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THCI

Research Commentary

Establishing Best Practices for Scholarly Research Based on the Tenets of Human-Computer Interaction

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INTRODUCTION

As computing technologies play more of a role in our daily lives than ever before, the field of Human-Computer Interaction (HCI) is more relevant than ever. As such, it is important that scholars give ample and appropriate attention to the main tenets that characterize and bound the field. The core phenomenon of interest is interaction: when a human comes into contact with information technology (IT), usually within a particular context, and driven by some defined task. During an interaction, humans *use* the *design* of the technology's interface (Zhang and Li, 2005). Thus, the pillars that support interaction (and hence, design and use) are HCI's four main tenets: computing technologies, context, task, and the human.

My conceptualization of HCI and the arguments put forth in this commentary draw directly from Zhang and Li (2004) and subsequent papers that support their perspective (i.e., Zhang and Li, 2005; Zhang and Galletta, 2006; Zhang et al., 2009). My framework is thus deeply embedded inside what is often referred to as HCI within Management Information Systems (MIS). Hewett et al. (1992) stated that HCI is "a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them" (as cited by Zhang et al., 2002, p. 335). However, Zhang et al. (2002) have carved out a specific niche, asserting that "in the Information Systems field, HCI issues are explored from a distinctive perspective: MIS researchers and educators take managerial and/or organizational issues into consideration" (p. 335).

Field (2001) observed that the "M" in MIS is becoming less necessary as computing has expanded beyond the workplace. This is evident in a recent examination of the completed research papers presented at the *International Conference on Information Systems* (*ICIS*) 2009, where 41.8% of papers were found to address non-organizational contexts (Zhang and Scialdone, 2010). While this is not a space to debate the utility of the "M" in MIS, or wax about the discipline's history, it is important to state that when I refer to HCI, I am referring to the study of human-computer interaction that has matured within the stream of scholarly publications and conferences that comprise what we call MIS, or IS. I use "IS" here to reinforce that our research is not exclusively bound by organizational concerns. I adopt Zhang and Li's (2005) framework for HCI as a sub-discipline of Information Systems (IS), primary concerned with "the ways that humans interact with technologies for various purposes" (p. 228). I also support the notion that both design

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and use are necessary ingredients for HCI research and frameworks (Zhang and Li, 2005; Benbasat, 2010).

This commentary will not predict future directions of HCI, or impose a research agenda. Rather, I will reason general advice regarding the four main tenets of HCI in hopes of providing guidance for future research. Mindful that interaction is the ultimate phenomenon of interest to HCI; I assert that scholars should situate their work within the tenets in such a way as to address both design and use/impact (with one or both being emphasized). To assist toward this end, I provide a diagram and accompanying examples from the literature. I also address the importance of design as a component that distinguishes HCI from IS, drawing on more examples from the literature. This commentary is intended to serve academics by providing a clear framework in which to think about and compose their work going forward. I also encourage readers to challenge the model and examples I present here. At the most, this will spark a productive debate about the nature of HCI research in IS; while at the least, it will help the reader solidify an understanding of how to define HCI and conduct appropriate research.

THE HUMAN

Maxwell (2002) noted that HCI is "devoted to helping people meet their needs and goals by making computing technology accessible, meaningful, and satisfying" (p. 191). In other words, it should endeavor toward assistance in reaching "people-oriented goals" (p. 192). If computing technologies are to be appropriately designed toward such goals, a thorough understanding of the human must be obtained.

There is an intimate connection between humans, their behaviors, and contexts. Daily, humans engage in multiple behaviors, each of which is set within a particular context. Behaviors necessary for a task are of interest to HCI. A multitude of human factors might be pertinent to any task. Some of these human factors might be homogenous across different tasks and contexts, while others are more related to some tasks than others. For example, motivation might be a key to understanding why people go to class, date, apply for a job, or even brush their teeth. Meanwhile, trust is probably more relevant to dating than to tooth brushing.

Of course, HCI is only concerned with tasks and contexts that can be supported via computing technologies. When computing technologies were largely conceived of as organizational productivity tools, this implied a certain reasonable expectation as to what human attributes might be worth researching. As technologies have become purchasing mediators, delivery services for entertainment, social facilitators, dating coordinators, news broadcasters, and classroom proxies, there is *necessarily* a need to understand human elements that were once outside of the reasonable scope of HCI, and also to develop a richer understanding of those which have always been of concern to HCI. In other words, HCI needs to expand in both breadth and depth in regard to its consideration of human factors.

As computing technologies become more integrated into our daily lives, we should expect researchers to expand their coverage of human topics and phenomena. In assessing the HCI literature from 1990-2008, Zhang et al. (2009) found that cognitive beliefs and behaviors, attitude, and performance were the most highly studied topics in papers that looked at technology artifacts following the development stage, comprising 61.7%, 35.9%, and 35.1% of works respectively. There is no doubt that these are important topics that span many contexts and tasks. However, here exists ample opportunity to expand the breadth of topics covered by HCI through addressing lesser-studied topics such as ethics, learning, and emotion (with their coverage being 1.5%, 8.3%, and 9.2% respectively).

Emotion, for example, is arguably important in organizational contexts. But it is probably just as relevant, if not more relevant, to social (and even marketplace) contexts, in which individuals engage in tasks that are more volitional. As more people maintain relationships through social information and communication technologies (ICTs), emotion is a human factor to which HCI should probably pay more attention. Another topic, how humans learn to use computing technologies, is also a good example. Whereas organizations have long used technology for teaching and training purposes, we now have ample opportunity to investigate how the design of websites or handheld mobile devices influences informal learning about products or health conditions. There are also opportunities to study how new technologies, such as social media, are used to enhance educational tasks.

There are often opportunities to study human elements that have already been addressed by HCI at a deeper level. This was pointed out in both commentaries written for the previous section on "Future Directions for HCI in MIS" (Benbasat, 2010; Lyyntinen, 2010). For example, Benbasat encouraged the integration of Neuroscience methods (with the specific example of fMRI use) to understand human interaction with technologies in a way that has been nearly unexplored in HCI. Meanwhile, Lyyntinen noted that we need to "seek a better understanding of interactions between physical, motor, and cognitive levels" of the human (p. 24). He argued that people are not "automatons or cogs" within an information system, as "they constantly narrate and make sense of what they are doing" (p. 24).

To illustrate the importance of depth, I turn to an example Benbasat (2010) referred to in his commentary about trust in e-commerce environments. Wang and Benbasat (2007) drew from rich, rigorously developed theories of trust and used a thorough understanding of this human attribute to explain both the how and why of trusting beliefs from a

design perspective. As a contrasting example, Miranda and Saunders (2003) considered cognitive beliefs and behaviors, specifically in the form of social presence theory. They explained, "the presence of the sender influences the recipients' understanding of the message" (p. 89). However, they also pointed out that "this concept has not been fully worked out in the literature," addressing this by broadening "social presence theory by acknowledging that the presence of others, including (but not limited to) the message sender, influences the nature and success of intersubjective interpretation" (p. 89).

In the two examples above, we can see contrasts in the depth of our understanding of human phenomena, as explained by theory. Wang and Benbasat (2007) drew from theories that have deeply-mined trust as a human attribute, while Miranda and Saunders (2003) integrated a theory on human cognitive beliefs and behaviors which they admit has not been entirely worked out. I do not intend to be critical of Miranda and Saunders, as their arrived-upon conclusions are very insightful. Rather, my intention is to indicate an opportunity. When an important concept has not been fully developed or exploited, we have the potential to make meaningful contributions to our understanding of the human by working it out within an HCI framework, across multiple contexts that span multiple tasks and IT artifacts. When our understanding of the human is strong, it ultimately leads to more robust understanding of use and impact, and/or more reliable design-informed theories.

As computing technologies are found in more aspects of our lives, helping us do more tasks in contexts that extend beyond the organization, research in HCI needs to better understand the human in order to design better technologies to support those tasks. Thus, I recommend that scholars endeavor to cover a wide range of human topics, and to draw from, or contribute to, theories that illustrate a deep and rich understanding of human phenomena.

THE TECHNOLOGY

That which makes us human has remained constant over time. Yet, computing technologies, or technological information artifacts, are becoming (if they are not already) a major element in people's daily lives. To see evidence of technological growth and diffusion, all one needs to do is to look around. It is not unusual to see most students in a classroom with their laptops out for taking notes, whereas notebooks and folders were the norm merely a decade ago. While navigating the streets of a big city, one is more apt to utilize electronic navigation than a paper map. The ways people access entertainment has changed drastically as well. In fact, Apple's *iTunes* is the current industry leader in music sales with 28% of the market, far surpassing Wal-Mart's 12% (NDP Group, 2010). This indicates a major shift in human behavior from acquiring physical artifacts at traditional brick and mortar shops, to digital delivery through electronic commerce.

It is nearly impossible to talk about the advancement of technology, the constituent behaviors (tasks) in which people engage, and the contexts in which those behaviors happen, without pondering whether technology drives behavior, or whether behavior shapes technology. Rather than proffer my stance on technological determinism, it is sufficient for my purposes here to note that the tenets of task and context are intimately connected to technology, just as they are to the human.

While HCI clings to the term "computer" as a keepsake from its past, these days the "C" more accurately implies IT artifacts. As HCI is a sub-discipline of IS, we are blessed to be under the wing of its advances, but also cursed with inheriting its controversies. Therefore, HCI researchers must necessarily be concerned with the slippery notion of the IT artifact. Defining and conceptualizing the IT artifact has proven to be a bit of a conundrum for our mother discipline, stuck at the center of some intense (albeit important) debates (c.f., Agarwal et al., 2005; Alter, 2003a, 2003b; Benbasat and Zmud, 2003; Hevner et al., 2004; Orlikowski and Iacono, 2001; Saunders et al., 2003; Weber ,2003; Whinston et al., 2004).

Rehashing various scholarly conceptualizations of the IT (or ICT) artifact is beyond the scope of this commentary. Yet, I believe that HCI works should explicitly define the IT artifact at the degree of detail appropriate for the research question(s) or problem(s) at hand. Orlikowski and Iacono's (2001) analysis of 10 years worth of *ISR* papers found that nearly 25% of the 177 articles included had an absent conceptualization of technology. In other words, such research invoked technology "in name only," whereby "IT artifacts are not described, conceptualized, or theorized" (p. 128). Akhlaghpour et al. (2009) followed up with an evaluation of 196 articles in three IS journals across approximately three years. Nearly 30% of articles found that the role of technology was absent. Zhang and Scialdone (2010) performed their own analysis of *ICIS 2009* completed research papers, discovering that 21%of these conference papers addressed technology in name only.

These results should remind HCI researchers to define and conceptualize the technology artifact under investigation in a meaningful way. Despite the lack of a standard and agreed upon procedure for conceptualizing the IT artifact, researchers should fully describe the technology being presented. Ideally, it should be described it in terms of other tenets of HCI, such as the tasks for which the artifact is intended (or those for which it is actually used), and the contexts in which it is used. It also makes sense to explain whether or not one is making claims about a general

technology (such as e-commerce), a specific one (such as Amazon.com), or a feature thereof (such as product rating) (Zhang and Scialdone, 2010). This benefits the researcher in that it might better help him or her think through a particular research problem. Perhaps most importantly, an explicit description and conceptualization of the technology under investigation helps the audience to grasp its particulars. This is especially pertinent in a multi-disciplinary field such as ours. As we draw from other disciplines for our own research, it is not unreasonable to expect other disciplines to occasionally dip into our contributions for their own work. Thus, we need to be especially clear about the artifacts that we are studying.

TASK AND CONTEXT

Benbasat (2010) stated that HCI should consider a wide range of user types, as "we need to expand our 'user base' from professional and managerial users and customers to other audiences," and that "users in application areas such as e-government, health care, and the digital divide provide us with ample opportunities to break out from our focus on only certain types of user populations, including the traditionally employed student population" (p. 19). He suggested the aging population as one ideal user base to be studied. The idea of the user base, as he proposed it, can be categorized by the two remaining tenets of HCI (task and context), as well as by the human tenet. The human might be considered in terms of cognitive style, emotional tendencies, demographics, or physical/motor capabilities (Zhang and Li, 2004; Zhang and Li, 2005; Zhang et al., 2009). For example, the two user bases that Benbasat noted (the aged population and those on the digital divide) are defined by demographics. However, task and context are also criteria that determine a user base. As these tenets were interwoven into my discussions above on the human and technology tenets, I turn my attention now to elaborating upon them.

Whether research in HCI emphasizes use and impact and/or design, all IT artifacts are developed to do *something*, that is, to support some type of human endeavor, ability, interest, need, and/or activity. Thus, task can be considered in terms of goals or characteristics. Zhang and Li (2004) explained that tasks "are carried out in a certain setting or context that imposes constraints or significance for doing and completing the tasks" (p. 232). Context can be considered at various levels including the global, social, organizational, or group level. Zhang and Li used a specific classification scheme that identifies 6 major contexts for HCI research: organizational, marketplace, home, social, cultural, or other.

Benbasat (2010) described professionals, managers, and customers (as well as users in e-government and health care) as user bases. The primary characteristics of these user bases emerge from considerations of task and context. Both a professional and a manager are likely situated within an organizational context; however, the tasks that these two types of users perform within this same context are likely different. The customer user base is likely situated within a marketplace context, where tasks include some type of shopping goal. An e-government user base would likely be rooted in a cultural or social context, and the users would be characterized by either the goals or the characteristics of tasks performed by e-government constituents (or officials).

I should point out that in the previous examples, context and task are interrelated but not mutually exclusive. For example, a user base defined by managerial tasks may be situated within a marketplace. Also, context should not necessarily limit the tasks that an HCI study considers. Tasks that are performed through purposeful misuse, or novel use of technology, should not be overlooked (c.f., Li et al., 2009, used in an example in the following section). In fact, such work might prove invaluable for the improvement of system design.

Much as Benbasat advocates the expansion of our user base, I believe that going forward, HCI has ample opportunity to extend into contexts it has thus far underserved. Computing technologies have diffused into many different parts of our daily lives. Whereas IS (or MIS) was originally concerned (almost exclusively) with organizational effectiveness and efficiency, the contexts in which people use IT, and the tasks in which they engage, no longer favor only business environments. This is reflected by the shift of research contexts studied within HCI over the years. Zhang et al. (2009) found that nearly 88% of the HCI research published between 1990 and 1995 was within the organizational context, but only 48% of the research published between 2003 and 2008 was situated within that same context.

In the field of HCI, there is clearly a growth of interest in contexts other than organizations. Perhaps the most dramatic increase of interest is in the context of the marketplace. While only 3.1% of studies between 1990 and 1995 considered the marketplace, 27.3% did between 2003 and 2008. This is likely linked to the boom of purchasing and consumption of digital goods. Social contexts also appear to be a growing target of interest as no studies were found to consider this context from 1990 to 1995, while 1.9% did from 1996 to 2003, and then 6.6% did between 2003 and 2008.

To be clear, I am not advocating the equal study of all contexts within HCI. There may be a greater demand for an array of technologies that suit realtors than for those who are involved in e-government. Thus, one should reasonably

expect to see more studies rooted within the marketplace than the cultural context. What this portends for the HCI researcher is that there is a changing landscape in regard to context and task, complimentary to the growth and expansion of technology. In continuing forward, HCI scholars might want to investigate how a given IT artifact might fit within a context in which it has not yet been studied. When aspiring to design novel studies in neglected areas, we might want to look at users within a particular context, consider the tasks that are unique to them, and build a study around those tasks in that particular context. By carefully considering issues of task and context, HCI researchers might better articulate and understand their research agenda.

In the previous section, I urged that future research explicitly include and clearly describe the technology of interest. Similarly, I suggest that researchers should strive to make the tasks and contexts in their work clear and understandable.

INTERACTION

Interaction happens between the human and the computing technology, geared toward a specific task within a particular context. Zhang and Li (2005) described interaction as traditionally being concerned with issues of design and usability, as the design of a computing technology's interface has traditionally been geared toward being used in a particular way. However, they note that such a view is narrow and limited. Pointing to the work of Carroll et al. (1991), Zhang and Li (2005) explicated the importance of the task-artifact cycle, stating, "a task sets requirements for the development of artifacts; the use of an artifact often redefines the task for which the artifact was originally developed; and such task redefinitions then affect the future artifacts to be developed" (p. 232). Thus, the phenomenon of interaction should not only include design, but also use and impact (Zhang and Li, 2004).

Additionally, Benbasat (2010) observed, "to be interesting and relevant (to practice) research in HCI should have a design component coupled with an evaluation of this design" (p. 16). I argue that for HCI scholars, use and design necessarily go hand-in-hand. Use is clearly a necessary element for evaluating a design; while studying use and impact assists HCI researchers in building design-informed theories. Consistent with Zhang and Li (2004) who discuss design as concerning "various system elements (devices, graphics, dialogs) for humans to interact with" (p. 129), I consider it (for the purpose of this discussion) to be those immediate technology elements or properties that a human interacts directly with. In other words, design in HCI spotlights that which humans can perceive about technology and actively experience.

Conceptualizing Interaction

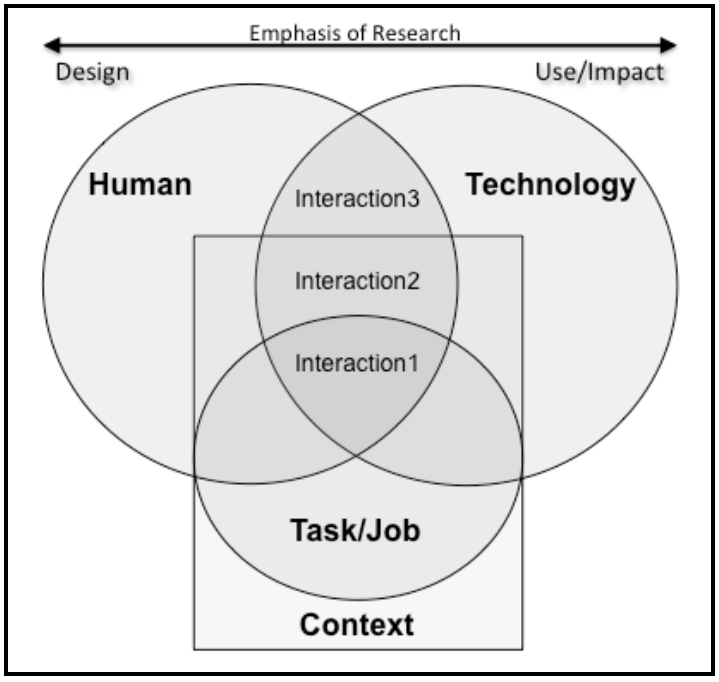

Figure 1: Positioning the Tenets of HCI for Research

Figure 1 represents a simple model of HCI research based on the tenets described above, situated in such a way as to highlight differences in how interaction might be investigated by researchers. I have labeled interaction with the numbers 1 through 3 in order to further the discussion as to the how the four tenets might be considered in various relations across different studies. The numerical designations do not signify my assertion of one position's superiority over another. Rather, my purpose is to highlight that interactions (and hence HCI phenomena) only happen when a human comes into contact with a technology, whether it be while engaging in a specific task situated within a given context (Interaction1), a specific context without a defined task (Interaction2), or free of context and task (Interaction3). As the bi-directional arrow at the top of the diagram implies, research that emphasizes artifact design typically leans more toward a focus on technology, while that which emphasizes use and impact is usually more invested in human factors.

As Interaction3 is, on the surface, most controversial, I will address this first. But before that, it is important to stress that this is *not* a model depicting how humans *actually* interact with computing technology; rather, this model is intended to help HCI researchers situate their phenomena of interest in relation to the tenets of HCI. Above I made the case that humans are intimately connected with context and task, and that technology is always designed for tasks situated within a particular context. Therefore, the act of a human interacting with a computer always occurs within a context for the purpose of engaging in a task or job. A use and impact emphasis in Interaction3 implies research regarding tasks in which humans might engage with technologies outside of the context for which they were intended. Meanwhile, a design emphasis in Interaction3 would address technology design that transcends task and context. Thus, Interaction3 is not meant to signify that the use or design of technology happens in a context-free or task-free setting, as this would be impossible.

An example that would fall into the Interaction3 position above comes from Zhang (2008), who has provided a set of 10 design principles for ICTs in regard to motivation. On the tenet of technology, Zhang broadly defines ICTs as designed ideally "to fulfill human needs and to support human values" (p. 46). Because she seeks to provide general design principles, such a non-specific conceptualization is appropriate. In regard to the human tenet, she draws mainly upon 5 different theoretical streams from psychology and HCI that address human needs in formulating her design principles. Appropriately, the tenets of task and context are not ignored even though they are not specified. Zhang explains that "a principle may belong to the 'should apply,' 'should not apply,' or 'may help if applied' category" (p. 66), and that these would be determined based on environment (context) and task. Because it provides a framework that addresses "a holistic picture of issues in technology design and use," (p. 68), Zhang's paper would be positioned within Interaction3 in Figure 1, leaning to the left to symbolize the design emphasis.

For a paper to be positioned with a design emphasis in Interaction2, it would be bounded in a particular context without a particular task or tasks specified. Zhang's paper would fit here if she had provided general motivational design principles for the workplace, or another specified context. Research with a use and impact emphasis in Interaction2 could inquire about the tasks in which people engage through technology within a given context. To better describe this position, as well as the use and impact emphasis of Figure 1, I will draw upon an example from Cameron and Webster (2005). Their study included the question, "how are IM systems used in the workplace" (p. 87). In terms of the technology, instant messaging systems (and features) were described in fine detail. The authors addressed the human tenet by reviewing past theories (on communication and electronic monitoring) and describing how various technology factors (such as privacy, symbolic cues, and media richness) affect human behavior. The context tenet is bounded in asking research questions about use within the workplace. Cameron and Webster also asked why employees communicate via instant messengers, a question that would more closely fall into the Interaction1 category on the surface. However, as their focus was on specific communication tasks (such as garnering quick feedback, enhancing privacy, and performing tasks that are difficult via other media), and as they noted that the implications of use "go far beyond the original intent of the technology designers" (p. 98), this is a clear indication the research conducted in this paper is best situated on the right side of Interaction2, emphasizing research that seeks to understand use and impact through the consideration of task.

Interaction1 in Figure 1 represents HCI research positions that: 1) do not pose questions about general design principles that transcend context and/or task; 2) do not inquire as to what contexts and/or tasks use and impact occur in for a given technology; and 3) do not consider use and impact above and beyond the intended purpose. Rather, research positioned within Interaction1 is bound by specifically defined task(s) and context(s). An example of such research comes from McNab et al. (2009), who studied the design of emergency response systems (ERS) and the resultant human performance. They conducted an experiment "to compare information selection speed and performance with the ERS when supplementary cues are used in contexts of varying complexity and time pressure" (p. 2). The authors attend to the human tenet by drawing on streams from behavioral and communication research in regard to human information processing and response. Through detailed explanation and a screenshot, the authors effectively communicated specifically how the technology of choice, ERS, works. As is characteristic of Interaction1 research, context and task bind, and in this case, drive the research. Although the actual context of the study is university students in a computer lab, it is meant to simulate the context of emergency response workers in an emergency response center. The participants' job was "to look at the information provided by the system and dispatch the necessary resources" (p. 9). Because McNab et al. (2009) proposed hypotheses that examine the

impact of design (such as color and location cues in the ERS) on task performance (i.e., cognitive effort, answering incidents, and information selection), their research would be positioned in the middle of Interaction1, showing about equal emphasis on design and use/impact.

The Importance of Design

As Figure 1 and the accompanying discussion illustrate, HCI scholars concern themselves with the design of IT artifacts, and the use/impact of design. I quoted Benbasat (2010) above in his assertion that design is a key component that makes HCI relevant. Indeed, I believe that it is this component which most fully provides HCI with its niche as a sub-discipline of IS. Mindful that design in HCI addresses those technology elements with which humans interact directly, I present examples from recent IS papers that are distinctly not HCI scholarly work.

To explain Interaction3 in Figure 1, I referred to Zhang's (2008) set of 10 motivational design principles for ICTs. This can be contrasted against the work of Briggs et al. (2009) who have also provided guidance for designers. Briggs et al. provided a detailed description of seven areas of concern (such as tools, products, goals, and scripts), rather than addressing the design of anything humans will interact with first-hand. The example I used to describe Interaction2 came from Cameron and Webster's (2005) examination of what employees use instant messaging for. While this paper clearly has a use and impact emphasis, it described how the design of instant messaging led to such uses and impacts beyond the basics of communication. Recently, Li et al. (2009) conducted a study that, in part, looked at innovative use of information systems in the workplace, with innovative use defined as "users' application of system features in novel ways to support their task performance" (p. 2). System use was hypothesized to result from types of motivations for task performance that employees experienced. So while both Cameron and Webster (2005) and Li et al. (2009) investigated unconventional use, the latter would not be considered HCI research because use was not coupled with design.

Finally, I return to the work of McNab et al. (2009) that I referenced to explain Interaction3 because it was tightly bounded by task and context. I compared this to the work of Sebastian and Bui (2009) who presented a paper at *AMCIS* entitled "Emergent Groups for Emergency Response – Theoretical Foundations and Information Design Implications." These are not design implications in the sense of those that McNab et al (2009) provided (which related to color and location), but rather they "suggest how critical information should be gathered, presented and disseminated using a workflow-based template design to assist emergent groups to help others" (p. 1). Similar to Sebastian and Bui (2009), a paper presented at the *International Community on Information Systems for Crisis Response and Management* conference by Javed et al. (2010) called "A Design Approach to an Emergency Decision Support System for Mass Evacuation" did not focus on technology features that humans interact with directly. Instead, their "design approach" consisted largely of modeling and explicating, "information needs, flows, and processes involved in emergency decision making" (p. 1).

In all of the previous examples, one could rightly notice that the IS literature often addresses the same tenets as HCI. This is to be expected, considering HCI is a sub-discipline of IS. One might also argue that laying out workflows (e.g., Sebastian and Bui, 2009; Javed et al., 2010), or general concerns (e.g., Briggs et al., 2009) are important groundwork for the development and implementation of appropriate design. I will not dispute this, but rather let that point serve as a reminder that HCI has a boundary that is debatably fuzzy at times, much like its parent discipline. However, these examples were chosen to illustrate that what distinguishes HCI phenomena, is the use of four distinct tenets to situate research, based upon the phenomenon of interaction that clearly emphasizes both design and use/impact, even if it does so to differing degrees.

SUMMARY

In this commentary, I have drawn heavily upon previous work conducted by Zhang and Li (2004) and the subsequent stream of papers that have built from their perspective (i.e., Zhang and Li, 2005; Zhang and Galletta, 2006; and Zhang et al., 2009). I have explained that HCI is a sub-discipline of IS with interaction, defined as humans interacting with computing technologies for a specific task within a given context, being the ultimate phenomenon of interest. I have proposed a set of guidelines for HCI scholars based on the four defining tenets of interaction, and emphasizing both design and use/impact. I have also provided distinct examples of how interaction can be situated based on these four tenets.

I began by addressing the human tenet, making the case that the breadth of human attributes under study needs to necessarily expand as new technologies are integrated into our daily lives. Additionally, I stated my belief that we need to deepen our understanding of human attributes, as superficial descriptions of human factors do not provide a sturdy framework around which to conduct HCI research. Next, I addressed the technology tenet, recommending that researchers clearly define the artifact being presented in terms of the context(s) and task(s) for which the technology is intended, as well as identifying the level of granularity (general, specific, or feature) at which the technology is

being studied. I explained that this allows the researcher to better articulate his or her study, while it helps the audience to better grasp potentially unfamiliar background details. I advised that researchers should explicitly address the remaining two tenets, task and context. I also proposed that HCI research should expand into previously under-investigated contexts, with consideration of tasks that may be largely unique to those contexts. Because interaction is the intersection of these four tenets, and it is the phenomenon upon which scholars ground their research in HCI, I believe that most meaningful contributions that come from HCI should be in the form of design-informed theory, or use robust theories from other disciplines to better inform design. It is this design component, after all, which gives our field its distinct scholarly voice.

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