

# HUMAN-COMPUTER INTERACTION AND MANAGEMENT INFORMATION SYSTEMS: APPLICATIONS

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ADVANCES IN MANAGEMENT  
INFORMATION SYSTEMS  
VLADIMIR ZWASS SERIES EDITOR

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HUMAN-COMPUTER  
INTERACTION  
AND MANAGEMENT  
INFORMATION SYSTEMS:  
APPLICATIONS

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To Carole, Lauren, Christy, and Matt; to Frank, Louise, Janice, and Doreen; to neighbors;  
to our family and friends past, present, and future *DG*

To Stoney, Cindy, Melody, Jing, Jixin, Tony, and Anny with love; to  
my colleagues and students with gratitude *PZ*



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# **SERIES EDITOR'S INTRODUCTION**

VLADIMIR ZWASS, EDITOR-IN-CHIEF

As the second volume devoted to human-computer interaction (HCI) research in the *AMIS* monographs, the present work makes a major contribution to the objectives of the series. Its companion volume presented analytically the theoretical foundations of HCI in MIS; this volume establishes this research stream on a firm ground.

HCI research in MIS is an organic part of the IS discipline. Indeed, MIS centers on the study of information systems, rather than on information technologies, which are these systems' constituent. Human actors play an essential role in information systems. In the MIS field, HCI studies humans in their interactions with information technologies in the organizational context or for organizational benefit. We need to study humans both as individual actors—say, companies' design engineers or e-tail customers, and as members of groups—say, technology-coordinated members of international virtual teams, members of organizations at large, and members of supraorganizational entities such as the collaborators in global supply chains.

The users of a system have a vital role to play in that system's success or failure, and thus in the organizational outcome. This is particularly so as these outcomes begin to depend on the discretionary use of many systems. Cooperation, collaboration, community building, and innovation can hardly be elicited through compliance. Here is a regrettably typical scenario: An organizational memory information system has been implemented with an intranet and would help in addressing the marketplace with the accumulated experience contributed by the engineers, marketers, and salespeople. The incentives for contribution have been put in place by a new motivation program aiming to enhance the level of innovation. We want to share cases across the functional units, and we need to learn from the customers. However, the system is cumbersome to use, the way the accumulated knowledge is classified is unnatural, and the use mode disrupts the way people work. Although seeded with several contributions and evangelized by its champions, the system is simply adjudged not worth bothering with. As such discretionary systems depend on network effects, the system will fall into disuse.

Explicitly or implicitly, information systems are built around a user model. For example, the ARPANET protocols and the Internet-Web compound they gave rise to were intended for information sharers; it is hard to protect them from subversives and it is difficult (generally for certain types of governments) to discourage access and sharing. In an organizational setting, the absence of task analysis can lead to the development of systems that—even if implemented—will produce

suboptimal outcomes, because they do not rely on an appropriate user model. In the extreme cases, as illustrated before, the systems fall by the wayside. It is therefore important that the user model underpinning an information system be constructed, prototyped, and validated across the user community.

In the advanced and advancing economies, issues such as ease of use, fun, support for flow experiences, and design aesthetics come to the fore. Indeed, you will find Amazon.com advertising the position of “user-experience specialist,” and SAP America searching for a “senior user-experience designer,” whose responsibilities include the “design of user interfaces based on research, human-factor principles, platform-style guides, and industry experience.”

The aim of HCI research in MIS is to learn how to design organizational information systems that support humans to the greatest extent possible. The editors of the present work, Dennis Galletta and Ping Zhang, have made a signal contribution to our field with their two-volume project. The first volume laid the theoretical foundations for the present work that contextualizes and applies HCI theories to e-commerce, teamwork support, health care, e-learning, and other areas of human pursuit. We would want the field to be able to train people suitable for the positions cited above. It would then function as translational medicine does by converting the findings of scientists into actionable knowledge. Of course, considering the aim, this work can never be completed. Izak Benbasat, a leading authority in our field, and not only in the HCI domain, offers a notable foreword. The volume editors offer an extensive research introduction. The series editor needs to say no more.

# FOREWORD

IZAK BENBASAT

I enjoyed very much reading this book and its companion (*Foundations*) 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, aims 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 the visionary 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 seventeen informative chapters representing the state of the art in the field. These chapters cover key HCI application issues that are beyond the “one person–one computer model” of early MIS HCI studies, such as the literature on graphical interfaces, to encompass broader issues dealing with organizational, cultural, and global issues influencing technology design, use, and adoption. While the person-computer model is still being investigated, for example, in the chapters on Internet download delays and pop-up ads, the person-computer-person model is also prominent in the chapters on virtual teams, collaboration technologies, and distributed teams, dealing with individuals or groups connected with or communicating through information technologies. The research and design challenges of the latter are more difficult because they focus not only on people interacting with technologies but also with each other via technologies. The three chapters on the topic of technology-based learning are interesting because they examine HCI issues in contexts where the objective is different from the performance of an activity, such as shopping on the Internet or making a decision, typically examined in MIS HCI studies. There are chapters on design methodologies that can be applied to systems analysis and design in general; but here specifically examined from an HCI or interface design perspective, they represent topics of increasing interest to MIS HCI researchers.

These topics also reveal another issue that we do not normally consider to be part of traditional HCI, namely the interface between users and technologists who are responsible for building systems and interfaces. Although the issues of Business-IT communication or linkage (i.e., the problem of the two solitudes) have been extensively researched in MIS, to my knowledge user-technologist communication has attracted less scholarly attention. The chapters covering public policy issues, health-care systems, and people with disabilities attest to the wide coverage of the book, the former topic addressing a problem that is consuming a significant amount of public resources and the latter dealing with the difficulties some of our fellow citizens face in accessing the information and services available via the Internet. Lastly, the book covers topics on adoption, where the emphasis is on identifying the factors that influence the utilization of new technologies.

Other significant contributions of this volume are found in the chapters dealing with philosophical issues, experimental methodology prescriptions, and measurement or metrics, since these provide the foundations of high-quality research endeavors. Developing new measures is a crucial activity that is a *sine qua non* for good research; unfortunately some leading journals in MIS have dampened the enthusiasm of those interested in pursuing such activities by somewhat discouraging such submissions. The inclusion of measurement-related topics in this volume will create a much-needed impetus to encourage the MIS HCI community to emphasize the development of new measures in its workshops and journal special issues.

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 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 or groups and the technological artifact in order to assist practitioners. Robert Zmud and I have been emphasizing this need recently. Fortunately, there are many fine examples in the volumes of research efforts that lead to actionable information for practice.

I hope that these volumes will initiate a series of books that, by conveying current and future accumulated knowledge in MIS HCI, will 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 these volumes a success. I congratulate Dennis Galletta and Ping Zhang for their vision and hard work in bringing them to fruition, and commend Vladimir Zwass for providing the platform for this work to be published.

HUMAN-COMPUTER  
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APPLICATIONS



# APPLICATIONS OF HUMAN-COMPUTER INTERACTION IN MANAGEMENT INFORMATION SYSTEMS

## An Introduction

DENNIS GALLETTA AND PING ZHANG

**Abstract:** *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.*

**Keywords:** *WWW, Electronic Commerce, Collaboration, Culture and Globalization, Training and Learning, User-Centered System Development, Health Informatics, Research Methodology*

## INTRODUCTION

This book is one of two complementary volumes that present scholarly works from a variety of thought leaders in HCI, especially those who have ties to the field of management information systems (MIS). The first volume (*AMIS* Vol. 5) covers concepts, theories and models, and general issues of human-computer interaction studies relevant to MIS. Addressing perspectives on HCI from different disciplines, the first volume's topics include the nature and evolution of our understanding of who users are; theoretical understanding of how to design systems to support humans; theories and models of cognitive and behavioral aspects of using information technology (IT); and fundamental understanding of the affective, aesthetic, value-sensitive, and social aspects of HCI. This volume (*AMIS* Vol. 6) covers applications, special case studies, and HCI studies in specific contexts. Topics in this volume include HCI studies in electronic commerce and the Web context; HCI studies for collaboration support; culture and globalization issues; specific HCI issues in IT learning and training; theoretical understandings of system development processes; HCI issues in health care and health informatics; and, finally, methodological concerns in HCI research.

Each volume concludes with thoughtful reflections by well-known authors. In the first volume, Fred Davis discusses the connection between the technology acceptance model (TAM) and HCI, and Jonathan Grudin provides a historical reflection of the development of three closely related

disciplines. In the second volume, an early, influential, and visible debate on soft versus hard science in HCI studies is revisited and updated from the perspective of one of the original debaters, John Carroll.

Application of theories, frameworks, and principles is crucial to the HCI-MIS field. Without theory, research would be haphazard, inconsistent, and inconclusive. Because of that undesirable potential, the MIS field has explicit requirements from editors of all of the major journals to provide adequate theory in performing studies.

Applications of human-computer interaction (HCI) theories, frameworks, and principles to MIS problems can be considered to be an organizationally based “proving ground” of sorts for those tools. Theories, frameworks, and principles provide an understanding of an issue or problem, while applications supply not only some partial evidence of whether or not the principles hold, but also some solutions, additional extensions, and new questions.

Therefore, in some ways, this second volume completes the story that was started in the first volume by complementing the perspectives and theories with those selected application areas that several of our most respected colleagues have chosen to examine. In other ways, this volume should stimulate the emergence of new applications and problem areas as it raises new questions—most papers suggest the need for additional research and even new areas of theory. Thus, this volume provides for tomorrow’s conceptual work and applications. Such is the hallmark of a vibrant and progressing field.

## RESEARCH CONTEXT

It is important to establish an appropriate disciplinary base for studying HCI issues. In the introduction to the first volume, we assert that HCI is an interdisciplinary research arena. Several papers in this volume underscore the multifaceted and interdisciplinary nature of the field. These papers import theoretical perspectives and tools from a variety of reference disciplines. The astute reader will recognize theories from several areas, including such fields as psychology, sociology, computer science, economics, health science, cultural sciences, and organizational sciences.

There is one interesting benefit to the interdisciplinary nature of HCI. There is a highly publicized and dramatic trend towards outsourcing system development (and many other) tasks to offshore vendors, and hiring is down. At the same time, enrollments in systems-related academic programs have declined sharply. Fortunately, Schwartz (2005) provides a preview of an upcoming government report that indicates that “work that crosses multiple disciplines” and requires creativity, ingenuity, and, most interestingly, “integration of business processes with IT,” is less likely to be cast offshore in the foreseeable future. The HCI designer’s task fits with all of these notions.

In addition to being multidisciplinary, HCI is also a strong practical and application-oriented area. Applications requiring interactions with human users can be found everywhere in our surroundings, and are therefore of significant concern to both researchers and practitioners in a wide variety of disciplines. Long-term efforts are under way to pull these researchers and practitioners under a single metaphorical umbrella where duplication of effort can be avoided and synergies can be exploited (DevCon, 2005; Galletta et al., 2005; Instone, 2005). The MIS field’s main academic association, the Association for Information Systems (AIS), is participating in the dialog and movement. Other professionals include ergonomists, graphic designers, business analysts, product designers, engineers, and health professionals. There are few fields that escape the task of designing for a user’s experience, and the time has come to share important findings among these fields.

While efforts are under way to pool resources, the disciplines will remain distinct. Ergonomists will continue to examine physical impacts in human factors work, graphic designers will retain their skill base on layout and presentation, and mechanical engineers will not yield their ability to

Table 1.1

**Framework for Applying Theory**

	The Academic Researcher	The Practitioner
Goals	Generalization	Problem solving
Activities	Theory development and testing	System design and evaluation

analyze materials that will go into a physical product. At the same time, it is striking that all of them need to be concerned with usability and users' experience of their products. All need to ask if people will understand the product with little training, if the product will behave as users expect, and if the product will be appealing. These concerns are indeed also shared by systems designers in the MIS field. What distinguishes MIS researchers is the organizational context.

Both MIS researchers and practitioners are interested in the organizational context. That context provides a notion of an organization's strategic goals and users' tasks. For researchers, the organizational context drives the choice of research problems and suggests methods for learning more. In a similar fashion, for practitioners, the organizational context bounds the problems that are examined and leads to approaches for solving them. The differentiating factor is that researchers are most often interested in acquiring generalizable knowledge, while designers are focused on providing a solution to the organization, with systems that have improved usability or enjoyment.

The rest of this paper is organized as follows: First, the notion of applying theory is described. Then each of the papers in this volume will be described, in order by section.

**APPLYING THEORY**

Theory is applied in a multitude of ways by researchers and practitioners, and there are important differences in the purpose and the application itself. Each part of the framework in Table 1.1 will now be discussed.

**Generalization versus Problem Solving**

Both academic researchers and practitioners are concerned with issues that arise at the organizational, system, user, and task level. What differentiates them is the level of generalization and problem solving that each desires.

Academic researchers who study a particular organizational system, user, or task are interested in what it will teach them about future systems, users, and tasks. Generalizability is of primary concern for building models and publishing papers. If the knowledge is not generalizable in some way, it is unlikely that other researchers will take an interest in that knowledge. Lessons learned can be shared with others and progress can be made for the entire field.

On the other hand, practitioners want to solve organizational problems. They need to build a system or make a particular decision. Sometimes theories published in journals are not immediately useful or visible to practitioners. However, some research undoubtedly filters through to practitioners, as many attend conferences, hear presentations by researchers, or read materials generated by researchers. In that case, pieces that they find useful could drive their problem solving.

The difference between the researcher's and practitioner's purpose is actually unexpectedly unifying. Applying theory to an organization's problems should allow practitioners to develop systems

that are responsive to the needs of the organization and its members. This puts MIS in a unique position to provide the necessary organizational focus. Stated another way, MIS needs HCI and HCI needs MIS, as mentioned in the introduction to the first volume. It is worthwhile to examine each part of this assertion in some detail.

### **HCI Needs MIS**

Historically, HCI research has included some explicit consideration of organizational issues, especially with respect to managing a project for greatest usability. For example, the classic piece by Gould and Lewis (1985) specifies that the first step in designing usable systems is identifying users and their tasks. Failing to gain such an understanding could lead to vexing design problems, such as presenting dialog boxes or prompts that use terminology unfamiliar to users, or requesting users to follow steps that they cannot find in any documentation or training materials. Equally as vexing, designers sometimes err by providing detailed instructions for performing well-known tasks such as selecting File-Save to save a file or File-Print to print a document. Amidst the obvious instructions, it might be difficult to find the key aspect of help needed, or that key aspect might have not been provided.

Such a focus has existed in the MIS field for a long time in work on systems analysis and design. The organizational context for practical problems is often provided by a business analyst (i.e., an MIS person). A business analyst is a compelling candidate for designing a user's experience. He can speak the user's business language to gain a quicker and more accurate representation of the task. He can develop more effective design specifications with richer organizational knowledge. He can produce test goals and benchmarks that are meaningful to the organization. He can determine if usability is of adequate quality for release to users.

From the perspective of applying theory, the MIS field has models that would benefit the HCI field by providing such context more systematically. For instance, the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003) contains both effort expectancy and performance expectancy. As described by Davis (2006), the former had been called "ease of use" and the latter "usefulness" in the past. In this model, performance expectancy, along with outcomes of these expectancies, provide useful context for effort expectancy. Effort expectancy by itself seems to provide a focus that is incomplete.

As an example, the famous "Ernestine" project (Gray et al., 1992) provided evidence that support calls could be handled more quickly by avoiding purchase of a new system. The new system had touted an "HCI friendly" design (with an easier-to-use interface and faster connection speed), but in reality, several steps that were previously done in parallel (computer and human) would now have to be done sequentially. Broadening the analysis to organizational needs for overall efficiency helped provide the proper decision, and helped save several million dollars. Further, additional analysis of customer satisfaction, company image, and IT strategy might have provided crucial input to the decision as well. The context provided by MIS is valuable and necessary, hence, HCI needs MIS.

### **MIS Needs HCI**

The converse is also true, that MIS needs HCI. We have models that would, and do, benefit from more detailed notions in HCI. Again, using the UTAUT (Venkatesh et al., 2003) example, neither MIS researchers nor practitioners should stop after making an overall assessment of effort expectancy. They should make use of HCI principles and theoretical perspectives for their application work. MIS researchers should drill deeper and specify more elements of usability. For example, some systems