SHRI VISHNU ENGINEERING COLLEGE FOR WOMEN::BHIMAVARAM
(AUTONOMOUS)
DEPARTMENT OF INFORMATION TECHNOLOGY
HUMAN COMPUTER INTERACTION
UNIT – I

1.1. Introduction: Importance of user Interface – Definition (Defining the User Interface).

1.2. Importance of Good Design.

1.3. Benefits of Good Design.

1.4. A brief History of Screen Design.

1.1. Defining the User Interface

User interface design is a subset of a field of study called human-computer interaction (HCI).

Human-computer interaction is the study, planning, and design of how people and computers work together so that a person's needs are satisfied in the most effective way.

HCI designers must consider a variety of factors:

- What people want and expect,
- What physical limitations and abilities people possess,
- How their perceptual and information processing systems work, and
- What people find enjoyable and attractive.
- Technical characteristics and limitations of the computer hardware and software must also be considered.

The user interface is the part of a computer and its software that people can see, hear, touch, talk to, or otherwise understand or direct. The user interface has essentially two components: input and output. Input is how a person communicates his or her needs or desires to the computer. Some common input components are the keyboard, mouse, trackball, one's finger (for touch-sensitive screens), and one's voice (for spoken instructions). Output is how the computer conveys the results of its computations and requirements to the user. Today, the most common computer output mechanism is the display screen, followed by mechanisms that take advantage of a person's auditory capabilities: voice and sound. The use of the human senses of smell and touch output in interface design still remain largely unexplored.

Proper interface design will provide a mix of well-designed input and output mechanisms that satisfy the user's needs, capabilities, and limitations in the most effective way possible. The best interface is one that it not noticed, one that permits the user to focus on the information and task at hand, not the mechanisms used to present the information and perform the task.

The main aim of HCI is to provide programmers with valuable knowledge about how users most effectively interact with computers so that programs can be designed to be more **user-friendly, efficient, and intuitive (in-built/spontaneous/natural).**

User-friendly: It means that the user feels comfortable using the software and can effectively perform the task he/she set out to do.

Efficiency: It means that the user is able to perform the task with minimal effort and maximum speed**.**

Intuitive: It means that the user can look at the program and almost through instinct (make-up/nature) knows how the basics of the program work.

Armed with this knowledge of human computer interaction, programmers have been able to create ever more friendly and efficient environments, increasing productivity and general computer usage and greatly changing the look and feel of computing.

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.

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 some of the goals of HCI are……

1. **Proper functionality**
2. **Consistency**
3. **Standardization**
4. **Reliability**
5. **Security and Data Integrity**
6. **Integration**
7. **Portability**
8. **Availability**

Proper functionality: the program works as it is expected to, e.g. a word processor is for typing documents into not playing games on.

Consistency: a control works the same way every time it is encountered, its function does not change inside the program. For example, a user always clicks a button; they do not click it sometimes and type text into at other times.

Standardization: seeks consistency across programs so that, for example, a user could learn one word processor and then be able to use any word processor available to them, i.e. learn Microsoft Word and then be able to sit down and use Corel WordPerfect and ClarisWorks with a minimum of effort.

Reliability: the program works without a flaw; it does not lock up or crash. Microsoft Windows 95 is a good example of an unreliable program, it crashes fairly often.

Security and Data Integrity: the program protects the users' data from unwanted tampering and alteration. Hackers and viruses are two of the most common threats to security and data integrity however flaws in the programs code (bugs) can also alter and/or destroy users' data without warning.

Integration: seeks to use multiple programs in conjunction with one another e.g. Microsoft Office. In Office, you can type a document in Word and then insert a spreadsheet into the document or insert the document into a Power Point presentation. This is integration.

Portability: is the least achieved goal of the eight presented here. Portability refers to the ability to use one program on multiple operating systems without recompiling it for every system, i.e. be able to install and use Microsoft Office off the same CD on Macintosh, Linux, and Windows 95 machines.

Availability: Availability is the principle that if users cannot find or access a program they will not use it but if it is readily available, especially if it is more available that its competition, a user is more likely to use the program.

1.2. Importance of Good Design

- With today's technology and tools, and our motivation to create really effective and usable interfaces and screens.
- We produce systems that are inefficient and confusing or, at worst, just plain unusable? Is it because:
    1. We don't care?
    2. We don't possess common sense?
    3. We don't have the time?
    4. We still don't know what really makes good design?
- The root cause is Number 4, with a good deal of Number 3 thrown in.
- We do care. But we never seem to have time to find out what makes good design, nor to properly apply it.
- Interface and screen design were really a matter of common sense, we developers would have been producing almost identical screens for similar type of projects. When was the last time you saw two designers create almost identical screen solutions, based on the same requirements, without the aid of design guidelines or standards?
- These tasks often have a direct impact on an organization's relations with its customers, and its profitability.
- A screen's layout and appearance affect a person in a variety of ways.
    - If they are confusing and inefficient, people will have greater difficulty in doing their jobs and will make more mistakes.
    - Poor design may even chase some people away from a system permanently.
    - It can also lead to aggravation, frustration, and increased stress.

Example-1: User who relieved his frustrations with his computer with a couple of well-aimed bullets from a gun.

Example-2: The User with his extreme exasperation and anger, dropped his PC out of his upper-floor office window.

- A design is said to be good if it consists of a combination of **well designed input** and **output procedures** which fulfils the user's requirements in a successful manner.
- A good design is one which possesses the following features.
    - It allows its users to focus on the data and activity.
    - It provides data to its users for performing their activities without using any specific procedures.

Example bad designs:

- Closed door with complete wood
- suggestion : Glass Door

Importance of Good Design:

- The interaction design means **designing interactive products** to support people in their everyday and working lives.
- A good-designed interface is very useful to its users **for analyzing the performance of a system**.
- Good screen design attracts users and makes their **tasks simple and fast**.
- Designing should **focus on interfaces** with good designing features.
- Good screen design **avoids mistakes done by users**.
- It is a component that displays several complex activities given to the system.
- A window's layout and looks does leave an impact on the users.
- If the design is very complex, confusing and not sufficient enough then the persons will face problems at their work and commit more mistakes.
- Improper designing may develop frustration in people towards the system and they may stop using it.
- Several health problems may also arise like the people become aggressive, stressful when they do not get what they expect from the system, quickly and accurately.

1.3. Benefits of Good Design

- The most important benefit is that a good design **increases the manufacturing rate of the product** and **its demand in the market** by the users.
- If we make screens with weak clarity this causes the users to spend one extra second per screen. This may tend to decrease the screen usage. Hence we should improve the clarity of the screen while designing.
- A researcher tried to **enhance screen clarity and readability by reducing the elements**

on the screen. Hence, the distinct objects which had been put on the same display line to conserve area were placed on different lines accounted for twenty percent increase in the screen users. This is due to **the reduction of elements on the screen and better clarity**.

- Some researchers manipulated the sequence of screens and which enabled the users to compute the transactions in 25% less time and with 25% less errors in contrast to those who used original screens.

Table 1.1 Impact of Inefficient Screen Design on Processing Time

ADDITIONAL SECONDS REQUIRED PER SCREEN IN SECONDS	ADDITIONAL PERSON-YEARS REQUIRED TO PROCESS 4.8 MILLION SCREENS PER YEAR
1	.7
5	3.6
10	7.1
20	14.2

- Good designing principles caused the users **to take quick decisions**.
- The correct layout of data on screens **increases performance** and **reduces the expenses** of the company during its usage.
- Good designing **minimizes the training costs** due to less training time.
- **Identifying and resolving problems** during the design and development process also has significant economic benefits.
- An organization's customers benefit because of the **improved service they receive**.
- A good design leads to **great user satisfaction** as **stress, frustration and anger are reduced.**
- The **rate of customers increases** due to the satisfactory service provided to them by a good design interface.
- The economical advantage of good design is that **it saves a great amount of money by fixing the errors during the design process** itself rather than fixing them after the product's release.

1.4. A Brief History of the Human Computer Interface

- The need for people to communicate with each other has existed (occurred) since we first walked upon this planet.
- The lowest and most common level of communication modes we share are **movements** and **gestures**.
- Movements and gestures are language **independent** i.e. they permit people who do not speak the same language to deal with one another.
- The Next higher level in terms of universality and complexity is **spoken language**.
- Most people can speak one language, some two or more. A spoken language is a very efficient

mode of communication if both parties to the communication understand it.

- ❖ At the Third and highest level of complexity is **written language**. While most people speak, not all can write.
- ❖ But for those who can writing is still now here near as efficient a means of communication as **speaking.**
- ❖ In modem times we have the **typewriter** another step upward in communication complexity i.e. significantly fewer people type than write.
- ❖ Spoken language, however is still more efficient than typing regardless' of typing skill level.
- ❖ Through its first few decades, a computer's ability to deal with human communication was inversely related to what was easy for people to do.
- ➢ The computer demanded rigid (inflexible), typed input through a keyboard, people responded slowly using this device and with varying degrees of skill.

The human-computer dialog reflected the computer's preferences, consisting of one style or a combination of styles using keyboards, commonly referred to as Command Language, Question and Answer, Menu selection, Function Key Selection, and Form Fill-In.

CHRONOLOGICAL HISTORY OF GRAPHICAL USER INTERFACES

1) 1973 Pioneered at the Xerox Palo Alto Research Center.

—First to pull together all the elements of the modern GUI.

2) 1981 First commercial marketing as the Xerox STAR.

—Widely introduced pointing, selection, and mouse.

3) 1983 Apple introduces the Lisa.

— Features pull-down menus and menu bars.

4) 1984 Apple introduces the Macintosh.

— Macintosh is the first successful mass-marketed system.

5) 1985 Microsoft Windows 1.0 released.

— Commodore introduces the Amiga 1000.

6) 1987 X Window System becomes widely available.

— IBM's System Application Architecture released.

— Including Common User Access (CUA).

IBM's Presentation Manager released.

— Intended as graphics operating system replacement for DOS.

— Apple introduces the Macintosh II.

— The first color Macintosh.

7) 1988 NeXT's NeXTStep released.

— First to simulate three-dimensional screen.

8)1989 UNIX-based GUIs released.

— Open Look by AT&T and Sun Microsystems.

— Innovative appearance to avoid legal challenges.

— Motif, for the Open Software Foundation by DEC and Hewlett-Packard.

— Appearance and behavior based on Presentation Manager.

Microsoft Windows 3.0 released

9)1992 OS/2 Workplace Shell released.

Microsoft Windows 3.1 released.

10)1993 Microsoft Windows NT released.

11)11)1995 Microsoft Windows 95 released.

12)1996 IBM releases OS/2 Warp 4.

— Microsoft introduces NT 4.0.

13)1997 Apple releases the Mac OS 8.

14)14)1998 Microsoft introduces Windows 98.

15)1999 Apple releases Mac OS X Server.

— A UNIX-based OS.

16)2000 Microsoft Windows 2000 released.

— Microsoft Windows ME released

17)2001 Microsoft Windows XP released

The Blossoming of the World Wide Web

1)1945 Hypertext concept presented by Vannear Bush.

2)1960 J. C. R. Licklider of MIT proposes a global network of computers.

3)1962 Design and development begins on network called ARPANET

4)1969 ARPANET is brought online.

— Connects computers at four major universities.

— Additional universities and research institutions soon added to the network.

5)1973 ARPANET goes international.

6)1974 Bolt, Beranek and Newman releases Telenet.

— The first commercial version of ARPANET.

7)1976 University of Vermont's PROMIS released.

— The first hypertext system released to the user community.

8)1982 the term Internet is coined.

9)1983 TCP/IP architecture now universally adopted.

10)1988 Apple's HyperCard released.

—Presents the hypertext idea to a wider audience.

—The first Internet worm unleashed.

11) 1989 Tim Berners-Lee and others at the European Laboratory for Particle Physics (CERN) propose a new protocol for distributing information.

— Based upon hypertext.

12)1990 HTML created.

— In conjunction with Berners-Lees protocol.

ARPANET is decommissioned

13) 1991 HTML code released on the Internet by Tim Berners-Lee.

Berners-Lee's work is credited with hatching the World Wide Web.

Gopher developed at the University of Minnesota.

— First really friendly interface.

14)1992 Delphi released.

— First to provide commercial online Internet access to subscribers.

— Mosaic created by the National Center for Supercomputing Applications (NCSA) at the University of Illinois.

— The first popular graphic-based hypertext browser.

15)1994 Netscape Navigator Version 1.0 released.

World Wide Web Consortium founded.

— To promote and develop Web standards.

16)1995 Microsoft Internet Explorer Versions 1.0 and 2.0 released.

AOL, CompuServe, Prodigy, Yahoo, and Lycos come online.

National Science Foundation ends Internet support.

HTML 2.0 approved as proposed Web standard.

Netscape Navigator Versions 2.0 and 3.0 released.

Microsoft Internet Explorer Version 3.0 released.

Opera Version 2.1 released.

— Browser for computers with small resources.

— Written from scratch (not based upon Mosaic).

— Version 2.1 the first widely available.

— HTML 3.2 draft released & NCSA halts development of Mosaic.

— Netscape Navigator Version 4.0 released.

— Microsoft Internet Explorer Version 4.0 released.

— Opera Version 3.0 released& HTML 4.0 certified as proposed standard.

— Microsoft Internet Explorer Version 5.0 released.

A Brief (or) Chronological History of Screen Design:

The screen of 1970's is shown below.

- Initially the **cathode ray tube** was used in screen designing.
- In the 1970s IBM launched its 3270 cathode ray tube text-based terminal.
- The 3270 was used in large number of ways in offices and companies for good screen designing.
- During the 1970s **less number of guidelines** were available for designing.
- Designing was implemented using **hardware** and **telephone line transmission** issues.
- The 1970s screen contained several domains with **unclear and unintelligible (**impossible to understand/meaning less**)** headings.
- The screen was **not properly ordered** and **had a command area** that required an information to the filled and **memorized** by the user.
- A reference to a **manual was needed for understanding** the unclear messages displayed on the screen.
- The screens displayed green text on black background thus restricted to monochrome.

Therefore the screen of the 1970s needed huge amount of toleration and exercise by the users in order to extract the best from the screen.

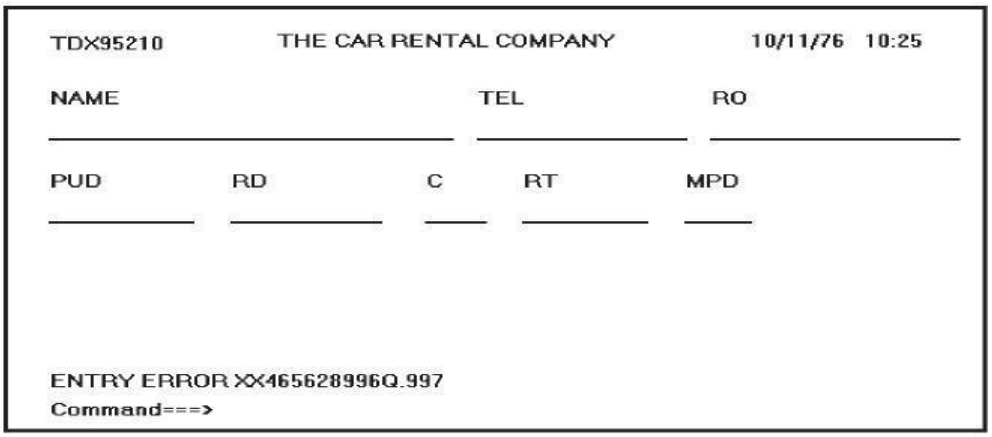

Figure 1.1 A 1970s screen.

The screen of 1980s is shown below.

- In the 1980's a wide variety of design guidelines are available.
- Screens are clear by arranging and ordering of elements.
- Headings are used.
- Commands & Functional keys are used.

- Instructions, remainders as prompts are used for the users.
- Codes like PR, ST, FU, MD, CO, SC were presented.

Figure 1.2 A 1980s screen.

The screen of 1990's is shown below.

- Here graphics are used in screen design.
- Borders are also included.
- Buttons and menus are used for commands.
- Font size, Styles, line-thickness and colors are used for elements.
- Drop-down combination boxes, list boxes, spin-boxes were used for making entries.

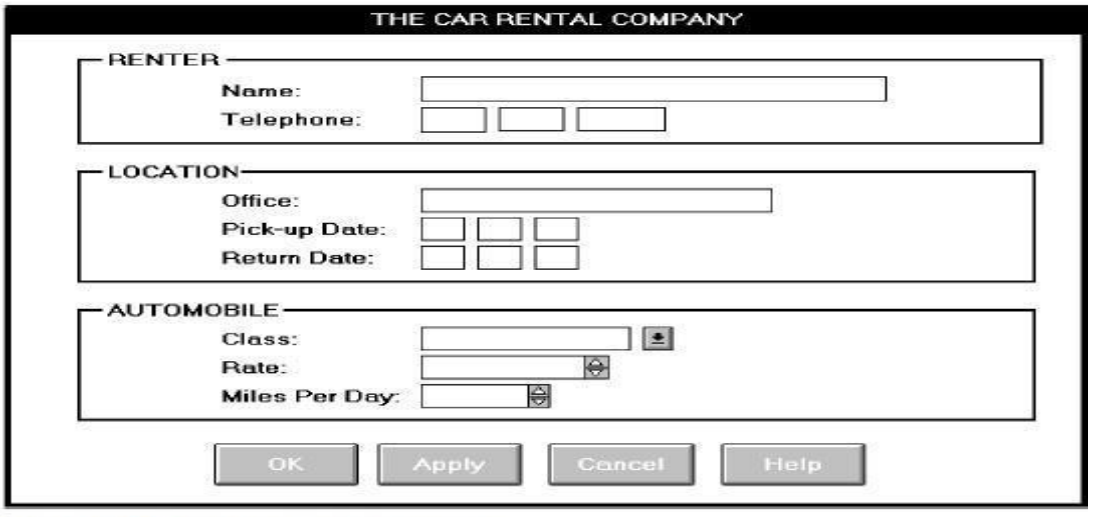

Figure 1.3 A 1990s and beyond screen.

- No need of memory use for users.
- Codes were removed.
- Listing controls was included.