.D. at MIT's Sloan School of Management, and has served on the business school faculties at University of Michigan, University of Minnesota, and University of Maryland. Dr. Davis has served as Associate Editor for the scholarly journals *Management Science*, *MIS Quarterly*, and *Information Systems Research*. He has published extensively about user acceptance of IT and IT-assisted decision making. His research has appeared in such journals as *MIS Quarterly*, *Information Systems Research*, *Management Science*, *Decision Sciences*, *Journal of Applied Psychology*, *Journal of Experimental Social Psychology*, *Organizational Behavior and Human Decision Processes*, *IEEE Transactions*, and *Journal of MIS*.

1.15 Human Factors, CHI, and MIS

[Jonathan Grudin](#)

Human-computer interaction research has been pursued in different disciplines with different emphases. Human Factors and Ergonomics has primarily focused on hands-on operation by people employed to operate hardware, enter data, and carry out other essential tasks. The MIS focus has been more managerial, considering decisions about hardware and software acquisition, oversight of operational aspects, and use of computer output. A third focus, embodied by ACM SIGCHI, recruited cognitive scientists and computer scientists to study users whose hands-on technology use is more volitional. These three approaches map to the early computer professions of operator, systems analyst and manager, and programmer. Better understanding of similarities and differences

across disciplines may improve the prospects for interaction. One conclusion is that cultural and methodological differences among these groups have impeded efforts to find common ground.

Jonathan Grudin is a Senior Researcher at Microsoft Research. Before joining Microsoft in 1998, he was Professor of Information and Computer Science at University of California, Irvine. After obtaining a BA in Mathematics-Physics from Reed College and a PhD in Cognitive Psychology from University of California, San Diego he worked at the Medical Research Council Applied Psychology Unit, Wang Laboratories, and MCC. He has taught at Aarhus, Oslo, and Keio Universities, and currently is Affiliate Professor at the University of Washington Information School. Since the early 1980s he has focused on human-computer interaction, primarily within the ACM SIGCHI organization and conferences. He was Editor in Chief of ACM Transactions on Computer-Human Interaction for six years and is currently ACM Computing Surveys Associate Editor for Human-Computer Interaction.

2 Volume 5. Applications

Foreword by Izak Benbasat

“I enjoyed very much reading this book and its companion (Volume 1) that together make significant, timely and valuable contributions to HCI research in Management Information Systems (MIS). These two excellent volumes are being published at a time when HCI scholars in MIS are experiencing a renaissance. After years of dormancy, the field is experiencing a burst of new activity. Major MIS conferences are including HCI in their core coverage. Leading HCI and MIS academic journals have published, or will be publishing, special issues based on the best papers presented at these conferences as well as at the workshop devoted to HCI research in MIS — the pre-ICIS Annual Workshop on HCI Research in MIS. MIS academics have a new home base from which to launch new activities: the Association of Information Systems (AIS) Special Interest Group on HCI (SIGHCI) established in 2001 has as its objectives to promote and support HCI research, teaching and practice in MIS. These two volumes are the crowning touches to this exciting era of renewal. The chapters, written by the leading scholars in MIS and HCI, not only capture and synthesize the new knowledge generated from recent academic work, but also put forth a vision and novel ideas of senior academics that will shape MIS HCI work during the next decade.

The rich tapestry of topics that comprise MIS HCI is captured very well in this volume with its comprehensive introduction and 17 informative chapters representing the state-of-the-art in the field.

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I would like to mention three important aspects captured in this volume and its companion that are worth noting. The first is that it represents the work of individual researchers, and their research teams, who focus on a program of research rather than one-shot individual studies. It is encouraging to observe that the volumes describe many such programmatic research efforts. The second is the importance of developing a critical mass of studies within the MIS HCI community by combining the efforts and coordinating the activities of groups of individual researchers. There are many chapters in the two volumes that comprehensively integrate the work of a community of HCI researchers. The AIS SIGHCI community and its workshops and meetings would be the appropriate venues to continue adding to the fine examples we find in these volumes by discussing and debating important issues facing practice, and planning a series of coordinated research activities to tackle them as a community of scholars. The third is to focus, where appropriate, on practice-related issues in HCI. That is, we need to learn how to design the interaction or the interface between individuals and groups with the technological artifact in order to assist practitioners. Bob Zmud and I have been emphasizing this need recently. Fortunately, there are many fine examples in the volumes of such research efforts that lead to actionable information for practice.

I hope that these volumes will initiate a series of books that will convey current and future accumulated knowledge in MIS HCI to guide and encourage scholars in the field to advance their research work. It is an excellent choice as the main textbook, or as a supplementary one, for advanced undergraduate or graduate courses in MIS HCI, and one that would be most suitable for an advanced doctoral topics seminar. I would like to thank the scholars who have contributed their excellent work to make this book a success. I congratulate Dennis Galletta and Ping Zhang for their

vision and very hard work in bringing this work to fruition, and commend Vladimir Zwass for providing the platform for this work to be published.”

2.1 Applications of Human-Computer Interaction Research in Management Information Systems

[Dennis Galletta](#) and [Ping Zhang](#)

In this introduction to the second of the two complementary volumes, we provide a general context of applications of HCI research in MIS and then preview all papers in the second volume. This volume represents applications of HCI from the point of view of MIS research. Applications take particular courses that are carved out by researchers; we find that MIS researchers have taken HCI work in the directions of electronic commerce, team collaboration, culture and globalization, user learning and training, user-centered system development, and information technology in health care. Two reflective pieces at the end of this volume provide ample food for thought for researchers in this area.

PART 1. ELECTRONIC COMMERCE AND THE WEB

2.2 Human-Computer Interaction for Electronic Commerce: A Program of Studies to Improve the Communication between Customers and Online Stores

[Izak Benbasat](#)

In electronic commerce the user-company interface is the website that represents the online storefront of an e-tailer. This web interface is the company's *window to the world* through which communication with customers takes place and relationships are built. Therefore, electronic commerce gives rise to new HCI challenges mainly associated with how to design the web interfaces for effective communication between customers and online retailers. This paper describes a series of studies conducted to investigate topics associated with HCI design for electronic commerce, mainly concerned with improving customer-company communications on the web, including customer-product, customer-customer, customer-salespeople and customer-recommendation agent communications. The main objectives and findings of these studies are discussed, and how they can be incorporated into an overall research framework for conducting HCI studies in the age of electronic commerce is described.

Izak Benbasat is Canada Research Chair in Information Technology Management at the Sauder School of Business, the University of British Columbia, Canada. He was CANFOR Professor of Management Information Systems from 1991 till 2000. He served as Associate Dean, Faculty Development, from 1996 to 1999, and Associate Dean, Research (2001-2). Professor Benbasat received his B.A. in Business Administration from Robert College, Istanbul, and Master of Science and Ph.D. in Management Information Systems from the University of Minnesota. He is a past Editor-in-Chief of *Information Systems Research*, and currently a Senior Editor of the *Journal of the Association for Information Systems*. His current research interests include the investigation of

human-computer interaction for electronic commerce, such as designing interfaces for product understanding, recommendation agents and collaborative shopping.

2.3 Understanding the direct and interaction effects of Web delay and related factors: A research program

[Dennis Galletta](#), Raymond M. Henry, Scott McCoy, and [Peter Polak](#)

Benefits of using the Internet are partially offset by one aspect of its usability: highly-variable, intermittent, but frequent interpage delay. For several years, the HCI literature has studied user reactions to long computer response time in clerical applications, but few studies have examined this problem in the domain of the web. Examining the delay problem in a web context is important, because the web touches many more users, most of whom have little formal computer or task training. Hence, we have examined in our labs consequences of delay, along with factors that interact with delay. Some of our experiments have been published and some are still under review. Consequences of delay that we examined include user attitudes, behavior, and performance. Factors that we examined for possible interactions included site depth, familiarity with terminology used in organizing the site, variability of the delay, and feedback (continuous and gradual filling of the screen to make it obvious that the page is indeed loading). Experiment I (n=196) provided seven levels of delay, ranging from zero to twelve seconds (in two-second increments), and discovered that ill effects began as delay exceeded two seconds. Experiment II (n=206) again compared reactions to the same levels of delay, but this time with Mexican subjects. It was found that Mexicans were more patient than those in the U.S. In both studies, the outcomes differed when comparing a familiar site with an unfamiliar site, suggesting that interactions should be examined more formally. Experiment III (n=160) introduced two other factors from the HCI literature, and with a 2x2x2 ANOVA, we assessed the interactions between delay and site depth, and familiarity with the terminology in the site. As predicted, we found a significant three-way interaction. Consistent with more traditional literature, we also found strong direct effects. Experiment IV (n=152) employed another 2x2x2 design, but along with delay we analyzed the effects of variability and feedback as interacting variables. Analysis revealed that page loading feedback is only important when there are long delays, and variability does not seem to be important in influencing attitudes, behavior, and performance of users. Conclusions from the four studies are that user impatience is high; results of delay can differ with culture; variables that interact with delay are familiarity with site terminology, depth of the site, and feedback (in a slow site). Variability does not seem to interact with delay.

Dennis F. Galletta is an AIS Fellow and Professor of Business Administration at the Katz Graduate School of Business, University of Pittsburgh, and Fox School of Business, Temple University. He obtained his doctorate from the University of Minnesota. His research involves human factors, electronic commerce, and user training, especially with a focus on user attitudes, behavior, and performance. His articles have appeared in journals such as *Management Science*, *Information Systems Research*, *Journal of MIS*, *Journal of AIS*, *Decision Sciences*, *Communications of the ACM*, *Data Base*, *Information & Management*, and *Accounting, Management, and Information Technologies*. He serves or has served on several editorial boards, including *MIS Quarterly*, *Data Base*, *Information Systems* and *eBusiness Management*, and *Cycle Time Research*. He embarked in fall 1999 on an around-the-world trip with Semester at Sea, teaching IS courses aboard ship. While on land, over the years he served as the AIS VP of Member Services, ICIS Treasurer, AIS Council

Member, general chair of the first AMCIS Conference, and, most recently, co-program chair of AMCIS 2003. He is currently co-Program Chair for ICIS 2005 and Editor-in-Chief of ISWorld.

Raymond M. Henry is an Assistant Professor in the Department of Management at Clemson University. He earned his PhD in Information Systems from the University of Pittsburgh, holds an MS in Information Systems from Virginia Commonwealth University, and a BA from the University of Virginia. His research focuses on IT governance, the relationship between information systems and organizational structures, and the use of information sources.

Scott McCoy is Assistant Professor of MIS in the School of Business at the College of William and Mary. He earned his PhD in Information Systems from the University of Pittsburgh with a major in MIS and a minor in Telecommunications. His research interests include HCI, Cross-Cultural Issues in IS, IT in Developing Countries, and Telecommunications Policy. He teaches HCI, Telecommunications and Ecommerce.

Peter Polak is an assistant professor of computer information systems in the School of Business Administration at the University of Miami. He earned his PhD in Information Systems from the University of Pittsburgh with a major in MIS and a minor in Telecommunications. His research interests are in the areas of human-computer interaction, Internet technologies, electronic commerce, electronic auctions, and telecommunications.

2.4 Pop-up animation: Impact and implications for website design and online advertising

[Ping Zhang](#)

Owing to the rapid growth of Internet technologies, website designs and online advertisements with pop-up animations have affected and will continue to affect millions of people. Our understanding of the effectiveness and the impact of online advertisements on consumers is still limited from a theoretical perspective, and the empirical evidence continues to be scant. This paper synthesizes and integrates several lab-controlled experiments conducted over an eight-year period (from 1996 to 2003) on the impacts of pop-up animations in the web environment. Human visual attention literature is used to emphasize human cognitive characteristics that prevent or enable us to behave in certain ways when there is animation in our vision field. These studies, together, addressed the following research questions: (1) as a non-primary information source, does animation decrease viewers' information seeking performance? (2) if so, do location and timing of pop-up animation matter? and, (3) as viewers' familiarity with online advertisements increases, do those early animation effects diminish over years? The studies also validate the applicability of visual attention theories in the web environment and have significant practical implications for online advertising strategies for both marketers and content providers.

Ping Zhang is Associate Professor at School of Information Studies, Syracuse University. She earned her Ph.D. in Information Systems from The University of Texas at Austin. Her research appears or will appear in journals such as *Behaviour & Information Technology (BIT)*, *Communications of ACM*, *Communications of AIS (CAIS)*, *Computers in Human Behavior*, *Decision Support Systems*, *International Journal of Human-Computer Studies (IJHCS)*, *International Journal of Electronic Commerce*, *Journal of American Society for Information Science and Technology*, *Journal of AIS (JAIS)*, among others. With Dov Te'eni and Jane Carey,

she co-wrote a HCI textbook for non-Computer Science students, *HCI: Designing Effective Organizational Information Systems* (John Wiley and Sons, 2005). Dr. Zhang received several Best Paper awards at IS conferences, an excellence in teaching award from The University of Texas at Austin, and an outstanding service award from AIS SIGHCI. She is Associate Editor for IJHCS and CAIS, and a guest co-editor for JAIS, JMIS, IJHCS, IJHCI, and BIT. She is the founding chair (2001-2004) of the AIS SIGHCI.

PART 2. COLLABORATION SUPPORT

2.5 Bridging Distance: Empirical studies of distributed teams

[Judy Olson](#) and [Gary Olson](#)

Remote work is acknowledged to have considerable challenges. But, of course, not all remote work is alike. Building on our work on remote work in various types of collaboratories (science collaborations involving many institutions and scientists) and case studies of remote work in corporations, we identify six types of remote work, and then list the challenges shared by all and particular to each type. We then discuss potential solutions to the challenges, best practices noted in our field and laboratory work. Among the solutions are evenly distributed technology, services for awareness of activity in the remote location, explicit achievement of common ground, trust building exercises as well as incentives design to encourage collaboration. It is additionally important to design the work so that the remote connections are not tightly coupled, but rather require little interaction to be successful. We additionally acknowledge that the social and technical worlds are evolving, which may make remote work eventually possible and distance matter less.

Judith Olson is the Richard W. Pew Professor of Human-Computer Interaction at the University of Michigan. She is a professor in the School of Information, the Business School, and the Psychology Department. She got her Ph.D. in Psychology at the University of Michigan then held a postdoctoral fellowship at Stanford University before returning to Michigan as a faculty member. Except for three years at Bell Labs and a year at Rank Xerox Cambridge, UK, she has been at Michigan her entire professorial life. Her research focuses on the technology and social practices necessary for successful distance work, encompassing both laboratory and field study methods. She has served on a number of editorial boards and panels for both the National Research Council and the National Science Foundation. She was one of the first seven inductees into the CHI Academy.

Gary M. Olson is the Paul M. Fitts Professor of Human-Computer Interaction and Associate Dean for Research in the School of Information and Professor of Psychology at the University of Michigan. He received his B.A. (1967) in Psychology from the University of Minnesota, and a Ph.D. (1970) in Psychology from Stanford University. After serving in the Navy, he moved to The University of Michigan in 1975 in the Department of Psychology. In 1996 he additionally became a charter faculty member of the new School of Information at the University of Michigan. For the past 15 years, he has conducted research in the areas of human-computer interaction (HCI) and computer supported cooperative work (CSCW). His current focus is on how to support small groups of distributed people working on difficult intellectual tasks. This research has involved both

field and lab studies. He has published more than a hundred articles and papers, and has edited three books. Gary is a member of the CHI Academy.

2.6 Asynchronous virtual teams: Can software tools and structuring of social processes enhance performance?

[Starr Roxanne Hiltz](#), [Murray Turoff](#), and Jerry Fjermestad

The virtual teams studied in NJIT's program of research are task-oriented groups that are dispersed in time and space and work together over a period of time to produce a product such as the design and implementation of a software artifact, using computer-mediated communication (CMC). There are two basic ways of providing support or structure for interaction in virtual teams: construct or use special software (or hardware) tools that support and guide the group, or impose interaction processes (e.g., leadership roles, schedules of deliverables, rules of interaction) designed to enhance process gains and decrease process losses. Which approach performs better under which conditions is still a major research question. This chapter briefly reviews the literature on virtual teams, describes the evolution of a long-term series of studies on distributed teams using asynchronous computer-mediated communication, and then reports the results of several recent field experiments conducted at NJIT. These experiments included two studies of ways in which to provide support for large teams: one provided sophisticated listing and voting tools, and the other imposed a Delphi type process. The results were not always as hypothesized, and the way in which some independent variables were dropped from subsequent studies or raised further issues for future research is described.

Starr Roxanne Hiltz is Distinguished Professor, Department of Information Systems, College of Computing Sciences, New Jersey Institute of Technology. She conducts research on applications and social impacts of computer technology, publishing widely in journals including JMIS, MISQ, Communications of the ACM, and Management Science. Her research interests currently include Group Support Systems (particularly, support for virtual teams), Asynchronous Learning Networks, and Pervasive Computing.

Jerry Fjermestad is an Associate Professor, in the School of Management, New Jersey Institute of Technology. Jerry has published in JMIS, DSS, Group Decision and Negotiation, International Journal of Electronic Commerce and several other journals and conferences. His current research is on customer relationship management, virtual teams and outsourcing.

Rosalie Ocker is an assistant professor in the Management Information Systems Department at Temple University. Rosalie received her Ph.D. from Rutgers University in Computer and Information Science in 1995. Her research interests include computer-mediated communication, group creativity and innovation, and customer relationship management (CRM). She is the principal investigator for a multi-year research grant sponsored by SAP America, Inc. on Customer Relationship Management (CRM) readiness. Rosalie has published her research in journals such as the Journal of Management Information Systems and Group Decision and Negotiation, and in various conference proceedings including the Hawaii International Conference on Systems Science, the American Conference on Information Systems and Decision Sciences.

Murray Turoff is Distinguished Professor of Information Systems and Hurlburt Professor of MIS, New Jersey Institute of Technology. For two decades Dr. Turoff has been active in research and development associated with the use of computers to aid and facilitate human communications. Credited as "the father of computer conferencing," he designed the first computer conferencing system while working in the executive offices of the President of the United States. Currently he is interested in large scale 'social decision support systems" and in Emergency Response Management Information Systems.

2.7 Collaboration Technology, Tasks and Context: Evolution and Opportunity

[Ilze Zigurs](#) and [Bjørn Erik Munkvold](#)

From the early days of computer conferencing, through the heyday of group decision support systems, to the current profusion of communication technologies, the elusive goal of effective collaboration has been examined from a variety of perspectives. Three important themes recur in this on-going search: collaboration technologies, collaboration tasks, and the contexts in which they come together and are used. Collaboration technologies have been characterized in a variety of ways, at the same time that radical changes continue to occur in their capabilities. Collaboration tasks have also been defined in a variety of ways and their fit with specific technologies remains a complex issue. Technologies and tasks are brought together in use contexts that range from face-to-face settings to virtual spaces, and many issues raised by differences in use context remain unresolved. This paper examines our evolving understanding of collaboration technologies, tasks, and contexts. The changing characterization of each of these concepts is described. Key research findings are summarized, and opportunities for future research are discussed. The main contribution of this paper is to provide a summary analysis of how collaboration technologies, tasks, and contexts have been treated in information systems research, along with recommendations for future research on unresolved issues.

Ilze Zigurs is a Professor and the Mutual of Omaha Distinguished Chair of Information Science and Technology, in the College of Information Science and Technology at the University of Nebraska at Omaha, USA. Her research examines design and implementation of groupware for making teams more effective. She has published in such journals as *MIS Quarterly*, *Journal of Management Information Systems*, *Journal of Organizational Computing and Electronic Commerce*, and *Group Decision and Negotiation*, among others. She is co-editor with Laku Chidambaram of a book, *Our Virtual World*, which examines both positive and negative impacts of the Internet on individuals, organizations, and society in their work and personal lives. Professor Zigurs serves as Editor-in-Chief of *e-Service Journal*, and was formerly a Senior Editor for the *MIS Quarterly* and Department Editor for the *IEEE Transactions on Engineering Management*.

Bjørn Erik Munkvold is Associate Professor in the Department of Information Systems, Agder University College, Norway. He was previously a systems consultant and researcher in a number of industries, including banking, pulp and paper and telecommunications. His main research interests are organizational implementation of information technology, computer supported co-operative work, and information systems research methodology. He has published articles in journals such as *European Journal of Information Systems*, *Communications of the AIS*, *Database for Advances in Information Systems*, and *Journal of Organizational Computing and Electronic Commerce*. He has

authored a recent book titled *Implementing Collaboration Technologies in Industry: Case Examples and Lessons Learned*.

PART 3. CULTURE AND GLOBALIZATION

2.8 Towards Reliable Metrics for Cultural Aspect of Human-Computer Interaction: Focusing on the Mobile Internet in Three Asian Countries

[Jinwoo Kim](#), Inseong Lee, Boreum Choi, [Se-Joon Hong](#), [Kar Yan Tam](#), and Kazuaki Naruse

Mobile Internet is defined as mobile access to the Internet through handheld devices such as mobile phones and PDAs. Popular mobile Internet services differ from country to country, as do usage patterns. In fact, differences in mobile Internet usage patterns may be even more profound across countries than they are with the traditional stationary Internet. This is because mobile devices, which operate only within local areas, access the wireless network, whereas globally uniform devices access the stationary Internet. Numerous factors might be related to the different usage patterns of the mobile Internet across different countries. This study primarily focuses on the cultural differences of mobile Internet users since culture has a profound impact on the use of localized information technology. Despite the importance of cultural differences, little research has been performed on the cross-cultural issues affecting information technologies in general, let alone the specificity of the mobile Internet. This paucity of research is a consequence of the difficulties in reliably or validly measuring cultural aspects of information technology usage. Therefore, this paper proposes a set of metrics that can measure cultural aspects of mobile Internet usage based on prior studies on culture, in general. We provide empirical evidence about the reliability and validity of the proposed metrics using survey data that was collected in three Asian countries at the same time with the same questionnaire.

Jinwoo Kim is Professor of HCI in the School of Business at Yonsei University. He is also working as the Director of Human Computer Interaction Lab at Yonsei University. His research interests include three types of issues in three different domains. The three issues include navigation structures for interactive systems, cross-cultural value of IT and its impact on usability, and evaluation metrics and framework for digital contents. The three platforms include traditional e-Business systems, mobile Internet and digital TV. He has published several papers in Information Systems Research, Decision Support Systems, International Journal of Human Computer Studies, International Journal of Human Computer Interaction, ACM Transaction on Human Computer Interaction, Communications of ACM, and other related journals and conferences.

Inseong Lee is a Researcher at the Human Computer Interaction Laboratory, Yonsei University in Korea. He has been involved in the mobile internet user survey, Mbiz Survey in Korea and WMIS Project worldwide. His current project is a cross-cultural study on localization strategies to export mobile internet service. His papers have appeared in International Journal of Human-Computer Interaction, International Journal of Mobile Communications, Journal of Electronic Commerce Research, and other related journals and conferences. His interests are in the areas of understanding cultural factors of different adoption and important usability factors of mobile internet usage behaviors, and evaluating human-computer interfaces.

Boreum Choi is a Researcher at Human computer Interaction Laboratory, Yonsei University in Korea. She is interested in cultural aspects of mobile internet usage and interaction design. Her current project is a cross-cultural study on localization strategies to export mobile internet service.

Se-Joon Hong is an Assistant Professor of information systems in the School of Management at the Hong Kong University of Science and Technology. He obtained his PhD in Information Systems from the Graduate School of Industrial Administration (GSIA) at Carnegie Mellon University. Prior to his PhD, he had been a brand manager of the PC Division of IBM, Korea. His current research interests are mobile commerce, IT adoption and diffusion and human factors in information systems. He has articles published in *Annals of Software Engineering*, *Electronic Markets* and *The DATA BASE for Advances in Information Systems*.

Kar Yan Tam received his PhD in Management Information Systems from Purdue University. Before joining HKUST, he was a faculty member at the University of Texas (Austin). He has also held a Research Scientist position at EDS where he worked in the area of software engineering methodologies and tools. His research interests include information technology applications and electronic commerce. He has published extensively on these topics in major information systems and management science journals and is currently on the editorial board of more than six journals.

Kazuaki Naruse is the Chief Specialist of smart card marketing for Toshiba Corporation. Since joining Toshiba, he has developed numerous systems such as smart card, security, and financial applications. From 1998 to 2003, he was the Research Director of the electronic commerce promotion council of Japan (ECOM). He directed the Mobile EC Working group. Since 2003, he has acted as the chairperson of worldwide mobile internet survey (WMIS), organizing international research projects. He completed his Master's degrees in applied physics at Waseda University in 1979 and electronic engineering at Yale University in 1986. He is currently in the doctoral course on informatics at the Graduate University for Advanced Studies.

2.9 Cultural and Globalization Issues Impacting the Organizational Use of Information Technology

[Geoffrey S. Hubona](#), [Duane Truex](#), Jijie Wang, and [Detmar W. Straub](#)

Cultural and globalization issues are known to affect the organizational use of information technology (IT). In particular, studies have indicated that a variety of cultural and globalization factors effect the organizational adoption and diffusion of IT. Among socio-cultural factors, the differing effects of gender, social norms, beliefs and values, technology cultururation, and degree of technological advancement have all been shown to impact the transfer and use of technology in organizations. Globalization issues also have ramifications with respect to differences in government policy, environmental factors, structural language features, as well as national economic and IT policy. We sample from the voluminous published literature that reports on these, and other cultural and global impacts on the organizational use of IT. Organizational impacts examined include: technology transfer, IT use, adoption and diffusion, systems development, the creation and evolution of standards, and employment practices. Field studies include IT applications in Switzerland, Japan, Egypt, Jordan, Saudi Arabia, Lebanon, the Sudan, Canada, Denmark, Hong Kong, the UK and France, as well as other countries, as largely compared to the United States. Some of the specific IT applications examined include the Internet, email, fax, electronic

communications media, personal computing, electronic data interchange (EDI) standards, and systems development methods and approaches. Implications for relevant theory and practice are discussed, as are suggestions for future directions of research in this domain.

Geoffrey S. Hubona is an associate Professor in the department of Computer Information Systems (CIS) at Georgia State University (GSU). He holds a BA in Psychology from the University of Virginia, an MBA from George Mason University, an MA in Economics and a PhD in MIS, both from the University of South Florida. He previously held faculty positions at Virginia Commonwealth University and at the University of Maryland Baltimore County. His research focuses largely on human-computer interaction as it applies to: user and organizational acceptance of information technology; 3D visualization; and direct brain-computer interfaces. His research has been published (or accepted for publication) in *ACM Transactions on Computer-Human Interaction*, *IEEE Transactions on Systems, Man, and Cybernetics, Part A: Systems and Humans*, *The DATA BASE for Advances in Information Systems*, *International Journal of Human-Computer Studies*, and *Journal of Information Technology Management*.

Duane Truex, an associate Professor in the GSU CIS department, researches the social impacts of information systems and emergent ISD. He is an Associate Editor for the *Information systems Journal*, has co-edited two special issues of *The Database for Advances in Information Systems* and is on the on the editorial board of the *Scandinavian Journal of Information Systems*, the *Journal of Communication, Information Technology & Work* and the *Online Journal of International Case Analysis*. His work has been published in the *Communications of the ACM*, *Accounting Management and Information Technologies*, *The Database for Advances in Information Systems*, *the European Journal of Information Systems (EJIS)*, *le journal de la Societé d'Information et Management (SIM)* *the Information Systems Journal (ISJ)*, *the Journal of Arts Management and Law*, *IEEE Transactions on Engineering Management*, and forty-four assorted IFIP transactions and edited books and conference proceedings. An active member of the IFIP WG 8.2, he is the co-program chair of the 2004 Manchester UK conference on IS research methods to be held in July 2004.

Jijie Wang is a Ph.D. student in the department of Computer Information Systems (CIS) at Georgia State University (GSU). She holds a BBA in Accounting from Peking University, and a MS. in CIS from Georgia State University. Her research interests include software project management, software engineering, computer-mediated community, and open source software development.

Detmar W. Straub is the J. Mack Robinson Distinguished Professor of Information Systems at Georgia State University. He has conducted research in the areas of e-Commerce, computer security, technological innovation, and international IT studies. He holds a DBA in MIS from the University of Indiana and a PhD in English from Penn State University. He has published over 110 papers in journals such as *Management Science*, *Information Systems Research*, *MIS Quarterly*, *Organization Science*, *Communications of the ACM*, *Journal of MIS*, *Journal of Global Management*, *Information & Management*, *Communications of the AIS*, *Academy of Management Executive*, *Sloan Management Review*, and *Journal of Global Information Management*.

PART 4. LEARNING AND TRAINING

2.10 Technology-Based Training: Toward a Learner Centric Research Agenda

Sharath Sasidharan and [Radhika Santhanam](#)

Technology-based training has the potential to become one of the key tools for knowledge dissemination. Yet, the effectiveness of technology-based training is not fully established. Hence, it will be fruitful to conduct detailed research to identify factors that could enhance the outcomes of technology-based training. Towards this end, we review existing research on this topic. Based on this, we suggest that there be a shift in research focus to dwell more on the learner rather than the technology used in training. We provide suggestions for future research.

Sharath Sasidharan is completing his Ph.D. in Information Systems at the Gatton College of Business and Economics at the University of Kentucky. He holds a B.Tech in Electrical and Electronics Engineering from the University of Kerala in India and an MBA from the University of Glasgow in the United Kingdom. His major research interests include issues related to human-computer interaction, organizational acceptance of technology, ERP systems, e-learning, online training and information systems accessibility for the disabled.

Radhika Santhanam is a Gatton Endowed Professor in the School of Management, College of Business, at the University of Kentucky. Using a variety of research methods, Dr. Santhanam has investigated issues relating to the effective use of resources invested in technology. From a micro-perspective, her research in the area of Human-Computer Interaction has investigated methods by which training and better system design can improve users' understanding and utilization of Information Systems. From a macro perspective, her research has proposed methods by which organizations can select and track investments in information systems in order to make effective use of organizational resources. She has published her research in several journals and currently serves on the editorial board of *MIS Quarterly*, *Decision Support Systems* and *Computers and Operations Research*.

2.11 Developing Training Strategies with an HCI Perspective

[Lorne Olfman](#), [Bob Bostrom](#), and [Maung Sein](#)

This paper outlines a strategic perspective for designing, implementing and delivering software training with a human-computer interaction (HCI) perspective. The IT training strategy development framework is based on research we have conducted over the last two decades. A comprehensive training strategy is a plan for matching a training method appropriate to the specific type of trainee and the specific IT-tool given a set of training outcomes. In order to develop a training program it is necessary to know what knowledge trainees must have at the end of the training program. What trainees must know can be mapped into a set of knowledge levels. Knowledge levels comprise an integrated hierarchy of skills that taken together form the basis for ensuring the ability to effectively learn either a specific software application or at the highest level to be able to learn any application. A training strategy provides a basis for creating a training program that includes activities and methods necessary to move the trainees to the appropriate

knowledge level. The strategy is especially important because there is no one training program that can be universally applied. It enables the right approach for the right system for the right trainee. A training strategy is integrated into an organization's learning strategy, which determines how resources are expended on training. The learning strategy is itself in tune with the organization's corporate strategy. Thus, our conceptualization of a training strategy is firmly embedded within the HCI perspective as defined and articulated in this book and reflected in other papers.

Lorne Olfman is Dean of the School of Information Science and Professor of Information Science at Claremont Graduate University. He came to Claremont in 1987 after graduating with a Ph.D. in Business (Management Information Systems) from Indiana University. Lorne's research interests involve three main areas. First, he is concerned about the ways in which software can be learned and used in organizations. Second, he is interested in the impact of computer-based systems on knowledge management. Third, he is studying the design and adoption of socialware, especially as it relates to educational uses. Lorne's publications in journals (including *MIS Quarterly*, *Journal of MIS*, and *Communications of the ACM*) and conference proceedings (including the *International Conference on Information Systems* and the *Hawaii International Conference on System Sciences*) span these three research areas.

Bob Bostrom is the L. Edmund Rast Professor of Business at the University of Georgia. He teaches in Management Information Systems (MIS) and Management areas. He is also President of Bostrom & Associates, a training and consulting company focusing on facilitation and the effective integration of people and technology. Bob holds a B.A. in Chemistry and M.B.A. from Michigan State University, an M.S. in Computer Science from SUNY at Albany, and a Ph.D. in MIS from the University of Minnesota. Besides numerous publications in leading academic and practitioner journals, he has extensive consulting and training experience in the areas of MIS management, MIS design, organizational development, facilitation, leadership and digital collaboration. His current research interests are focused on high-performing individuals, facilitation, leadership, digital collaboration, technology-supported learning, and effective design of organizations via integrating human and technological dimensions.

Maung K. Sein is Professor of Information Systems (IS) at Agder University College, Norway. A Ph.D. graduate from Indiana University, his current research interests are Information and Communications Technology in national development, IT in the public sector, and, e-Government. He has conducted research in end-user training, human-computer interaction, conceptual database design, systems development methods, data warehousing, computer personnel, and IS management. He has published widely in such prestigious journals as *Information Systems Research*, *Management Information Systems Quarterly (MISQ)*, *Communications of the Association of Computing Machinery (CACM)*, *The Information Society*, and *Human Computer Interaction*. He has conducted workshops and seminars on different aspects of research methods at several universities in the USA, Norway, Finland and Tanzania. He has served or is serving on editorial boards of *MISQ*, *MISQ Executive*, *Communications of the Association of Information Systems*, and *E-Service Journal*. He has also chaired and has served on program committees of several international conferences.

2.12 The Learning Objects Economy: What Remains to be Done?

Conrad Shayo, and [Lorne Olfman](#)

Learning objects consist of small chunks of digitized instructional content that can be delivered online. Each small chunk is a self-contained, objective centered unit; whose content helps the learners achieve a demonstrable learning objective. The application of the learning object concept in education and training was borrowed from object-oriented theory used in computer and information science where software products of higher quality are designed and developed more quickly, cheaply, and flexibly (Graham, 2001). Just like each software object is self-contained and fulfils a single programmed objective, each learning object is self-contained, focuses on a single job task, and fulfils a single learning objective. The idea that learning objects can provide learners customized, just in time instructional content that meets their specific learning needs is compelling. However, despite projections that the corporate eLearning market (outside the school system) will be over 11.5 billion dollars by 2003, a learning objects economy has remained elusive. The learning object economy infrastructure e.g., national politics and policies, digital learning objects repository, specifications and standards, etc. is still evolving. A critical mass of learning object producers, managers, and consumers is yet to materialize. Problems with teacher resistance to change, and lack of clear compensation and rights' management systems still persist. The jury is still out! In this paper, we review the existing literature on the learning objects economy, focusing on its promises and challenges, what has been accomplished thus far; and what remains to be done to make it a reality.

Conrad Shayo is a professor of information science at California State University, San Bernardino. Over the last 23 years he has worked in various capacities as a university professor, consultant, and manager. He holds a Doctor of Philosophy and a Master of Science in information science from Claremont Graduate University. He also holds an MBA in management science from the University of Nairobi, Kenya, and a Bachelor of Commerce in finance from the University of Dar-Es-Salaam, Tanzania. His research interests are in the areas of IT assimilation, performance measurement, distributed learning, end-user computing, organizational memory, instructional design, organizational learning assessment, reusable learning objects, IT strategy, and "virtual societies." Dr. Shayo has published these and other topics in various books and journals. Currently, he is involved in developing reusable learning objects and Web based learning game simulations. He is also a co-editor (with Dr. Magid Igbaria) of the book, *Strategies for Managing IS/IT Personnel*.

Lorne Olfman is Dean of the School of Information Science and Fletcher Jones Chair in Technology Management at Claremont Graduate University. Lorne came to Claremont in 1987 after graduating with a PhD in Business (Management Information Systems) from Indiana University. Lorne also holds a Bachelors degree in Computing Science, a Masters degree in Economics (both from the University of Calgary) and a Masters of Business Administration from Indiana. Lorne's extensive work experience includes computer programming, economic analysis of government airport policy, and computer model development of financial plans for a telecommunications company. Lorne's research interests involve three main areas: how software can be learned and used in organizations, the impact of computer-based systems on knowledge management, and the design and adoption of systems used for collaboration and learning. He has published articles on these topics in journals including *MIS Quarterly*, *Journal of Management Information Systems*, and *Information Systems Journal*. Lorne has always taken an interest in using technology to support teaching and has been using the Internet to facilitate classes for more than a decade. A key

component of Lorne's teaching is his involvement with doctoral students. Lorne has supervised 35 students to completion. Lorne is an active member of the Information Science community. He regularly reviews papers for journals and conferences, and was in consecutive years the program chair and general chair of the Association for Computing Machinery's Conference on Computer Personnel Research. He also coordinated mini-tracks of the Hawaii International Conference on System Sciences for 10 years.

PART 5. USER-CENTERED IS DEVELOPMENT

2.13 Research Issues in Information Requirements Determination for Systems Development and Human-Computer Interaction

[Glenn J. Browne](#)

The most important factors in the development of usable and functional systems are the completeness and accuracy of requirements gathered from users. Information requirements determination is a difficult and complex process that remains one of the major challenges in systems development. This paper reviews recent research in requirements determination, highlighting questions that have been partially answered and questions that still need to be investigated. A detailed framework of the requirements determination environment is presented to organize the research in this critical aspect of systems development and human-computer interaction. The framework includes a model of the requirements determination process together with influences on the process, including cognitive, motivational, communication, organizational, problem domain, and other issues. Research questions resulting from the requirements determination process and surrounding influences are discussed.

Glenn J. Browne is an associate professor and the James C. Wetherbe Professor of Information Technology at the Rawls College of Business Administration at Texas Tech University. He received his Ph.D. from the Carlson School of Management at the University of Minnesota. His research focuses on cognitive and behavioral issues in information requirements determination, systems development, e-business, and managerial decision making. His articles have appeared in *Management Science*, *Organizational Behavior and Human Decision Processes*, the *Journal of Management Information Systems*, *IEEE Software*, *Information & Management*, and other journals.

2.14 Dimensions of Participatory in Information Systems Design

[John Carroll](#) and [Mary Beth Rosson](#)

Only 20 years ago, participatory design (PD) seemed to North Americans a curious Scandinavian perspective. Today, it is widely employed in community informatics, and increasingly in commercial development practices as well. We survey PD from the standpoint of six dimensions of participation: participatory impetus, ownership, scope of design, nature of the participatory process, scope of cooperation, and expectations about learning and human development. Using these dimensions as a framework, we analyze several traditional and emerging models for PD: the original European model (illustrated by the Utopia project), the early North American model

(illustrated by the PICTIVE method), and recent variations involving long-term participatory interactions oriented to role development, and an embedded participant model emphasizing facilitation of user initiatives. We discuss when and how various PD approaches are most useful.

John M. Carroll is Edward Frymoyer Chair Professor of Information Sciences and Technology at the Pennsylvania State University. His research interests include methods and theory in human-computer interaction, particularly as applied to networking tools for collaborative learning and problem solving. He has written or edited 14 books, including *Making Use* (MIT Press, 2000), *HCI in the New Millennium* (Addison-Wesley, 2001), *Usability Engineering* (Morgan-Kaufmann, 2002, with M.B. Rosson) and *HCI Models, Theories, and Frameworks* (Morgan-Kaufmann, 2003). He serves on 9 editorial boards for journals, handbooks, and series; he is a member of the US National Research Council's Committee on Human Factors and Editor-in-Chief of the *ACM Transactions on Computer-Human Interactions*. He received the Rigo Career Achievement Award, from ACM (SIGDOC), the Silver Core Award from IFIP, and was elected to the CHI Academy. In 2003 he received the CHI Lifetime Achievement Award from ACM.

Mary Beth Rosson is Professor of Information Sciences and Technology at Pennsylvania State University. Her research interests include scenario-based design and evaluation, the use of network technology to support collaboration, especially in learning contexts, and the psychological issues associated with use of high-level programming languages and tools. She is co-author of *Usability Engineering: Scenario-Based Development of Human-Computer Interaction* (Morgan Kaufmann, 2002), author of *Instructor's Guide to Object-Oriented Analysis and Design with Application* (Benjamin Cummings, 1994), as well as numerous articles, book papers, and tutorials. Dr. Rosson is active in both ACM SIGCHI and ACM SIGPLAN, serving in numerous technical program as well as conference organization roles for the CHI and OOPSLA annual conferences.

PART 6. HEALTH CARE/HEALTH INFORMATICS

2.15 Technology-Enabled Transformations in U.S. Health Care: Early Findings on Personal Health Records and Individual Use

[Ritu Agarwal](#) and [Corey Angst](#)

Information intensive industries, such as health care, rely extensively on the ability to store, process, analyze, and use data. Although other information intensive industries have adopted information technology aggressively and reaped the benefits that result from usage, the health care industry has been notoriously slow to implement information systems, with some researchers suggesting that health care is 10-15 years behind other industries. Recognizing the critical importance of decision quality in the health care sector, together with the need to improve the speed and efficiency of operations, many have called for the transformation of the health care industry through widespread adoption and usage of information technology (IT). In this paper, we define and discuss health information technology (HIT) and the extensive opportunities for IS research in this field. In particular, we direct our attention to the electronic personal health record (PHR) and investigate the justification for adoption of a class of software that we label a discretionary application. Finally, we report findings from an empirical investigation of PHR usage and show that specific demographic and health conditions drive value for PHRs and ultimately usage intentions.

Ritu Agarwal, PhD, is the Ralph J. Tyser Professor of Information Systems at the Robert H. Smith School of Business, University of Maryland, College Park. Dr. Agarwal has published over 50 papers on information technology management topics in journals such as *Information Systems Research*, *MIS Quarterly*, *Communications of the ACM*, and *Journal of Management*, and has made presentations at a variety of national and international conferences. Her current research is focused on how organizations derive value from information technology through adoption, diffusion and creative use; IT in the health-care sector; and the design and structuring of IT activities. Professor Agarwal is currently serving as a Senior Editor for *MIS Quarterly*, and an Associate Editor for *Information Systems Research* to name but a few editorial appointments.

Corey Angst is a 4th year PhD candidate in the Decision and Information Technologies Department at the Robert H. Smith School of Business, University of Maryland. His interests are in the transformational effect of IT in the healthcare industry and technology usage in the healthcare sector. Prior to pursuing this degree, Angst worked for 10 years as a mechanical engineer in both technical and marketing roles, most recently with the DuPont Company. Angst has presented papers at several academic conferences and has several papers under review within the IS and Medical Informatics fields. He has a BS in Mechanical Engineering and an MBA from the University of Delaware.

2.16 Organizational and Individual Acceptance of Assistive Interfaces and Technologies

[Adriane B. Randolph](#) and [Geoffrey S. Hubona](#)

Much of the management information systems literature focuses on organizational and individual technology acceptance for conventional, non-impaired users. However, little of this literature considers the range of users' cognitive and physical differences and the implications on prevailing theories of technology acceptance and use. Individuals with disabilities have unique requirements with respect to using and interfacing with conventional and assistive technologies. For example, many individuals with impaired motor functions cannot effectively use conventional mouse and keyboard interfaces. It is particularly important to understand the impact as affecting the organizational adoption and diffusion of these technologies. We describe important considerations for the acceptance and use of assistive interfaces and new technologies while focusing on both organizational and individual considerations. At the individual level, we investigate how a person's ability affects technology acceptance and usage, and we illustrate this with two novel interface technology case studies. At the organizational level, we consider factors for the diffusion of assistive technologies. It is important that the management information systems and assistive technology research communities share knowledge to ensure that disabled users have adequate technical access and support in organizations.

Adriane B. Randolph is a Doctoral Candidate in the Department of Computer Information Systems at Georgia State University. She is a National Science Foundation (NSF) Graduate Research Fellowship Award Recipient, KPMG Doctoral Scholar, and Southern Regional Education Board (SREB) Doctoral Scholar. In addition, she is a member of the Association for Computing Machinery (ACM) and the Association for Information Systems (AIS). Her research interests focus on human-computer interaction, assistive technology, and user-centered design. In particular, she is working with brain-computer interfaces in the Georgia State University BrainLab. Prior to

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Geoffrey S. Hubona is an Associate Professor in the Department of Computer Information Systems at Georgia State University. He holds a BA in Psychology from the University of Virginia, an MBA from George Mason University, an MA in Economics and a PhD in MIS, both from the University of South Florida. He previously held faculty positions at Virginia Commonwealth University and at the University of Maryland Baltimore County. His research focuses on human-computer interaction as it applies to 3D visualization and Internet usability, direct brain-computer interfaces, and the user acceptance of information technologies. His research has been published (or accepted for publication) in *ACM Transactions on Computer-Human Interaction*, *IEEE Transactions on Systems, Man, and Cybernetics, Part A: Systems and Humans*, *The DATA BASE for Advances in Information Systems*, *International Journal of Human-Computer Studies*, and *Journal of Information Technology Management*.

PART 7. METHDOLOGICAL ISSUES AND REFLECTIONS

2.17 Conducting Experimental Research in HCI: From Topic Selection to Publication

[Allan Dennis](#), [Monica Garfield](#), [Heikki Topi](#), and [Joseph Valacich](#)

Human-Computer Interaction (HCI) draws on a wide range of academic disciplines and leverages many different theoretical foundations. Identifying the right research projects to pursue in this domain, executing the research and finding an appropriate outlet for such work is a challenge. This paper will present ways to determine appropriate projects, the role of theory in the formation of a project, issues underlying success in research design and explore the different models for publishing “relevant” HCI research. Our focus is on laboratory experiments used for theory testing.

Alan R. Dennis is Professor of Information Systems and holds the John T. Chambers Chair of Internet Systems in the Kelley School of Business at Indiana University. His research focuses on the use of computer technologies to support teams, on knowledge management, and on the use of the Internet to improve education. He received a Bachelor of Computer Science from Acadia University in Nova Scotia in 1982, a Master of Business of Administration from Queen's University in Ontario in 1984, and a Ph.D. in Management Information Systems from the University of Arizona in Tucson in 1991. He is the author of more 100 research papers, as well as four books, two on data communications and networking, and two on systems analysis and design. He is the Publisher of MIS Quarterly Executive and serves on the editorial boards of Journal of Management Information Systems, Journal of the Association for Information Systems, Journal of Computer-Mediated Communication, and International Journal of e-Collaboration.

Monica J. Garfield is an Assistant Professor in Computer Information Systems at Bentley College. Her research focuses on the use of IT to enhance creativity, the impact of technology on group interactions and knowledge creation. She also works in the area of telemedicine with regards to socio-technical issues that impact the implementation of telemedicine networks. She holds an A.B. from Vassar College, an M.B.A. and M.S. from Boston University and a Ph.D. in MIS from the University of Georgia. Her work has appeared in such journals as Information System Research,

MIS Quarterly, Communications of the ACM and Journal of Management Information Systems. She is also the editor of the ISWorld Net's Data Base Course.

Heikki Topi is an associate professor of computer information systems at Bentley College. His current research focuses on human factors and usability issues in data management, systems analysis & design and Web search, management and commercial utilization of advanced telecommunications technologies with a special emphasis on wireless applications, and the effects of time availability on human-computer interaction. His research has been published in a number of information systems and information science journals, and he is the co-editor of Auerbach's IS Management Handbook.

Joseph S. Valacich is The Marian E. Smith Presidential Endowed Chair and The George and Carolyn Hubman Distinguished Professor in MIS at Washington State University. His primary research interests include technology-supported individual and group decision-making as well as how individuals and groups appropriate technological support and mediated communication tools for enabling group processing and performance.

PART 8. REFLECTIONS

2.18 Soft versus Hard: the Essential Tension

[John Carroll](#)

Through the past 30 years, Human-Computer Interaction (HCI) has developed as a strongly theoretical area of interdisciplinary scientific research and technology development. In the mid-1980s, there was debate in the pages of the journal *Human-Computer Interaction* regarding the nature of science in HCI. Allen Newell and Stuart Card described a “hard science” paradigm for HCI, which they argued would more effectively integrate psychology and computer science as interdisciplinary foundations. Robert Campbell and I questioned this conclusion. Like most significant debates, this discussion is ongoing. This paper summarizes the original debate, and places it in the context of HCI, as this field developed through the ensuing 20 years, and, more generally, in the context of multidisciplinary research visions, which inevitably must wrestle with the tensions between “soft” and “hard” science.

John M. Carroll is Edward Frymoyer Chair Professor of Information Sciences and Technology at the Pennsylvania State University. His research interests include methods and theory in human-computer interaction, particularly as applied to networking tools for collaborative learning and problem solving. He has written or edited 14 books, including *Making Use* (MIT Press, 2000), *HCI in the New Millennium* (Addison-Wesley, 2001), *Usability Engineering* (Morgan-Kaufmann, 2002, with M.B. Rosson) and *HCI Models, Theories, and Frameworks* (Morgan-Kaufmann, 2003). He serves on 9 editorial boards for journals, handbooks, and series; he is a member of the US National Research Council’s Committee on Human Factors and Editor-in-Chief of the *ACM Transactions on Computer-Human Interactions*. He received the Rigo Career Achievement Award, from ACM (SIGDOC), the Silver Core Award from IFIP, and was elected to the CHI Academy. In 2003 he received the CHI Lifetime Achievement Award from ACM.