

Finding Common Ground Among HCI Reference Disciplines

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ABSTRACT

Five panelists provide an interesting set of contrasting points of view of the HCI field from four distinct disciplines: Business, Computer Science, Information Science, and Psychology. Panelists are asked to respond to six questions in their presentations that address what their particular field offers that is unique, what seems to be quite similar, the effects of the overlaps, and advice for the future. Many of the panelists represent multiple fields, providing a unique opportunity to address the issues of overlap.

Keywords

HCI Field, Research, Business, Computer Science, Information Science, Psychology

INTRODUCTION

Over the last three or four decades, researchers began to investigate the area of human factors in interacting with artifacts in our world, and computer systems quickly became a natural target for such investigation. The emergent field called "human/computer interaction" (HCI) was so well-received by so many researchers that the dams that exist between fields could not hold back a large flood of work that has been completed and much that is upstream, yet to be done. The water metaphor also applies to the ubiquitous application and importance of the work; computers are all around us and are found in many sizes, shapes, and capacities.

Several fields might inform our understanding of these paradoxically troublesome yet valuable devices. Understanding the human requires background in psychology, understanding the computer requires background in computer and information sciences, and understanding the context requires understanding of business and information systems. These three complex areas interact in even more complex ways, providing

adequate fodder for investigation by disparate teams for many years to come.

It would be useful at this juncture to stop and examine the rivers of work that feed our wide and winding stream in HCI. What is unique about each source of knowledge? What do we have in common? Where are there overlaps, and are they synergistic and beneficial or redundant and contradictory? This panel will explore these general questions, and will represent their fields in a rare opportunity for such interaction.

QUESTIONS FOR THE PANEL

1. What does your particular source field offer to HCI that is unique to your field? Please feel free to showcase important work in your field that would not be likely to come from other fields.
2. What does your source field offer to HCI that seems to be very much like what is offered by other fields? Please provide some examples to illustrate your points.
3. Which of those overlaps are beneficial, providing a sort of triangulation for our results?
4. Which overlaps are redundant and contradictory, hindering our progress?
5. What trends do you see? Do you see HCI drifting towards any particular field? Is it spreading wider or contracting?
6. What do you recommend for the future? That is, should territories for each source field be "staked out?" Should we stay the course, working hard to navigate the sometimes conflicting currents? Provide a plan that you believe would be useful.

PANELISTS' POSITION STATEMENTS

Panelists provided initial statements that will provide an understanding of their general philosophies. The panel

session will provide thorough discussion of these and other issues.

Jonathan Lazar

I am a professor in a computer science department, but my background is in information systems. I also work with sociologists and cognitive psychologists. So while I can actually represent a number of different communities, for the purposes of this panel, I am representing computer science. I do believe that computer science is the root of all Human-Computer Interaction, as Human-Computer Interaction originated in the computer science field in the early 1980s. As HCI has grown and blossomed in different research communities, this has been very valuable, because it can give us multiple views of a problem, and multiple views will always yield a better outcome. To limit our research to only one field is to limit our understanding of a problem. For instance, library scientists have been studying the optimal methods for organizing, searching, and finding information for over 50 years. Why re-invent the wheel when we can learn from other fields?

I think that HCI researchers in computer science can offer fresh views of how humans interact with technology. For instance, at CS-based HCI conferences, there are frequently presentations on new interaction methods, everything from pen-based input to desks that can interact with you, or even entire rooms that can interact with you. Without this fresh approach, we can sometimes become limited in only examining what we currently have, and what we currently use. In general, computer scientists tend to build and refine the tools, and then, the other research communities examine how users actually use those tools, how organizations implement those tools, and how these tools can change society.

I see the growth of Human-Computer Interaction reflected in a topic of study near and dear to my heart, the topic of web accessibility. Designing assistive technology was primarily a computer science topic, with help from areas such as industrial engineering and rehabilitation engineering, health science, speech pathology, and special education. Since the implementation of Section 508 in the United States, and similar laws in other countries, the topic of accessibility has taken center stage. More software tools are being built to help build accessible software products. The topic of accessibility is changing from a CS-focused topic to a topic that is explored in multiple research communities, including sociology, information systems, and policy sciences. Computer scientists first build the software, hardware, and other tools. As more researchers from different communities get involved, we can fine-tune the software and hardware products.

There are some challenges to getting the communities talking with each other. Computer scientists and information systems use different terminology, attend different conferences, and do not have frequent

opportunities to interact. The end goals of the research are different. The publication outlets are different. Computer scientists are generally concerned with topics such as building better tools or interfaces.

Information systems researchers are interested in understanding usage patterns, organizational uses of technology, and user acceptance of technology. But there are common areas of interest. I have seen CS researchers focus on usage patterns, and I have seen almost all research communities study the problem of long download times. In fact, you never know where useful research will come from. I have recently been studying user frustration, and I have been reading the work of medical school researchers that focus on muscle movement and blood pressure as it relates to frustration.

All research communities have something useful to add to the study of human-computer interaction. I do not think that each community should stake out their territory and claim their corner of the research world. I think that we need to have more inter-disciplinary efforts. I think that the future of human-computer interaction education and research is an inter-disciplinary department, or a College of Information Studies, Information Technology, or my ideal title, "The College of User Interaction." The mission statement for the College of User Interaction should be "We Help People Improve Their Lives Through Technology." Is that a mission that we can all agree on?

Judith S. Olson

I represent three approaches: Business, Psychology, and Information. Given that others on the panel are from Business Schools, I will concentrate on the Psychology and Information approaches.

Psychology has long been about how people interact with the world, from the neural level to individual psychology to social and organizational psychology. From the early 1970s in individual psychology there were investigations of the psychology of programming, followed by how people interact with personal computers and now mobile computing. One of the most influential contributions in HCI was the 1983 book, "The Psychology of Human Computer Interaction," by Card, Moran and Newell. In this book, the authors compiled the major phenomena in psychology that explained how people interact with various computing devices, from Fitts' Law about motor movement and size of targets to the cognition involved in forming goals, unpacking sub-goals, choosing among alternative methods and enacting those methods. They developed a comprehensive model of individual behavior on computers, called GOMS, which has now 20 years of extensions. At the social level, researchers in HCI adopted various laboratory tasks, like the prisoner's dilemma and Arctic Survival tasks, to investigate the ways in which new communication tools like IM, email, video conferencing, etc. changed the dynamic of social interaction. Organizational psychologists looked at how people's contributions to their organization changed with

the advent of email and other tools. Many of the early people doing HCI in companies were trained in psychology.

Schools of Information are growing from various roots, most commonly from schools of Library Science. Librarians have long been taught to be user centered, and it is no surprise that they are interested in the digital world and making it easier for people to find the information they seek. So it's natural for schools of information to house programs in HCI. Some of the HCI work coming out of schools of information focus on information retrieval; others on what's going on in the head of the information seeker, whether they really know what they're after. Schools of information, however, have grown to encompass much more than what used to be Information Science. They cover the pricing of information (a non-consumable), the effect of digital information on society (like social capital, the digital divide), alternatives to copyright policy issues (including copyleft and copymiddle!), and the problems associated with archiving digital information (e.g. whether any of it will be readable in 50 years).

Simply put, people doing HCI from the psychological perspective are mostly concerned with more interactive computing and the designs' effects on cognition, decision making, affect etc. People doing HCI from the information perspective are mostly concerned with information access, navigation, and visualization rather than the more interactive applications. Business schools are more concerned with the productivity paradox, the adoption of technology in organizations, and the HCI of e-commerce and issues of stickiness and trust. Although it is natural for each to focus on those aspects, there is no reason we should be restricted to continue in that path and not branch out. Let many flowers bloom!

Dov Te'eni

Having studied and since then taught in a B-school, let me define my source field as MIS, and at the same time, note that much of my reading and some of my publications are in journals that lay outside the management domain. Furthermore, I teach an HCI course in the B-school that overlaps with those taught in CS but I doubt that it would be judged appropriate if it were identical to the CS course. This duality runs through my arguments below.

HCI in the MIS context should explicitly consider the task, and, moreover, the task as seen by the user in the organizational context, such as scheduling a meeting, searching for information or making a decision. This is in contrast to important HCI studies outside MIS that are concerned with human-computer interaction across tasks, e.g., ergonomic design of input devices or appropriate combinations of color on visual displays. It is also in contrast to HCI research that looks at lower level tasks, which I refer to as interaction tasks that are dependent on the specific input output design, e.g., moving a text string from one location to another. Vessey and Galletta's

Cognitive Fit Theory (CFT) is a prime demonstration of a contribution that comes from this perspective in which task is central to HCI. I look for the impact of CFT on CS and find it similar, but certainly not identical, to Norman's notion of naturalness. Why have these two concepts not enriched one another? Are there still unnecessary dams between the two fields?

Perhaps it would be useful to think of two layers in HCI research, teaching and practice: the upper task level inherent in a particular domain such as MIS or education, and the lower interaction level, which cuts across domains. Applying HCI at the higher level occurs at the analysis stage of systems development. At the design stage there is substantial overlap due to common interfaces so that guidelines on arranging a screen layout and presenting graphics effectively should be taught and practiced with little distinction (I hesitate to say none) between the domains of application. I anticipate more HCI research in different domains, in other words, I believe HCI is spreading wider.

Concentrating on HCI in MIS, I have some suggestions for the future. Visualize the two layers, on the upper layer are the HCI research efforts within domains such as education, management, information science etc. On the lower layer is the CHI / human factors field. Now draw a vertical line between the two layers from management down to CHI. At the upper intersection is our SIGHCI. It has the all-important role of spreading the word in MIS. Without this close tie between HCI and management in terms of research, publications and teaching we will not be able to impact MIS. But at the same time we also need to maintain the tie with the lower level by building on and adapting research, by participating in academic activities such as SIGCHI, by collaborating in research and, hopefully, by feeding back our research results and impacting the lower layer.

Marilyn Mantei Tremaine

(Subtitle: Mixing Oil and Water: Paradigmatic Differences in HCI)

When I matriculated with my Ph.D., I had job offers from Computer-Science and Information Systems. I chose to enter IS on the advice of Herb Simon who felt a business school was eclectic enough to allow the new field of Human-Computer Interaction. After 8 years I returned to Computer Science and spent 10 years in a CS Department. During this interlude I watched and helped the HCI field grow, primarily through ACM SIGCHI. In my most recent re-incarnation, I find myself chairing an IS Department in a small technical university in Eastern United States, NJIT. Both in my graduate education and in my academic seasoning, I have worked in both the IS and CS / Psychology paradigms and have experience with the differences between both. Most recently, I served as technical program chair for ACM Group 2003 and saved at least 3 good papers from extinction that were scored low merely because of the large paradigm differences

between the two camps. What are these differences and what impacts do they make on how research is being done?

I am going to distinguish between the two approaches by calling the IS one, HCI, and the CS / Psychology / Design one, CHI, since this second name was chosen by the community when they created ACM SIGCHI.

A key difference between the two paradigms is their focus. CHI focuses on design and design improvements. Thus, much of the work is in the invention of new interfaces. This invention is purported to be theory-based design, but the theory often follows the design. CHI also has a large computer-science component that examines methods for building classes of interfaces and also a developing graphics design component. In contrast, HCI focuses on the evaluation and impact of the interface design. As such, it takes existing design and examines what aspects of the design are relevant to a user's choice, a user's performance or a user's subsequent behavior with the application. Both HCI and CHI overlap in their research endeavors and HCI can be found inventing new software technology and CHI evaluating designs, but, in general, the goals and methods are quite different for each group.

CHI will tend to use looser qualitative methods and a low number of subjects for data capture whereas HCI will require tight validation of its experimental methods and a larger N. In contrast, at the very detailed design end of CHI, very tightly controlled experiments will be run. This leads to conflict and confusion amongst the research papers in both fields. CHI people are criticized for not running studies based on underlying theory and HCI people are criticized for running studies that are irrelevant. In both cases there are elements of research where the wrong method is applied to the wrong problem and the criticisms are valid. In others, the research question being asked requires methods that are unknown by the opposing research camp.

Jane Webster

My background is in organizational behavior and information systems from a business school. My remarks concerning HCI are from the perspective of MIS. Historically, HCI research and teaching have taken place in computer science, psychology, and MIS departments. Computer scientists focus more on developing technologies for the computer interface, psychologists concentrate more on individual issues, while MIS researchers attempt to truly bring together the technology with the individual in their studies. More recently, with the development of web-based applications and so-called customer relationship management systems, marketers have also started to conduct research in this area.

The interaction between the computer and the human has been a core element of MIS since its inception as a discipline (e.g., Mason & Mitroff, 1973) and regularly shows up in summaries of research areas within MIS (e.g., Swanson & Ramiller, 1993). Nonetheless, it appears to me that HCI remains on the periphery of what many researchers consider MIS.

Why is this? MIS researchers are distinctively positioned to address HCI issues as they focus both on people and information technologies. Nevertheless, most HCI research occurs in computer science, rather than in MIS. Further, most undergraduate HCI courses take place in computer science departments, with a smattering in psychology and MIS departments.

Why do computer scientists dominate this area of research and teaching? This may be because computer scientists are uniquely situated to develop the latest HCI tools and techniques and therefore get the attention of practice. These researchers thrive on developing the latest tools and need to continue to do so. However, they don't follow their tool development to market in terms of research; that is, they generally do not conduct large-sample tests on their HCI technologies. Quite the opposite, these technologies are "moving targets" that they are continually extending and improving.

I will put forth the perhaps controversial proposition that computer scientists' research often hampers development of the HCI field for several reasons. First, computer scientists often seem to "come up" with reasons for their technologies, post-hoc. For instance, they may draw on "common knowledge" of human behaviors or even theories from psychology to "justify" applications for their tools. However, I will demonstrate how this might do more disservice to the field (than not suggesting these applications at all). Second, they generally do not test out their assumptions regarding appropriate applications through controlled studies such as experiments or through large-scale field studies. In contrast, they often demonstrate their technologies to like-minded computer scientists. Further, the developers themselves and their colleagues frequently act as the "testers" for these applications. I will use recent HCI articles from computer science to illustrate these arguments.

This void in the large-scale study of actual technologies with employees represents a substantial opportunity for MIS researchers. Further, with the continuing development of Web-based applications, I believe that HCI research and teaching will continue to grow in MIS departments. Optimistic signs of this have been recent special issues of Information Systems Research on web-based applications and forthcoming HCI publications in MIS outlets. Therefore, I hope to see HCI move from the periphery of MIS to a more central role in the near future.

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