

CSC 451 (Human Computer Interaction) Lecture Note 1

Introduction

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.

As its name implies, HCI consists of three parts: the user, the computer itself, and the ways they work together.

User

By "user", we may mean an individual user, a group of users working together. An appreciation of the way people's sensory systems (sight, hearing, touch) relay information is vital. Also, different users form different conceptions or mental models about their interactions and have different ways of learning and keeping knowledge and. In addition, cultural and national differences play a part.

Computer

When we talk about the computer, we're referring to any technology ranging from desktop computers, to large scale computer systems. For example, if we were discussing the design of a Website, then the Website itself would be referred to as "the computer". Devices such as mobile phones or VCRs can also be considered to be "computers".

Interaction

There are obvious differences between humans and machines. In spite of these, HCI attempts to ensure that they both get on with each other and interact successfully. In order to achieve a usable system, you need to apply what you know about humans and computers, and consult with likely users throughout the design process. In real systems, the schedule and the budget are important, and it is vital to find a balance between what would be ideal for the users and what is feasible in reality.

Evolution of Human-Computer Interaction

Since its beginning, the area of Human-Computer Interaction has expanded considerably. To operate the early personal computers (PCs), you needed a lot of training and, predictably, there were a lot of problems in the user experience. Simple

operations like moving the mouse or erasing text faced users with never-before-seen problems, all of which posed major barriers to the computer's use.

In the early 1980s, HCI emerged as an attempt to understand how and why computers could be made more user-friendly. The subject of research soon expanded to encompass nearly all aspects of information technology.

Importance of Human-Computer Interaction

HCI is critical since it will be necessary for goods to be more successful, safe, helpful, and functional. It will make the user's experience more enjoyable in the long term. As a result, having someone with HCI skills involved in all phases of any product or system development is critical. HCI is also necessary to prevent goods or projects from failing completely.

When creating clear intuitive systems that will be accessible by people with a wide variety of talents and knowledge, as well as those who have not finished any official training, HCI is critical. HCI makes software and gadgets more intelligible and useful for everyone by leveraging our everyday knowledge of the environment.

As everyone has used genuine paper folders in their daily lives, displaying a visual of a small folder in a computer's interface helps the user comprehend the folder's purpose. Finally, if a system is well-designed using HCI approaches, the user should not have to worry about the system's complexities. Clear, straightforward, and natural interaction should be the norm.

Applications of Human-Computer Interaction

1. Everyday Life

Today, technology has infiltrated every area of our life. Even if a person does not directly own or use a computer, computers have an impact on their lives. ATM machines, railway ticket selling machines, and hot beverage vending machines are just a few examples of computer interfaces that people may interact with on a regular basis without having to possess a computer.

When creating any of these systems or interfaces, human-computer interaction (HCI) is crucial, whether designing an interface for an ATM or a desktop computer, HCI principles should be examined and taken into account to guarantee that the interface is safe, useful, and efficient.

2. Industry and Business

HCI is significant for any company that relies on technology or computers in its day-to-day operations. Staff are more content and productive when working with well-designed usable systems since they are not irritated.

HCI is particularly essential in the design of safety-critical systems like those found in power plants and air traffic control centres. In these instances, design flaws can have catastrophic consequences, including the death of many individuals.

3. Accessibility

When building systems that are not just functional but also accessible to persons with impairments, human-computer interaction (HCI) is a critical factor to consider. HCI's basic idea is to offer everyone with secure, usable, and efficient systems, which includes people with a wide variety of abilities and levels of experience and knowledge.

Any system that is built using HCI user-centered approaches and concepts will be as accessible as possible to people with impairments.

4. Users who are untrained

Today, only a small percentage of computer users read the software's documentation, assuming one exists. Only the most specialist and complex programmes need intensive training and a handbook.

Within a few minutes of engaging with a computer software, consumers expect to grasp its basic features. HCI equips designers with the ideas, strategies, and resources they need to create intuitive, easy-to-use interfaces that don't require training.

5. Other Applications

Virtual reality is an excellent example of human-computer interaction in the workplace. The interaction between the computer and the user is meant to provide the user a new viewpoint. Virtual reality, when done correctly, can genuinely resemble the actual environment, and is an excellent example of good HCI at action. Virtual Reality (VR) is the employment of computer technology to develop an artificial environment.

Augmented Reality (AR) is often mistaken with **Virtual Reality (VR)**. The main difference between the two is that while Virtual Reality replaces the entire real environment with an artificial one, Augmented Reality is applied in a direct view of an existing real environment and adds elements like sounds, videos, or graphics onto it.

Applications of Virtual Reality (VR)

1. VR in Military

Both the military from the UK as well as the US have employed virtual reality in their training as it enables them to take up a wide range of imitations. Virtual Reality is utilized for all departments of service ranging from the navy, the army, the air force, marines to the coast guard. Virtual Reality can effectively transport a trainee into a variety of varying scenarios, locations as well as environments with the purpose of facilitating training.

VR is employed for military purposes like simulations of flights, vehicles, and the battlefield, medic training, to create a virtual boot camp, and so on. The technology is an entirely engaging experience complimented with visuals and sound that can securely simulate risky training scenarios for preparing and training soldiers, while also avoiding putting them at risk until they are prepared for combat. Alongside this, the technology can also be employed for teaching soldiers skills like interaction with local civilians or with international correspondents while residing on the field.

Yet another VR adoption is done for treating Post-Traumatic Stress Disorder (PTSD) which the soldiers who have come back from combat often face, needing assistance to adapt to their normal life. This treatment is termed Virtual Reality Exposure Therapy (VRET). One of the main advantages which employing VR has provided is the curtailing of training costs.

2. VR in Education

VR is also deployed in the education sector for teaching and learning scenarios. It aids the students in conversing together, in the vicinity of a 3D environment. The students can also be carried on virtual field trips such as to museums, embarking on tours of the solar system as well as traveling back in time to varying eras.

Virtual reality can prove to be specifically advantageous for students having special needs. Research has discovered that VR could prove to be a motivating platform to safely train children and teach them social skills including children having autism disorders. For instance, the technology company, Floreo, executed virtual reality situations that enable children to absorb and train themselves with skills like making eye contact, pointing as well as developing social connections.

3. VR in Sports

Virtual Reality has been steadily shifting the sports industry for all its participants. This technology can be employed by coaches as well as players for training effectively across various sports, with them being able to view as well as experience particular scenarios repeatedly and enhancing their performance every time.

VR is also adopted to serve as a training aid for assisting in assessing athletic performance and examining techniques. It's also been known to enhance the cognitive capabilities of athletes while injured by allowing them to virtually experience gameplay situations.

Likewise, technology is also being adopted to improve the experience of the viewer while watching the sporting event. Various broadcasters have begun streaming live games through VR and are arranging to sell virtual tickets for live sports events which will allow people situated anywhere in the world to be a part of any sports event. This also enables the people who may not be able to afford to spend money, to attend live sports games and feel included as they enjoy a similar experience from their own locations, at no cost or for a reduced expense.

4. VR in Mental Health

VR technology, as I'd mentioned before, is being adopted to treat PTSD. By employing VRTD (Virtual Reality Exposure Therapy), a person is placed in a recreation of a traumatic event with the aim to help the person to come to terms with the event and start recovering.

Alongside this, it is also being employed for treating feelings like anxiety, depression, and phobias. For instance, various patients having anxiety have discovered meditation by employing VR as a useful approach to deal with stress sensitivity and enhance coping mechanisms. The VR technology can facilitate a safe environment for patients to face the components that they fear, whilst staying in a guarded and secure environment.

5. VR in Medical Training

VR is also being employed for practicing surgeries and procedures by medical as well as dental students, owing to its interactive characteristics, enabling a safe and guarded environment, free from any dire consequences, minimizing the risk of any harm or blunders upon practicing it on the actual patients.

Virtual patients are adopted for allowing trainers to gain abilities they can later use in the actual world. VR technology is not only aiding in enhancing the quality of medical training but also holding the potential to optimize expenses.

6. VR in Fashion

VR's application in the Fashion industry is one aspect that has been much less talked about. For instance, virtual replications of store environments can prove to be greatly effective for retailers to practice constructing their signage as well as product displays without the necessity of having to commit to the build.

Likewise, proper time and resources can be assigned for developing a layout of the stores. A couple of renowned brands that have started executing VR in their business are namely Tommy Hilfiger and Coach and Gap. These brands are adopting VR to facilitate a 360-degree experience of fashion events and enabling consumers to virtually try on clothes.

7. VR in Marketing

Marketing is a process that requires constant up-gradation in order to hone and improve its interactive techniques, with the focus being on persuading consumers. The traditional techniques are slowly becoming history with virtual reality becoming the new trend. **(Recommended - Marketing Analytics)**

Customized VR approaches play a hand in enhancing the marketing performance, owing to which the technology is adopted by many content creation organizations for enhancing their engagement with the content.

360° VR promotional videos become a valuable interactive tool for persuading consumers to acquire business items and services by facilitating a virtual experience regarding how these items can enrich their lives and appease their present and future requirements. For instance, back in 2016, **Oreo** launched a VR marketing campaign developed by digital agency 360i. In this campaign, the user is taken through a fun journey across the “**wonder vault**”. The video marked the cookie-selling company's first step into the world of Virtual Reality.

8. VR in Architecture

VR applications have been offering an advantage to architects for presenting their ideas and designs for their clients with a 1:1 scale which will allow the clients to undertake an in-depth exploration of the project prior to accepting the designs and starting the construction operations.

From residential buildings, commercial buildings, or any such construction project, each of them will gain an advantage from virtual reality applications since this will allow these projects to be visualized in a virtual environment to interpret each aspect of the project which includes safety precautions or cutting down any discrepancy from the finalized design.

The technology is also being deployed for improving the interior design, allowing customers to virtually walk-through the various interior designs for their business or personal building, replacing the standard drawings for designs.

THE GOALS OF HCI

The goals of HCI are to produce usable and safe systems, as well as functional systems. In order to produce computer systems with good usability, developers must attempt to:

- understand the factors that determine how people use technology
- develop tools and techniques to enable building suitable systems
- achieve efficient, effective, and safe interaction
- put people first

Underlying the whole theme of HCI is the belief that people using a computer system should come first. Their needs, capabilities and preferences for conducting various tasks should direct developers in the way that they design systems. People should not have to change the way that they use a system in order to fit in with it. Instead, the system should be designed to match their requirements.

Usability

Usability is one of the key concepts in HCI. It is concerned with making systems easy to learn and use. A usable system is:

- easy to learn
- easy to remember how to use
- effective to use
- efficient to use
- safe to use
- enjoyable to use

Why is usability important?

Many everyday systems and products seem to be designed with little regard to usability. This leads to frustration, wasted time and errors. This list contains examples of interactive products: mobile phone, computer, personal organizer, remote control, soft drink machine, coffee machine, ATM, ticket machine, library information system, the web, photocopier, watch, printer, stereo, calculator, videogame etc!.

How many are actually easy, effortless, and enjoyable to use?

For example, a photocopier might have buttons like these on its control panel.

C

Imagine that you just put your document into the photocopier and set the photocopier to make 15 copies, sorted and stapled. Then you push the big button with the "C" to start making your copies.

What do you think will happen?

(a) The photocopier makes the copies correctly.

(b) The photocopier settings are cleared and no copies are made.

If you selected (b) you are right! The "C" stands for clear, not copy. The copy button is actually the button on the left with the "line in a diamond" symbol. This symbol is widely used on photocopiers, but is of little help to someone who is unfamiliar with this.

Factors in HCI

There are a large number of factors which should be considered in the analysis and design of a system using HCI principles. Many of these factors interact with each other, making the analysis even more complex. The main factors are listed in the table below:

Organisation Factors

Training, job design, politics, roles, workorganisation

Environmental Factors

Noise, heating, lighting, ventilation

Health and Safety Factors

The User

Cognitive processes and capabilities

Motivation, enjoyment, satisfaction, personality, experience

Comfort Factors

Seating, equipment, layout.

User Interface

Input devices, output devices, dialogue structures, use of colour, icons, commands, navigation, graphics, natural language, user support, multimedia,

Task Factors

Easy, complex, novel, task allocation, monitoring, skills

Constraints

Cost, timescales, budgets, staff, equipment, buildings

System Functionality

Hardware, software, application

Productivity Factors

Increase output, increase quality, decrease costs, decrease errors, increase innovation

Disciplines contributing to HCI

The field of HCI covers a wide range of topics, and its development has relied on contributions from many disciplines. Some of the main disciplines which have contributed to HCI are:

Computer Science

- technology
- software design, development & maintenance
- User Interface Management Systems (UIMS) & User Interface Development Environments (UIDE)
- prototyping tools
- graphics

Cognitive Psychology

- information processing
- capabilities
- limitations
- cooperative working
- performance prediction

Social Psychology

- social & organizational structures

Ergonomics/Human Factors

- hardware design
- display readability

Linguistics

- natural language interfaces

Artificial Intelligence

- intelligent software

Philosophy, Sociology & Anthropology

- Computer supported cooperative work (CSCW)

Engineering & Design

- graphic design
- engineering principles