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### HUMAN COMPUTER INTERACTION IN DIGITAL INFRASTRUCTURE

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## **ABSTRACT**

This paper extends existing Information Systems perspectives towards Human-Computer Interaction (HCI) to consider HCI within Digital Infrastructures (DI) – heterogeneous and evolving systems comprising both IT and its design and user communities. Using the example of a new interface that has significantly decreased call handling times for sales and support agents (knowledge workers within a contact center), the paper finds that DI create an amount of flexibility that enables employees to shape tools over time. It argues that DI are a useful concept for HCI, as they stress the socio-technical and evolving nature of IT artifacts.

Keywords: Digital infrastructures Information Systems Call centers.

#### INTRODUCTION

Human-computer interaction (commonly referred to as **HCI**) researches the design and use of computer technology, focused on the interfaces between people (users) and computers. Researchers in the field of HCI both observe the ways in which humans interact with computers and design technologies that let humans interact with computers in novel ways. As a field of research, human-computer interaction is situated at the intersection of computer science, behavioral sciences, design, media studies, and several other fields of study. The term was popularized by Stuart K. Card, Allen Newell, and Thomas P. Moran in their seminal 1983 book, The Psychology of Human-Computer Interaction, although the authors first used the term in 1980 and the first known use was in 1975. The term connotes that, unlike other tools with only limited uses (such as a hammer, useful for driving nails but not much else), a computer has many uses and this takes place as an open-ended dialog between

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the user and the computer. The notion of dialog likens human-computer interaction to human-to-human interaction, an analogy which is crucial to theoretical considerations in the field.

#### DEFINITION

HCI (human-computer interaction) is the study of how people interact with computers and to what extent computers are or are not developed for successful interaction with human beings. A significant number of major corporations and academic institutions now study HCI.

#### **OBJECTIVE**

The intention of this subject is to learn the ways of designing user-friendly interfaces or interactions. Considering which, we will learn the following -

- Ways to design and assess interactive systems.
- Ways to reduce design time through cognitive system and task models.
- Procedures and *heuristics* for interactive system design.

#### What does Human-Computer Interaction (HCI) mean?

Human-computer interaction (HCI) is the study and planned design of human and computer activities. HCI uses productivity, safety and entertainment to support and fulfill human-computer activities and is applied to various types of computer systems, including air traffic control, nuclear processing, offices and computer gaming. HCI systems are easy, safe, effective and enjoyable.

Software engineering focuses on the production of software application solutions, whereas HCI focuses on discovering methods and techniques that support people. HCI designers always consider HCI usability and user experience goals for effective user interaction. Not all usability and user experience goals apply to every interactive computer system because certain combinations are incompatible. HCI designers also consider potential contexts, tasks at hand and computer system users.

The communication between the user and the system .Their interaction framework has four parts:

- User
- Input
- System
- Output

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Interaction models help us to understand what is going on in the interaction between user and system. They address the translations between what the user wants and what the system does. Ergonomics looks at the physical characteristics of the interaction and how these influence its effectiveness. The dialog between user and system is influenced by the style of the interface. The interaction takes place within a social and organizational context that affects both user and system. Human-computer interaction is concerned with the joint performance of tasks by humans and machines; the structure of communication between human and machine; human capabilities to use machines (including the learn ability of interfaces); algorithms and programming of the interface itself; engineering concerns that arise in designing and building interfaces; the process of specification, design, and implementation of interfaces; and design trade-offs. Human-computer interaction thus has science, engineering, and design aspects.

#### What is the program all about?

The program in Human Computer Interaction and Design focuses on study, design, development and evaluation of novel user interfaces and interactive systems taking into account human aspects, at the cognitive and sensory-motor levels, technological aspects, as well as business aspects.

The HCID program is an interdisciplinary program that offers courses on design and evaluation of interactive systems with a strong emphasis on user-centered design techniques: understanding the human capacities and consequences of using information technology as a tool for solving work related tasks, and developing and evaluating the systems by putting the user at the center of the design process. In addition, the program will create business thinking in terms of user profiles, user segments, house style, branding, and market development and product introductions. This international master's degree program is based on the following two basic pillars:

- The study of a range of current topics within the field of human-computer interaction: usability, user-centre design and user interface testing and research, and innovative interface technologies such as virtual reality, mobile systems, adaptive systems, mixed reality, ubiquitous computing and graphic interfaces.
- Acquisition of key skills and competences through a project-based study approach including active training of scientific communication, presentation and written skills in small groups.

Where HCI came from:

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Until the late 1970s, the only humans who interacted with computers were information technology professionals and dedicated hobbyists. This changed disruptively with the emergence of personal computing in the later 1970s. Personal computing, including both personal software (productivity applications, such as text editors and spreadsheets, and interactive computer games) and personal computer platforms (operating systems, programming languages, and hardware), made everyone in the world a potential computer user, and vividly highlighted the deficiencies of computers with respect to *usability* for those who wanted to use computers as tools.

#### **Excellence in HCI is important for several reasons:**

- *Quality of life.* Important applications of computers in medicine are possible only if they are both useful and easy to use by doctors, nurses, and aides; similarly, use of computers in education requires that they be both useful and easy to use by students and teachers. Computers can assist disabled individuals; at the same time, special techniques are needed to allow computers to be used by some who are disabled.
- *National competitiveness.* Information technology is one of the drivers for increased productivity. As more and more workers use computers in their jobs, training time and ease-of-use issues become economically more and more important.
- *Growth of the computer and communications industries.* Powerful, interesting, and usable applications are the fuel for continuing growth of these industries. The current growth cycle is the direct consequence of the graphical user interface developed by Xerox and commercialized by Apple and Microsoft, and of the lower computer costs made possible by the microprocessor. The resulting mass market supports commodity pricing for both hardware and software. Future growth cycles will in part be driven by current HCI research, which will lead to new applications that are increasingly easy to use.
- *National security.* Computer-based command, control, communications, and intelligence systems are at the heart of our military infrastructure. Interfaces between operators and computers are found in cockpits, on the bridge, and in the field. To be effective, these systems must have high-quality human-computer interfaces.

#### **Evaluating Interactive Systems:**

From the viewpoint of user interface design, people have widely differing abilities, preferences, and predilections. Important differences for information access interfaces include relative spatial ability and memory, reasoning abilities, verbal aptitude, and (potentially) personality differences. Age and cultural differences can contribute to acceptance or rejection of interface techniques. An interface innovation can be useful and pleasing for some users, and foreign and cumbersome for others. Thus software design



should allow for flexibility in interaction style, and new features should not be expected to be equally helpful for all users.

An important aspect of human-computer interaction is the methodology for evaluation of user interface techniques. Precision and recall measures have been widely used for comparing the ranking results of non-interactive systems, but are less appropriate for assessing interactive systems. The standard evaluations emphasize high recall levels; in the TREC tasks systems are compared to see how well they return the top 1000 documents (see chapter 3). However, in many interactive settings, users require only a few relevant documents and do not care about high recall to evaluate highly interactive information access systems, useful metrics beyond precision and recall include: time required to learn the system, time required to achieve goals on benchmark tasks, error rates, and retention of the use of the interface over time. Throughout this chapter, empirical results of user studies are presented whenever they are available.

#### **Principles of Human-Computer Interaction:**

Well-designed human-computer interaction is critical to the success of computer and information systems. This course focuses on the HCI design process and covers the underlying scientific principles, HCI design methodology, and the user-interface technology used to implement HCI. Topics include human cognition, HCI theories, user observation and task analysis, prototyping and evaluation techniques, user interface modalities and graphical user interface components, and accessibility. Selected additional topics may include HCI in website design, support of collaborative work, human interaction with automation, and ubiquitous computing. Student design projects are an integral part of the course. Reading the current HCI research literature is also required.

To assess the interaction between human and computers, Donald Norman in 1988 proposed seven principles. He proposed the seven stages that can be used to transform difficult tasks. Following are the seven principles of Norman –

- Use both knowledge in world & knowledge in the head.
- Simplify task structures.
- Make things visible.
- Get the mapping right (User mental model = Conceptual model = Designed model).
- Convert constraints into advantages (Physical constraints, Cultural constraints, Technological constraints).
- Design for Error.
- When all else fails Standardize.

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Through mobile devices and ubiquitous technologies, the design and development of intelligent software systems and interfaces is becoming increasingly important. In the English-language **Human-Computer Interaction** Master of Science program, students focus on theoretical and practical issues in current computer science research in the fields of interface design and interactive system development. In addition, this technically-oriented HCI master's program offers students the opportunity to participate in interdisciplinary projects. Students can attend courses offered as part of the Media Art and Design program as well as courses offered by the Faculty of Architecture and Urbanism and the Faculty of Art and Design.

#### **Conclusion:**

The subject of Human Computer Interaction is very rich both in terms of the disciplines it draws from as well as opportunities for research. Discussed here was just a small subset of the topics contained within HCI. The study of user interface provides a double-sided approach to understanding how humans and machines interact. By studying existing interfaces (such as the graphical user interface or the command line interface), we gain an understanding of how the human mind processes information. We gain insight into how human memory deals with the information presented, as well as its limitations. Alternatively, from studying how human physiology and psychology, we can design better interfaces for people to interact with computers. Work in this domain is only beginning (indeed the number of papers written on this topic has increased in the past few years), and there is much that we don't yet know about the way the human mind works that would allow more perfect user interfaces to be built.

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