Association for Information Systems
AIS Electronic Library (AISeL)

ICIS 1986 Proceedings

International Conference on Information Systems (ICIS)

1986

# Panel 2: Human Computer Interaction and Information Systems

Barry Floyd
*New York University*

Izak Benbasat
*University of British Columbia*

Marilyn M. Mantei
*Electronic Data Systems Corporation*

Thomas W. Malone
*Massachusetts Institute of Technology*

# PANEL 2

## Human Computer Interaction and Information Systems

Barry Floyd
Graduate School of Business Administration
New York University

Interest in human-computer interaction in the design of computer-based information systems has grown substantially over the past few years. Many IS programs have added faculty whose research focuses on human-computer interaction issues; they have added courses in HCI to their curriculum; and they have graduate students pursuing dissertations in this area. The research is emerging as an important facet of the information systems area. Therefore, it seems an appropriate time to cast a critical eye towards human-computer interaction research and to discuss its role in shaping the field of information systems. In hopes of passing beyond the well known platitudes, a panel of researchers in information systems has been formed to examine the directions of research in human-computer interaction in information systems and to present their opinions to the IS community at ICIS '86.

The panel discussion will be structured in the following way. Two questions will be posed to the panelists. Each panelist will have 5-7 minutes to respond to each question. All panelists will respond to a question before we proceed to the next question. Brief discussions will be held after each question. There will be time after all questions have been addressed for further discussion.

The questions posed to the panelists are directed towards defining the area of human-computer interaction by describing the critical issues in HCI addressed by information systems researchers and evaluating the way in which the researchers address those issues. The specific questions are:

1. What are the important issues human-computer interaction researchers in information systems should address?

2. How should this research be conducted and evaluated?

# Human Factors in Information Systems

Izak Benbasat
Faculty of Commerce and Business Administration
University of British Columbia

Human factors is the study of how people and computers interact. The objective is to develop design principles that work well in human terms. I would consider the following within the domain of human factors research in IS:

(a) Research evaluating interface mechanisms, such as comparing different information presentation methods or modes of communicating with computers;

(b) Research in understanding how computing technology affects its users, such as the influence of computing technology on the quality of working life of clerical workers, and how to minimize the dysfunctional outcomes of these influences by different design alternatives.

Category (a) deals with micro issues and category (b) with macro issues in human-computer interaction. The rest of my comments will deal with category (a). Within category (a), I distinguish between those aspects that are concerned with the mechanisms of system use, such as abbreviation methods, error correction options, and help facilities and those that are concerned with utilizing the capabilities of the system as a managerial tool, such as understanding how IFPS vs. LOTUS type interfaces influence the effectiveness of the problem solver. I consider the type of issues under the latter category more relevant to IS researchers.

The question of how to conduct and evaluate this type of research could be considered from the point of view of paradigms and methodologies. Typically the research conducted, especially that utilizing experimental strategies, have rated poorly on both of these criteria. Recently, there has been increased concern about the task and measurement of these studies (see Jarvenpaa, *et al., MIS Quarterly,* June 1985). Similarly, Huber (*Management Science,* May 1983) has criticized the emphasis of task variables in IS human-computer interaction studies. Research efforts are hampered because of the lack of commonly accepted taxonomies, e.g., what are the different task categorizations and measures for different variables.

At a higher level, there are no paradigms within the IS field to guide research efforts. Some of the studies try to rely on theory in psychology for hypothesis development, but this is the exception rather than the rule. In general, the lack of a clear paradigm and of reference discipline makes the conduct and evaluation of these studies difficult. It is still possible to examine the methodological quality of the work as an empirical study. More importantly, there is a need to judge the merits of the particular issue being investigated. First, as academics in an applied discipline we could determine the potential relevance of the issue to practitioners. Second, we could examine the degree to which the research is grounded in theory, in this case likely to be theories in cognitive psychology and human information processing. If the research clearly makes one of these two cases and is of high methodological quality, then it could be viewed as a contribution to the field.

## Bridging the Gap in Human-Computer Interaction

Marilyn M. Mantei
The Center for Machine Intelligence
Electronic Data Systems Corporation

Of all the disciplines associated with human-computer interaction, the researchers and practitioners in CIS are most likely to accept the need for improving user interfaces as real and important. Nevertheless, there are few individuals doing work in this area in CIS. This is an unusual gap because of an inherent problem in the HCI field, that of minimal technology transfer. Although a considerable amount of information is now known about how users interact with computer systems to improve the design of computer systems, there is a wide communication gap between the psychologists who study people and the computer scientists who study computers and software. I believe that this communication problem is one of the major issues facing HCI today and that it is a CIS research problem.

In what ways can CIS research alleviate this problem? It can specify ways in which human factors can be included in the software development life cycle. Tradeoff analyses can be generated to demonstrate when it is effective to include human factors. These can be used by IS managers for human factors decision making. CIS research can also help find ways to communicate between the psychologist and the system designer. It can focus on developing methods for representing what is known by the psychologists in language the computer scientist can understand, perhaps through the development of appropriate software. As a facilitator, CIS can also guide human-computer interaction researchers in their choice of problems, e.g., spreadsheet errors and conceptual difficulties with database queries.

To perform this effort, the CIS researchers doing human-computer interaction research need a variety of tools. These include the traditional ones of case studies and surveys, but they also include new ones such as documenting user problems via the capture of online logs, building expert systems to help with human-factored software design, and conducting psychological experiments to gather information on individual user's behavior with business systems. CIS researchers need to be both the psychologist and the computer scientist to be able to narrow the communication gap between these individuals.

## Computer Support for Groups and Organizations

Thomas W. Malone
Sloan School of Management
Massachusetts Institute of Technology

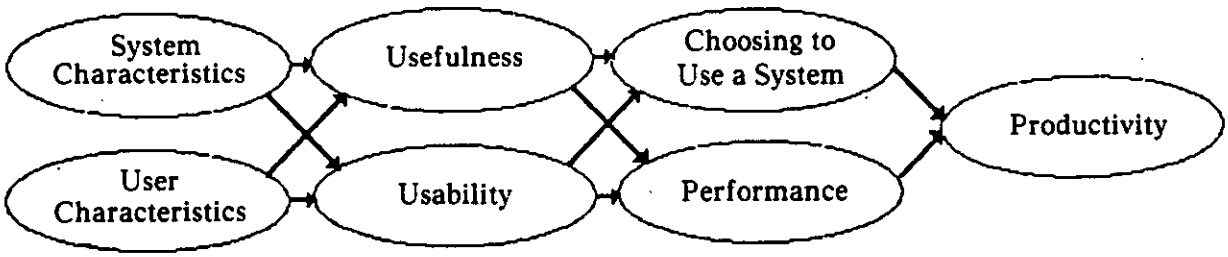
The study of human-computer interaction has traditionally focused on the design of interfaces for individual users of computer systems. Similarly, work on decision support systems has primarily focused on supporting individual decision making. This presentation will suggest that an increasingly important focus for both areas will be on the design of systems that support groups of people working together using computers. Simple examples of such systems include electronic mail, computer conferencing, and group decision support systems. The presentation will include examples of more advanced group and organizational support systems and suggestions for developing a theoretical base to help in their design.

This area of research seems to be a particularly promising combination of research traditions in human-computer interaction and information systems. Much work in the field of information systems suggests a sensitivity to organizational, political, and economic factors that has frequently

been lacking in work on user interface design. At the same time, work on human-computer interaction emphasizes an orientation toward analyzing alternative design options that has frequently been missing in research on the impacts and implementation of computers.

# Importance of Human-Computer Interaction Issues to the Design and Use of Business Information Systems

Judith Reitman Olson
Graduate School of Business Administration
The University of Michigan




Most of us in MIS/CIS, regardless of referent discipline or background, have the goal of designing information systems to enhance corporate productivity. Working from right to left in Figure 1, productivity is not achieved if the system is not used. Some users, called "dedicated users," are told what system to use when; these users include directory assistance operators and reservation clerks. For them, it is most important that the system do the right parts of their tasks and that it be usable to enhance speed and accuracy. Other users must choose to use a system before it will enhance his/her productivity. These are "discretionary users," and they include managers and financial analysts. For them, the system must enhance performance, but also appear to be useful and usable in order to affect the choice of use.

Both of these users' productivity will be affected by the functionality and the usability of the system, characteristics that are affected in turn by different features of the information system itself. For example, having a capability that allows hierarchical referencing in a spreadsheet application will affect the system's functionality; having pull-down menus and a display that shows the spreadsheet in a standard tabular format will affect the system's usability.

Fundamental questions about the usability and usefulness of information systems stem from an understanding of the mesh between human strengths and weaknesses and those of computers. Allocations of functions to either user or system stem from decisions about which one can do the task better and perhaps cheaper. Designs of interfaces similarly center around knowledge of human strengths and weaknesses - knowing when to design aids for the user's memory, how to present information to support the user's strong ability to infer meaning from spatial patterns and graphics, etc.

I see the next advance in enhancing corporate productivity coming from a fundamental understanding of how user abilities can be coupled with those of information systems so that not only do the corporate tasks get done faster, they are done more intelligently through the appropriate pairing of human and computer strengths and capabilities.

I see the next advance in enhancing corporate productivity coming from a fundamental understanding of how user abilities can be coupled with those of information systems so that not only do the corporate tasks get done faster, they are done more intelligently through the appropriate pairing of human and computer strengths and capabilities.

# PANEL 4

## Artificial Intelligence and Business: What Are the Real Prospects?

Chair: John Leslie King
University of California-Irvine

Panelists: Rob Kling, University of California-Irvine
Tom Malone, Massachusetts Institute of Technology
Vasant Dhar, New York University

During the past several years the cry has gone up that artificial intelligence has finally arrived. Soon, we are told, AI will alter the world in profound ways. Business will be altered along with everything else, presumably for the better. The positions people take on the issue of AI in business vary greatly, from the shrill promotional stance of AI marketeers, to the skeptics, who, a la Gertrude Stein, maintain that "there is no there there." Without drifting toward one of the other of these extreme views, it would be useful to know just what it means for AI to "be here," and how we should feel about it. Are we seeing the completion of something, or the beginning of something, or just an important part of a long and evolutionary process? In what ways might AI affect the world of business, and with what potential consequences? This panel attempts to provide a practical assessment of the current state of AI in business, and to make some grounded and sane projections about what will come in the future. The charge to the panel is simple. These three experts are asked to provide their best assessment of the probable outcomes of current efforts to apply AI technology to the world of business. Each of the panelists will approach the question from their own background, perspective, and interests.

Tom Malone has been engaged in assessing, building, and applying AI technologies in organizations. His current research is in the refinement of the concept of expert systems to fit more closely the reality of most organizations. He argues that AI technologies of the expert system variety can be used in a wide range of business applications. However, he feels the traditional view of expert systems is incomplete and often misleading. There are important problems with application of the standard expert system view. Perhaps most important, much of the knowledge that must be coded into an expert system in order to make it effective is not sufficiently available in many domains of business and management. Systems built in such domains will probably never have sufficient knowledge bases to make adequate decisions by themselves. Since these domains are common in organizations, penetration of AI technology into them will require a modification of the expert systems concept. Malone argues that a useful model is that of the decision support system, where the system is designed to support a decision maker, not to make decisions. Expert support systems designed to aid the work of human experts offer much promise and are likely to have a more immediate and significant impact on business than are expert systems as commonly described. This approach requires use of computers as intelligent and flexible media for representing knowledge rather than on trying to use computers as autonomous, intelligent decision makers.

Vasant Dhar is also a systems builder who has been laboring to apply emerging AI technology to business. He feels the struggle has only begun. He notes that much of the expert system building activity to date has been in "classification oriented" problem solving in the physical sciences, engineering, and medicine. These systems map facts to conclusions that have been articulated, a priori, by an expert. The application domain of managerial problems is quite different. It is based less on formal or systematized bodies of knowledge and more on experience that is often specific to an organization or project. Such problem solving is fundamentally knowledge based and in principle is amenable to support by intelligent systems. To support decision making in these problem domains

requires that the intelligent systems acquire and encode context-specific knowledge without constant intervention from specially trained personnel. In other words, the system must allow users to shape the form and content of the model, much as computerized spreadsheets do.

According to Dhar, this is a major challenge that requires the ability to link explicitly the qualitative context embedded in the model to the model itself. This capability is lacking in current systems, but the ability to incorporate it could/might be achievable within the short term. Conceptually, it requires designing support systems not as repositories of prefabricated OR/MS models, as much of literature on "model management" advocates, but as systems that allow the user to define and synthesize domain-specific model fragments incrementally and to guide the process of search for solutions or alternatives in a much more deliberate and fluid way than is possible with OR/MS models. At the same time, the system must take on the responsibility of model evolution in a changing reality - a burden for the user in current systems. Finally, the system should contain what Dhar calls "process knowledge." This is knowledge acquired as a consequence of "learning by doing." It often plays an important role in problem solving in protracted projects and, perhaps more importantly, can be passed along to new members of the team. This functionality requires systems to be able to learn by observation as well as being told. It is an active area of research in AI and still requires resolution of certain key theoretical issues.

Rob Kling's Ph.D. research in the early 1970's focused on fuzzy logic problems in AI, and his "Fuzzy Planner," is still widely cited as a key work in the field. In recent years, he has been concerned with the organizational and social implications of computing technology. He is presently investigating the area of expert systems and the way they might be absorbed into organizations. According to Kling, expert systems are domain- specific symbolic inferencing programs. Like their predecessors, the parametric mathematical models and operations research techniques, they expand the range of problems which are computationally tractable. They also depend upon specialized information about a task domain to provide a high degree of analytical leverage over less sophisticated methods. Although expert systems depend on sets of symbolic relations and rules of inference rather than sets of equations and techniques for solving them, from the perspective of organizational adoption and adaption they exhibit many of the same complex problems that limit the successful use of parametric modeling technologies. All of these technologies raise questions of what constitutes expertise and whose expertise shall be embodied in the system. They also tend to cloud the relationship between particular outputs and particular input assumptions, especially when used by naive users. They are plagued by problems of reliability and validity in maintaining the bases of the technology (e.g., rule systems, data bases) and in application to new problems on which they have not been tested.

Problems like these arise routinely in the world of modern computer using organizations. Even if the "technical" problems of expert systems are resolved, these problems will remain and will influence the effect of expert systems in organizations. These similarities allow us to draw upon what we have learned from recent empirical research into the use, operation, politics, and impacts of a variety of computer-based technologies which embody specialized expert judgments.