Human-Computer Interaction Design for Emerging Technologies

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Abstract: *This article presents a multifaceted case for the inclusion of the important Human-Computer Interaction (HCI) subject matter at both the graduate and undergraduate levels of the Association of Information Systems (AIS) model curricula. Based on the presentations and discussions during a panel at the 2003 Americas Conference on Information Systems (AMCIS), we first present the rationale for incorporating HCI materials in Management Information Systems (MIS) curricula. Second, we present a list of relevant and important HCI knowledge and skills that our students need for effective careers. Third, given the limited number of credit hours available to each MIS program, we explore several strategies and options for the integration of HCI into current and future MIS courses. Finally, drawing upon teaching experiences of the authors, we provide pedagogical suggestions for teaching HCI to undergraduate and graduate students.*

Keywords: Mixed Methods Research, Human-computer Interaction, Resilience,Resilience Strategies, Technology, Artefacts, Information Systems Keywords: Mixed Methods Research, Human-computer Interaction, Resilience, Resilience Strategies, Technology, Artefacts, Information Systems.

I. INTRODUCTION

Human-Computer Interaction (HCI) is interdisciplinary in nature and is studied by researchers, educators, and practitioners from disciplines such as computer science, psychology, management information systems, information science, and human factors engineering. Special interest groups in HCI existed for some time in computer science and human-factors engineering. 358 Communications of the Association for Information Systems (Volume13, 2004) 357-379 The Role Of Human-Computer Interaction in the MIS Curriculum: A Call to Action by J. Carey, D. Galletta, J. Kim, D. Te'eni, B. Wildemuth, and P. Zhang As technology develops and changes at an ever-increasing rate, HCI becomes increasingly important. A fast-growing HCI special interest group (SIGHCI) was recently established by the Association for Information Systems (AIS) in 2001. AIS SIGHCI meets twice a year at the Americas Conference on Information Systems (AMCIS) and the International Conference on Information Systems (ICIS). Members of AIS SIGHCI are particularly concerned with HCI issues that have relevance and importance in the Management Information Systems (MIS or IS) context. MIS-oriented HCI issues have been visited and addressed since the MIS discipline began. Over the years, MIS scholars:

Posited that information systems failures can be attributed to the lack of emphasis on the human/social aspects of system use [Bostrom and Heinen, 1977], pointed out the need to attend to user behavior in information technology research [Gerlach and Kuo, 1991], and tied a user-factor life cycle to the systems development life cycle [Mantei and Teorey, 1989]. In today's world of fast development and deployment of technology, HCI factors are even more critical and fundamental. HCI goals include: ensuring system functionality and usability, providing effective user interaction support, and enhancing a pleasant user experience. The overarching goal is to achieve both organizational and individual user effectiveness and efficiency. To reach these goals, managers and developers need to be knowledgeable about the interplay among users, tasks, task contexts, information technology (IT), and the environments in which systems are used. As educators, our role is to equip the next generation of managers, designers, and implementers of information systems with the knowledge and skills of HCI so that they can integrate them with many other aspects of the MIS.

II. OBJECTIVES

- Create a website user interface that meets the usability target.
- Users can quickly learn how to use the website's functions and tools.
- The website's functionality is simple to use, and the instructions are simple to remember.
- Attractive website design that makes users feel at ease and welcome when they visit the site.

III. PROCESS OF HCI DESIGN

Ebert outlined four human-computer interaction design principles that can be used to create user-friendly, systematic, and instinctive user experiences.In a single user interface design, one or more techniques can be employed. The four ways to developing a user interface are as follows:

1. Anthropomorphic Approach: This approach entails designing a human interface with human-like qualities.
2. Cognitive Approach: This method is used to create a user interface that helps the end user and takes into account the brain's and sensory recognition abilities.
3. Empirical Methodology: This method is used to evaluate and compare the usability of multi-conceptual designs.
4. Predictive Modeling Approach: The GOMS method is used to examine and assess many factors.

IV. HUMAN BEINGS

The HCI product is created and used by the product's users, who are people. Memory, attention, problem-solving, learning, motivation, motor skills, conceptual models, and diversity are all important for understanding humans as information-processing systems, how they communicate, and the features of the human/user as a processor of information. Interaction, communication, and language - Linguistic features such as syntax, pragmatics, semantics, conversational interaction, and specialised languages. Anthropometrics is the systematic assessment of human physical features such as dimensional descriptors of body size and shape, as well as physiological aspects of people and their link to their employment and surroundings.

4.1 Computer

Because computers have unique components that can communicate with users, they are employed for user interaction. Computers also give a platform for users to formulate and interact with components, resulting in effective learning. Computers excel at counting and measuring, precise storage and retrieval, quick and consistent answers, data processing, and calculatio.

4.2 What Are The Essential Features of MIS/HIC Research?

Many "classic" HCI studies came from Computer Science, Cognitive Psychology, Industry Engineering, Ergonomics, and a variety of other fields. HCI research has a long history. To mention a few, there are MIS, Information Science, Communication, and Social Psychology disciplines. For This tutorial covers published works in the MIS sector for the purpose of discussion. Certainly not. Does it include all of the sub-studies? field's The following section highlights some of the characteristics of MIS/HCI studies in the following areas: focus and scope/coverage of research disciplines of reference and theoretical support methodologies for research, and ramifications for theories, designs, and business practise.

4.3 Norman's Interaction Model

Norman focuses on the user's perspective. Norman uses psychology to define the user's cognitive process as their daily interactions with technology. The execution and assessment phases of Norman's model are separated. Each phase is broken down into a number of phases. There are seven unique phases in total.
The steps are as follows:

1. Creating a goal
2. Creating an intention
3. Defining an action and carrying it out
4. Observing the current status of the world
5. Taking a look at the current status of the world assessing the outcome.

V. THE MODEL OF INTERACTION

This interaction framework was established by Abowd and Beale as between-languages translation They state both a common and a unique point of view. a foundation for interaction and a translation within the framework. The Abowd and Beale framework focuses on here are four components, each with its own language.

These are the ones:

- User
- Input
- System
- Output
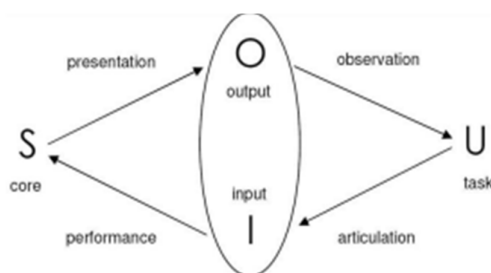
Figure 1: Model of Interaction

VI. DEVELOPMENT ON AS MALLER SCALE

The Computer Self-Efficacy Scale has been modified. Compeau and Higgins (1995a) developed the Computer Self Efficacy Scale, which will be used in this study. This is a task-oriented metric. Compeau and Higgins (1995a) integrated factors of task difficulty and recorded differences in self efficacy magnitude. Despite being proven to cover all aspects of computing technology use, it falls short of covering various software applications. As a result, the scale's prologue has been updated to incorporate many forms of software technology. This scale has been updated to add items that assess confidence in performing when step-by-step guidance is available, as well as confidence in reaching excellence when using a new software package.

6.1 Human Actors to Replace Human Factors

The terminology employed in a discipline can frequently reveal how individuals of that field "see" it. Once significant distinctions have been made, These concepts might become a barrier to the truth that lies underneath them if they are accepted and become part of the mainstream vocabulary. outdoors. As a result, it's a good idea to re-examine the words we choose to communicate ourselves from time to time. comprehension of the world In the title of the paper, I have opted to use the terms human elements and human actors. The chapter, in my opinion, demonstrates a contrast in the view of the person, with the former connoting a passive, and the latter connoting an active, Individual who is fragmented, de-personalized, and unmotivated, as opposed to an active, commanding individual. I assert that human factors work in the classic sense.

6.2 Focus of Research and Scope/Coverage

A research study can be done to look at a variety of issues at the individual, group, and organisational levels. industries and organisations The majority of MIS/HCI studies are conducted on an individual basis. Although some are built expressly for groups, others are not (CSCW, GDSS). Despite the fact that The emphasis in studies on virtual communities is most likely on the individuals in a virtual community.

[Preece et al., 1994, in Eason, 1991]. People can refer to one or more people in this diagram. Work can refer to activities that are either tightly or generally defined, such as tasks, or it can refer to activities that are more loosely defined. activities that are defined The physical, organisational, and social aspects of the environment are referred to as the environment. And Technology may be a powerful tool.

Impact Factor: 6.252

6.3 Participants

The younger group is frequently preferred in hci trials because they are young, technically proficient, highly educated, and unrepresentative of demographic reality. The collecting of data from older persons in study groups necessitates changes in research methodology and improvements to the data collection process. Formal education and literacy level are two variables in which the elder group of participants in the study differs significantly from the younger group. As the name implies, HCI is made up of three primary components: the user, the computer, and the environment. interaction denotes how they collaborate to achieve a common goal. achieve your objectives Figure 2 depicts the three basic elements of Interaction between humans and computers.
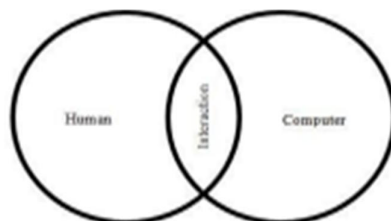
Figure 2: HCI's three components

User analysis is an important component of user-centered systems. design. The general public or HCI users could be considered. as a user of computer systems They may differ depending on the situation. They have a function and a task in the system. The uniqueness.The aforesaid task and the characterization of users are both dependent on each other.With their experience on it, they have a purpose. According to Danino (2001),that anybody utilises technology to try to solve a problem is an HCI user complete the task.

VII. THEORETICAL SUPPORT AND REFERENCE DISCIPLINES

Many aspects of a study programme might be influenced by reference disciplines or intellectual underpinnings. Computer science and human-computer interaction are the reference disciplines for MIS/HCI. engineering, management, management science, cognitive psychology, and social psychology are some of the fields of study. consumer psychology and marketing, and most recently, organisational psychology. The majority of MIS/HCI research is theoretically based or involves strong theoretical perspectives. The theoretical foundations of a study are quite important in the MIS discipline. Theories that already exist are expected to be justified in terms of their applicability to the challenges at hand. InA study is also meant to develop or advance current theories, either empirically or theoretically. or in a conceptual sense The study of individual reactions to MIS/HCI is one of several MIS/HCI research subjects.

7.1 Allow Active Users to Participate

While focusing attention on the user is a good thing, consumers aren't just passive objects for others to study and design for, as some stories suggest. Active agents are, or can be, people. They frequently want to complete tasks and comprehend what's going on, and they're prepared to go forward and investigate the computer system on their own if the training material, for example, is unclear or overly pedantic. If the system does not provide an explanation for its actions, the user will frequently make one up in order to make the system's actions understandable. People are constantly trying to make sense of their surroundings. Creating user-friendly instruction sequences. In research and design, the focus shifts from the product to the process. This means that more attention should be devoted to the design process, as well as working with users at all phases of the process. to observe the iterative nature of design and how one's conception of what they're designing changes as a result of it. the procedure itself This is in contrast to a design approach that starts with a set of fixed requirements and then iterates. and without the consumers' participation This shift in perspective has been noticeable across much of the country for some time. Work on systems design in the Scandinavian tradition (see the Chapter by Ehn and Kyng). It's also seen in the Jones (1988) and Floyd's work (1987)

VIII. PROCESS OF DESIGN THINKING

Design thinking (DT) is a systematic and exciting approach to problem solving that integrates human, business, and

technical variables [11, 16, 22, 23, 58], with a focus on developing novel solutions based on a user-centered perspective [9, 10, 52, 65, 67]. This user-centric innovation strategy, along with associated mindsets and toolkits, has been adopted by a growing number of firms and institutions, ranging from industry giants like IBM to startups like Airbnb.

Designers' processes, such as user understanding and user experience, gave rise to design thinking. Its applicability has been expanded in recent years to address broader issues, such as how firms and other groups might find new strategic goals, develop new service possibilities, or implement procedural change. The DT process is non-linear and iterative.
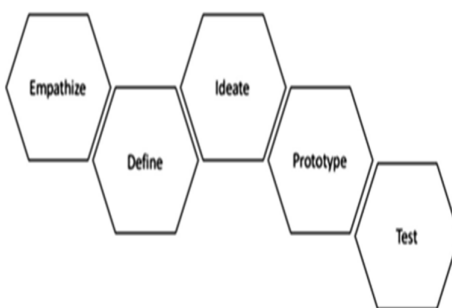
Figure 3: Process of Design Thinking

Searches of major design, engineering, and construction journals yielded the majority of the execution literature. Between September 5, 2017 and December 5, 2017, researchers searched computer science databases (e.g., ACM Digital Library, Technology Research Database). The terms used in searches are The following are the items that have been presented. Table 1 depicts the chosen candidate's eligibility assessment. Four inclusion criteria were used to evaluate articles.

- Design thinking and HCI (Human-Computer Interaction).
- Review of HCI (Human-Computer Interaction) and Design Thinking;
- Review of HCI (Human-Computer Interaction);
- A review on design thinking;
- The design process for HCI (Human-Computer Interaction);
- The design thinking method;
- The design procedure;
- HCI (Human-Computer Interaction) and Design Thinking Process Comparison.

8.1 Adaptability

This refers to a user's ability to recover from mistakes, which they invariably make. Recovery can happen in two directions: forward and backward. Error prevention is a part of forward error recovery. The easy reversal of erroneous actions is referred to as backward error recovery. The latter is usually concerned with the user's behaviour, and the user initiates it. The former is the one that should be built into the system and started by it.

In this way, fault tolerance, reliability, and dependability are all linked to recoverability. This basic usability, which Ken Maxwell (2001) refers to as error protection, is a level one goal for him. This, according to Jeff Raskin (2000), is part of his first commandment of interface design, which stipulates that "a computer shall not be made to look like a human."

8.2 Familiarity

This is the extent to which the user's own personal experience and knowledge in the real world can be used. drew upon to provide insight into the new system's workings A user's familiarity is important. a measure of the relationship between their current knowledge and the information needed to complete the task to use the new system To a considerable extent, consumers' early reactions are influenced by familiarity. the user's first impression of the system and how it is regarded, and whether the user can as a result based on his own prior knowledge, select operating procedures If this is possible, it will save a lot of money. reduce the amount of new knowledge that needs to be learned and the amount of time it takes to learn it The phrase Dix et al. (1992) proposed the concept of familiarity.

8.3 Reliability

According to Dix et al (1992), consistency refers to the similarity in behaviour that results from similar experiences. scenarios or tasks with identical goals He also believes that this is the most widely distributed. In the literature on user interface design, this principle is mentioned. This principle is expressed as "joint first." a place that is familiar It is critical that the user has a consistent interface. However, identifying the nature of consistency, which can take numerous forms, is a tough task.

8.4 Language is Shaped By Technology

As should be obvious, the current preference for specific types of voices in VUIs is a translation of long-held speech ideals into this new interaction setting. This reinforces speech ideologies (the idea that one method of speaking is better or more prestigious than others, or that others are improper or inappropriate). Prejudices against certain methods of speaking can arise as a result of speech ideologies, which can lead to discrimination against persons who talk in that manner.

8.5 Collection of Information

A cross-sectional design and survey methods were used in the current investigation. The study's participants are software developers that create customised software for end customers. They are in South India, in the metropolitan cities of Chennai and Bangalore. Due to budgetary and operational restrictions, the study relies on convenient sampling.
Responses were obtained through personal interviews and email. There were 700 surveys distributed in all, with 156 valid responses. The study enlisted the help of twenty-two software firms. They comprise both huge global software firms and medium and small software firms.

8.6 Information Management Systems

To argue that HCI is a necessary component of MIS, one must first define what MIS is, which is a tough endeavour in and of itself. To begin with, publications, societies, and even university departments disagree on the meaning of MIS, as well as whether MIS is the correct phrase. Many terms could be substituted for MIS in various situations, including computer information systems (CIS), business computing science (BCS), information systems (IS), information science, information technology (IT), information management (IM), decision support systems (DSS), electronic data processing (EDP), and information resource management (IRM). For the sake of simplicity, these terminologies will be referred to as MIS or IS. Baskerville and Myers [2002] revisit the idea of management information systems (MIS) as a reference discipline.

8.7 Feedback Technologies' Potential

Behavior is managed by comparisons of feedback to goals, standards, or norms, according to feedback intervention theory.1996 (Avraham and DeNisi). Feedback is a basic tool for monitoring and comparing behaviour. It helps a person to assess their own performance more accurately. Feedback technologies have been demonstrated to be one of them.one of the most efficient ways for lowering household energy consumption (Geller et al., 1982). Fischer, Corinna (2008) looked at over twenty studies and five compilation articles from 1987 to the present. feedback's impact on electricity use, as well as consumer reactions, attitudes, and desires feedback. She discovered that typical energy savings ranged from 5 to 12 percent (but the absolute range was between 5 and 12 percent). (Percentage range: 0% to 20%). A comparable review may be found here.

IX. CONCLUSION

Consumption is heavily influenced by human behaviour. A 10% reduction in total energy intensity means that 8.5 quads of fossil fuels are not consumed, resulting in an 8.5 percent reduction in CO_2 emissions, which is equivalent to doubling America's nuclear power output (Armel, 2008). In-home feedback technology has been proven to cut energy use by 10-15% on average, with considerable reductions associated to more frequent feedback and higher data granularity (e.g., particular appliance energy usage data). As the cost of home energy sensing falls, the amount of data that can be visualised and fed back to the consumer about their energy usage will skyrocket. The most efficient ways to construct interfaces around this data in order to reduce consumption.

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