

Human Computer Interface: Introduction

Definition

- *human-computer interaction is interdisciplinary design science created by applying the methods of experimental psychology to the powerful tools of computer science.*

The commendable role of Interface designers

- User-interface designers are the heroes of a profound transformation.
- Their work turned personal computers into today's wildly successful mobile devices, enabling users to communicate and collaborate in remarkable ways.
- The desktop applications that once served the needs of professionals have increasingly given way to powerful social tools that deliver compelling user experiences to global communities.
- These invigorated communities conduct business, communicate with family, get medical advice, and create user-generated content that can be shared with billions of connected users

Advantages of good Human Computer Interface

- A good user interface creates an effective user experience
- An effective user experiences change people's lives:
 1. Doctors can make more accurate diagnoses
 2. Pilots can fly airplanes more safely;
 3. children can learn more effectively,
 4. users with disabilities can lead more productive lives
 5. graphic artists can explore more creative possibilities.
 6. At a societal level, connected communities open up new forms of collective action and policy engagement. Having more informed citizens may lead to better decisions, more transparent governance, and greater equity when facing legal, health, or civic challenges.

7. In business settings, better decision-support and document-sharing tools support entrepreneurs
8. In-home settings, digital photo libraries, and internet conferencing enhance family and personal relationships.
9. Mobile devices enrich daily life for many users, including those with disabilities, limited literacy, and low incomes.
10. The remarkably rapid and widespread adoption of mobile devices (including smartphones, tablets, game devices, fitness trackers, etc.) supports personal communication, collaboration, and content creation.
11. According to Economists there is a direct linkage between cellphone dissemination and economic growth since communications facilitate e-commerce and stimulates entrepreneurial ventures.
12. Mobile devices also promote wellness, enable timely medical care, and provide life-saving disaster response services.

Some probable disadvantages of effective HCI

- Reducing the need for telephone operators, typesetters, and travel agents.
- Too often, users must cope with frustration, fear, and failure when they encounter excessively complex menus, incomprehensible terminology, or chaotic navigation paths
- There may be increased dangers from extreme groups who promote terrorism, oppressive social policies, or racial hatred.
- The increased power of social media and collaboration technologies means that there must be a new balance of legal protections, policy powers, and privacy.

Expectations from user interfaces

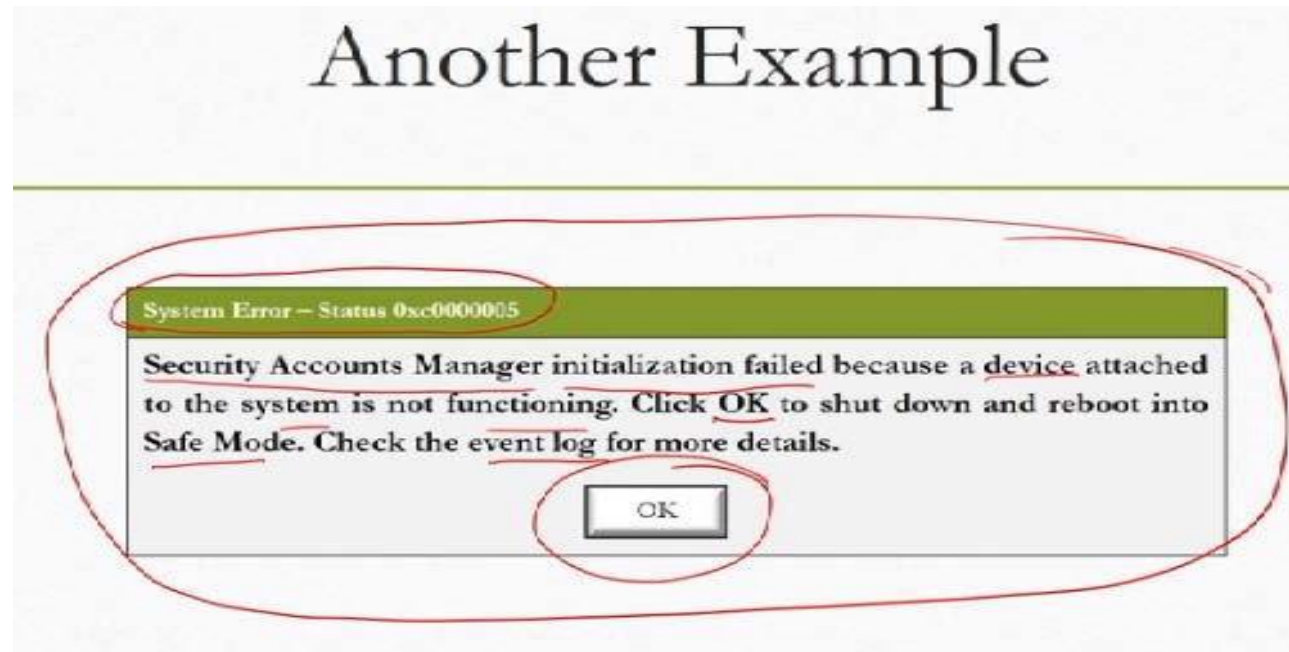
- user interfaces extend to translation into multiple languages, accessibility support for users with disabilities, and accommodation for varying network bandwidths.
- User interfaces should be ubiquitous, pervasive, invisible, and embedded in the surrounding environment.
- Novel devices will be context-aware, attentive, and perceptive, sensing users' needs and providing feedback through ambient displays that glow, hum, change shape, or blow air.

- This course is all about design and implementation of human computer interfaces or interactive systems so design is the key term here.
- Interactive systems are those systems that are used or interacted by a user who is a layman and does not have any specific qualification or special training to be a user of the system.
- Now this brings us to the next question that we should try to answer *is it necessary for the users to know about the technology behind.*
- So for an interactive system, in order to operate or interact with an interactive system the user need to have any specific technological knowledge.

Question?

- Is it necessary for the users to know “about the technology behind”?

- Let us see an example
- This is an example of an error message produced by an operating system
- There is a header which says system error status some number which is actually in hexadecimal code




- The error message says that a particular app or application **initialization failed** because some device attached to the system is not *functioning click ok to shut down and reboot into safe mode.* Check the event log for more details and there is only one button to select which is *okay.*

- So whether you like it or not you have to press ok to move forward now**

- If I do not know anything about this terms , what is the hexadecimal code what is event log? What is system accounts manager or security accounts manager?
- I will not understand anything from this message although it is shown to user of the system but the user is expected to have certain level of knowledge as is evident from particular output.

Outcome

- 
- Make the user anxious
 - Did I do something wrong?
 - How to get out of it?
 - Should we refrain from performing any more things?

Outcome

- May lead to loss of motivation for further use

- Now this anxiety or this kind of confusions in the mind of the user may lead to the loss of motivation of further use.
- This may make the user think that such systems are not for me to use. So rather I should not use it which actually will defeat the whole purpose of making the system used by the users.
- So we want to avoid the user being forced to lose motivation or being forced to have confusion because certain knowledge is not there.
- The principle objective for interactive system should be that the system should not force users to learn about the underlying technology otherwise the user will not be motivated to use the system.
- So accordingly the system should be designed.

- So the main concern is how to design the system so that users find it easy to use.
- So that is the main challenge to an interactive system design.

A Definition!

"Human-computer interaction 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." (ACM SIGCHI)

Core Concern

- Incorporating Humans into design so that we can take care of their needs and expectations.
- So the key thing to notice in the definition is that we are dealing with systems for use by the human users. So effectively it points to the fact that we need to incorporate humans into the design so that we can take care of their needs and expectations.

Interdisciplinary

- * Identifying human factors and incorporate those in the design requires knowledge and expertise in many field of studies

Which Discipline?



Considering Human in Design

- So the key concern here is how to consider the human in the design process?

User-Centric Design

User-Centric Design

- The process to design products, which are computers, in which the users' needs and expectations are taken care of by considering their characteristics

User-Centric Design

- Design layouts that meet users' expectations

Different Design Perspectives

- The term **user centric design** actually refers to different things to different stakeholders in different ways.
- To a typical **creative designer** the term user centric design refers to the design of the interface elements and layouts or in other words the **creative design aspects of the design or of the system**.
- For a **product designer** particularly industrial product designer the term may refer to the form of the product in **other words the shape, size, look of the product**
- . To an **electronic engineer** user centric design may actually mean adding more **features at the hardware level in terms of more sensors, smaller chips or a more power efficient battery** maybe so essentially some hardware features

Usability

Usability

- We require an explicit measure to judge our design – if we have taken care of the human factors

The measure is called "Usability"

- Usability is an important concept in the design of interactive systems

the extent to which a product can be used by specific users to achieve specific goals with effectiveness, efficiency and satisfaction in a specified context of use

Usability: Definitions and Standards

- ISO definition (ISO 9241-210:2009) of usability - "The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use."

- There are 3 crucial aspects in the definition

1. The product is meant to be used by specified group of users it is not meant for all.

So that is a very important thing we should note that whenever we are talking of a usable product we are talking of a product that should be used by a very specific group of users and we are not talking about a product which is usable to all. So we need not design a product as usable for use by all.

2. The second crucial aspect is that **the product should allow the users to achieve specified set of goals** again it is also very important to note that. If we are planning to put every conceivable feature in a product so as to satisfy everybody that **does not necessarily lead to a usable product.**

A usable product by definition or by standard definition is supposed to satisfy specific set of goals of the users.

So it is supposed to let the user achieve only specific set of goals it is not necessary that the user can achieve every possible goals that he or she might have .

- The third crucial aspect also which says that the product should be **designed for specified context of use.** In other words a **usable product need not be so for all usage scenarios so we need not try to design a usable product which can be used in any context.** So it has to be usable within some specified context of use not for every usage context

Usability: Definitions and Standards

- Definition reveals **THREE** measures
 - Effectiveness ✓
 - Efficiency ✓
 - Satisfaction ✓

- The following **usability measures** have been proposed for practical evaluation:
- 1. **Learnability**. It is the ease with which a first time or a novice user performs basic tasks with the system .
- 2. **Speed of performance/Efficiency** . speed at which the users can complete tasks typically measured in terms of task completion rate.
- 3. **Rate of errors by users**. The fourth measure is error rate which is the rate at which the users make errors. Along with that the **severity of those errors and the ease with which the users can recover from the errors**. So this measure actually contain 3 concepts one is the rate, one is the severity, another one is the ease with which error recovery can be made.
- 4. **Retention over time/Memorability**. How well do users maintain their **knowledge** after an hour, a day, or a week? Retention may be linked closely to time to learn, and frequency of use plays an important role.
- 5. **Subjective satisfaction**. How much did users like using various aspects of the interface? The answer can be ascertained by interviews or by written surveys that include satisfaction scales and space for free-form comments

Usability Motivations

- The enormous interest in interface usability arises from the demonstration of the benefits that come from well-designed user interfaces.
- Usability has gone from desirable to necessary for survival.
- This increased motivation emanates from designers and managers of consumer electronics who produce mobile devices, ecommerce websites, and social media where excellent user experiences are necessary to succeed in large, highly competitive markets

- The huge interest in games and entertainment has raised the performance of devices, networks, and user interfaces.
- The goals are to ensure that game playing is fluid and vivid; that photo, music, and video streaming is fast; and that sharing is graceful and simple.
- Strong motivations for usability quality come from high-functioning professionals who demand excellence in environments such as lifecritical systems, industrial plants, legal offices, and police agencies.
- The spirit of usability excellence is also expected by users of exploratory, creative, and collaborative interfaces as well as diverse sociotechnical systems