



**ADITYA ENGINEERING COLLEGE (A)**

# **HUMAN COMPUTER INTERACTION**

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# UNIT-I

## Definition of HCI:

- "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."

## 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

- 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,

## The Importance of Good Design

- 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 Benefits of Good Design

- the proper formatting of information on screens does have a significant positive effect on performance
- One researcher, for example, attempted to improve screen clarity and readability by making
- screens less crowded.
- Separate items, which had been combined on the same display line to conserve space, were placed on separate lines instead.
- The result screen users were about 20 percent more productive with the less crowded version
- Proper formatting of information on screens does have a significant positive effect on performance.
- In recent years, the productivity benefits of well-designed Web pages have also been scrutinized.
- Training costs are lowered because training time is reduced.
- Support line costs are lowered because fewer assist calls are necessary.

## A Brief History of the Human Computer Interface :

- The lowest and most common level of communication modes we share are movements and gestures.
- Movements and gestures are language- independent, that is, they permit people who do not speak the same language to deal with one another.
- The next higher level, in terms of universality 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 nowhere near as efficient a means .of communication as speaking.
- In modern times, we have the typewriter, another step upward in communication complexity.



- Significantly fewer people type than write. (While a practiced typist can find typing faster and more efficient than handwriting, the unskilled may not find this the case.)
- Spoken language, however, is still more efficient than typing, regardless' of typing skill level.
- Throughout the computer's history, designers have been developing, with varying degrees of success,
  - easier-to-learn capabilities: voice and handwriting.
  - Systems that recognize human speech and handwriting now exist.

- History of GUI
- 1973 Pioneered at the Xerox Palo Alto Research Center.
  - First to pull together all the elements of the modern GUI.
- 1981 First commercial marketing as the Xerox STAR.
  - Widely introduced pointing, selection, and mouse.
- 1983 Apple introduces the Lisa.
  - Features pull-down menus and menu bars.
- 1984 Apple introduces the Macintosh.
  - Macintosh is the first successful mass-marketed system.
- 1985 Microsoft Windows 1.0 released.  
Commodore introduces the Amiga 1000.

- 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.

- 1988 NeXT's NeXTStep released.
  - First to simulate three-dimensional screen.
- 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.
- 1992 OS/2 Workplace Shell released.
  - Microsoft Windows 3.1 released.
- 1993 Microsoft Windows NT released.
- 1995 Microsoft Windows 95 released.

- IBM releases OS/2 Warp 4.  
Microsoft introduces NT 4.0.
- 1997 Apple releases the Mac OS 8.
- 1998 Microsoft introduces Windows 98.
- 1999 Apple releases Mac OS X Server.  
— A UNIX-based OS.
- 2000 Microsoft Windows 2000 released.  
Microsoft Windows ME released
- 2001 Microsoft Windows XP released

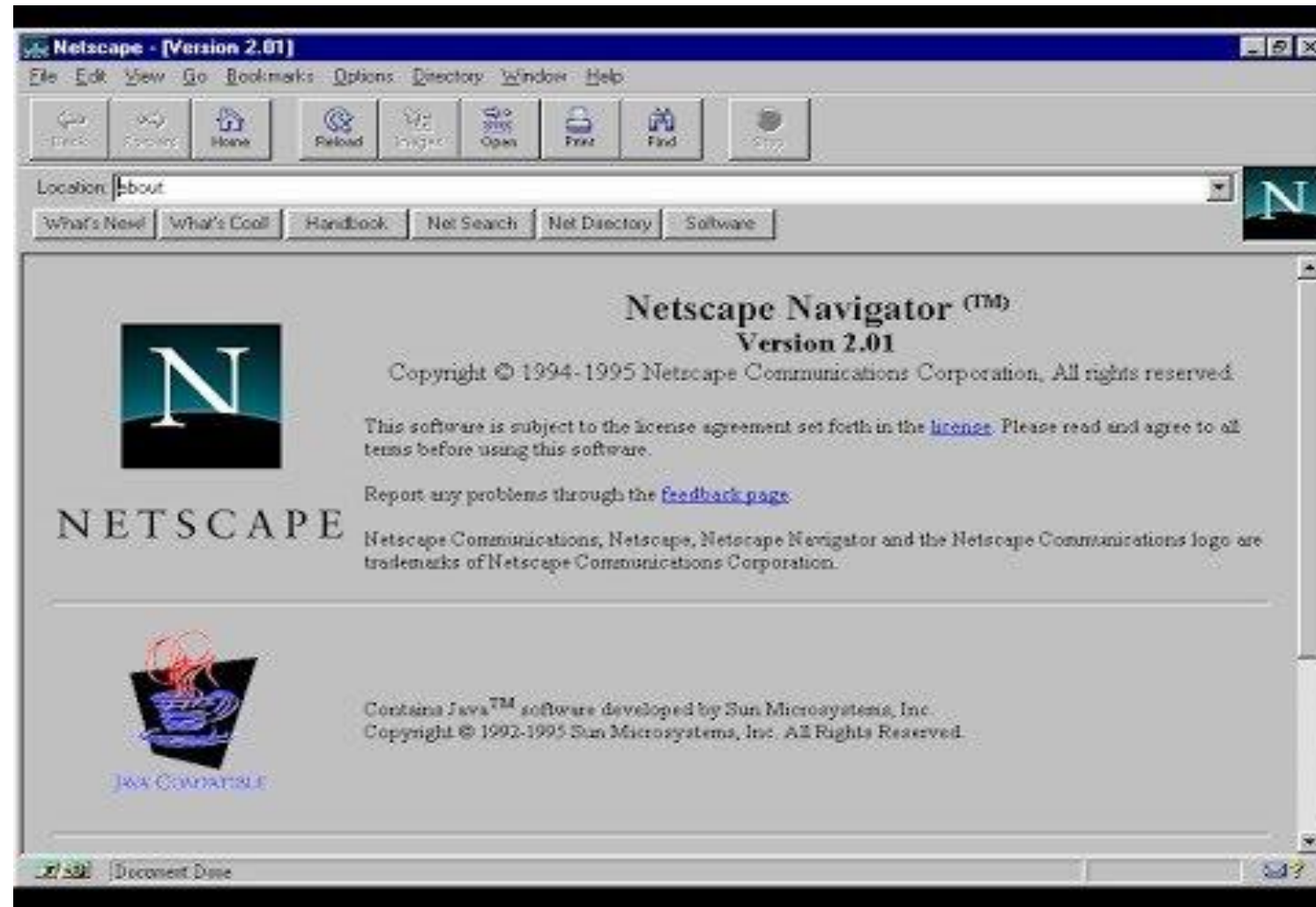
## Chronological History of the Internet

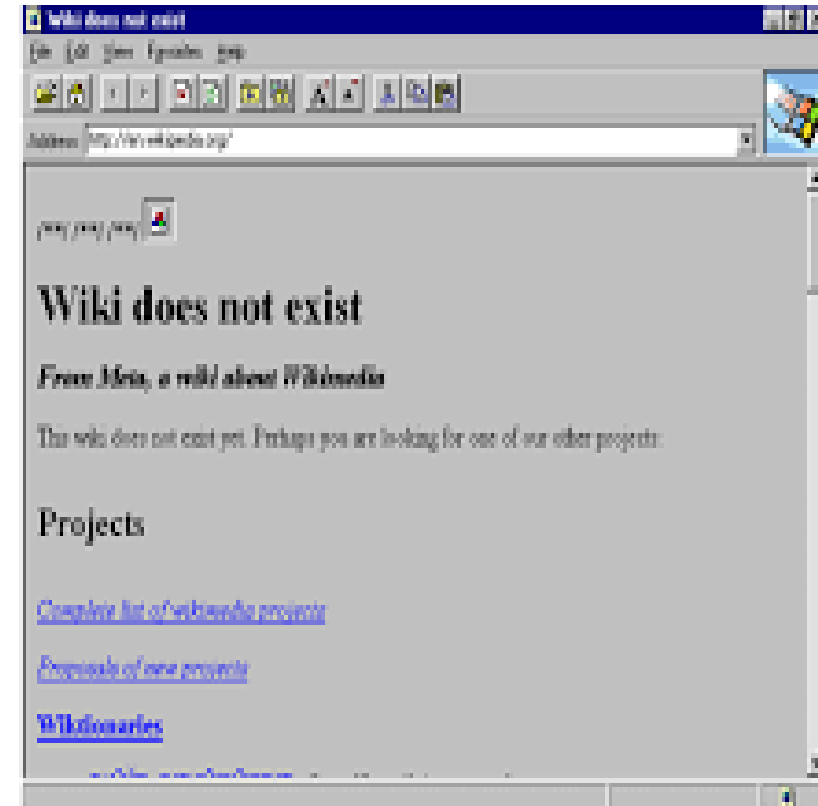
- 1945 Hypertext concept presented by Vannevar Bush.
- 1960 J. C. R. Licklider of MIT proposes a global network of computers.
- 1962 Design and development begins on network called ARPANET
- 1969 ARPANET is brought online.
  - Connects computers at four major universities.
  - Additional universities and research institutions soon added to the network.
- 1973 ARPANET goes international.
- 1974 Bolt, Beranek and Newman releases Telenet.
  - The first commercial version of ARPANET.
- 1976 University of Vermont's PROMIS released.
  - The first hypertext system released to the user community.
- 1982 The term Internet is coined

- 1983 TCP/IP architecture now universally adopted.
- 1988 Apple's HyperCard released.
  - Presents the hypertext idea to a wider audience.
  - The first Internet worm unleashed.
- 1989 Tim Berners-Lee and others at the European Laboratory for Particle Physics
- (CERN) propose a new protocol for distributing information.
  - Based upon hypertext.
- 1990 HTML created.
- 1991 HTML code released on the Internet by Tim Berners-Lee

- 1992 Delphi released.
    - First to provide commercial online Internet access to subscribers.
    - The first popular graphic-based hypertext browser.
- 1994 Netscape Navigator Version 1.0 released.
- 1995 Microsoft Internet Explorer Versions 1.0 and 2.0 released.







# A Brief History on Screen Design

A 1970 and 1980 screen design :



TDX95210	THE CAR RENTAL COMPANY	10/11/76	10:25
NAME	TEL	RO	
<hr/>			
PUD	RD	C	RT
MPD			
<hr/>			
ENTRY ERROR XX465628996Q.997			
Command--->			

THE CAR RENTAL COMPANY

RENTER >>

Name: \_\_\_\_\_

Telephone: \_\_\_\_ \_

LOCATION >>

Office: \_\_\_\_\_

Pick-up Date: \_\_\_\_ \_

Return Date: \_\_\_\_ \_

AUTOMOBILE >>

Class: \_\_\_\_\_ (PR, ST, FU, MD, CO, SC)

Rate: \_\_\_\_\_

Miles Per Day: \_\_\_\_\_

The maximum allowed miles per day is 150.

Enter F1=Help F3=Exit F12=Cancel

**THE CAR RENTAL COMPANY**

**RENTER**

Name:

Telephone:

**LOCATION**

Office:

Pick-up Date:

Return Date:

**AUTOMOBILE**

Class:

Rate:

Miles Per Day:

**Figure 1.3** A 1990s and beyond screen.

## Graphical Systems: Advantages and Disadvantages:

- **Advantages :**
- Symbols recognized faster than text
- Faster learning
- Faster use and problem solving
- Easier remembering
- More natural
- Exploits visual/spatial cues
- Fosters more concrete thinking
- Provides context
- Fewer errors
- Increased feeling of control
- Immediate feedback

## Disadvantages:

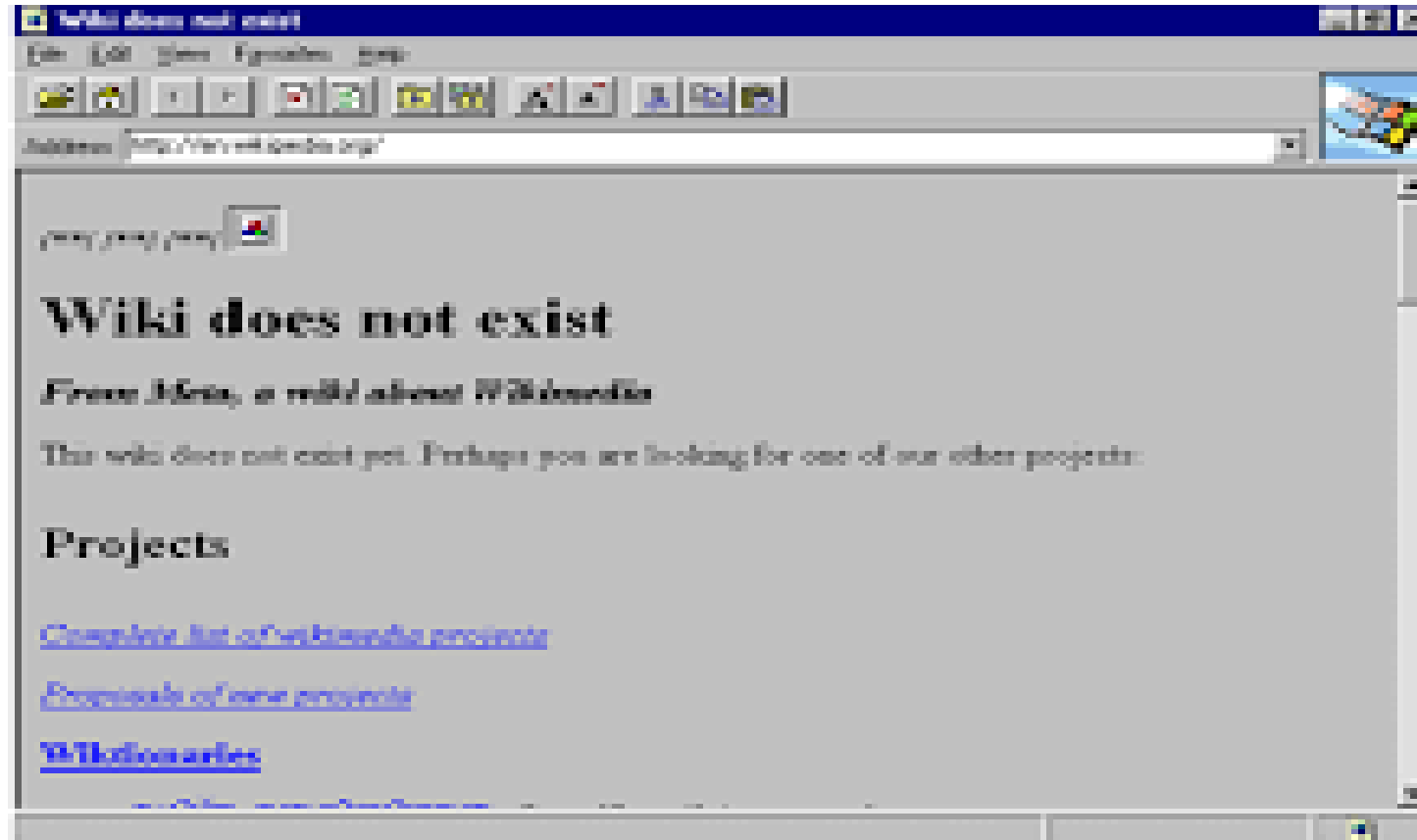
- Greater design complexity
- Learning still necessary
- Replaces national languages
- Easily augmented with text displays
- Smooth transition from command language system
- Lack of experimentally-derived design guidelines
- use a pointing device may also have to be learned
- Working domain is the present
- Human comprehension limitations
- Window manipulation requirements
- Production limitations
- Few tested icons exist
- Inefficient for touch typists
- Inefficient for expert users











## The Popularity of Graphics:

- Text could be replaced by graphical images called icons.
- These icons could represent objects or actions
- Selection fields such as radio buttons, check boxes, list boxes coexisted with the reliable old text entry field
- sophisticated text entry fields with attached or drop-down menus of. Objects and actions were selected through use of pointing mechanisms.

- User's actions to be reacted to quickly, dynamically, and meaningfully.
- WIMP interface: windows, icons, menus, and pointers
- Graphic presentation is much more effective than other presentation methods.
- It permits faster information transfer between computers and people by permitting more visual comparisons
- Graphics also can add appeal or charm to the interface and permit greater customization to create a unique corporate or organization style.

## Direct Manipulation

Direct Manipulation System Posses the following Characteristics.

The system is portrayed as an extension of the real world:

- It is assumed that a person is already familiar with the objects and actions in his or her environment of interest.
- The system simply replicates them and portrays them on a different medium, the screen.

## Continuous visibility of objects and actions:

- Like one's desktop, objects are continuously visible.
- labeled buttons replacing complex syntax and command names.
- Cursor action and motion occurs in physically obvious and natural ways



## **Indirect Manipulation (the problems in direct manipulation)**

- In practice, direct manipulation of all screen objects and actions may not be feasible because of the following
- The operation may be difficult to conceptualize in the graphical system
- The graphics capability of the system may be limited.
- The amount of space available for placing manipulation controls in the window border may be limited

- When this occurs, indirect manipulation is provided.
- Indirect manipulation substitutes words and text, such as pull-down or pop-up menus, for symbols, and substitutes typing for pointing.
- Most window systems are a combination of both direct and indirect manipulation.

## Characteristics of the Graphical User Interface:

### Sophisticated Visual Presentation:

- Visual presentation is the visual aspect of the interface.
- The sophistication of a graphical system permits displaying lines, including drawings and icons.
- It also permits the displaying of a variety of character fonts, including different sizes and styles
- The display of 16 million or more colors is possible on some screens
- The meaningful interface elements visually presented to the user in a graphical System include , windows (primary, secondary, or dialog boxes), menus (menu bar, pull down, pop-up, cascading), icons to represent objects such as programs or files

- **Restricted Set of Interface Options:**
- The array of alternatives available to the user is what is presented on the screen or may be retrieved through what is presented on the screen.
- This concept fostered the acronym WYSIWYG.

- **Pick-and-Click Interaction:**
- The primary mechanism for performing this pick-and-click is most often the mouse and its buttons.
- The user moves the mouse pointer to the relevant element (pick) and the action is signaled (click).
- The hand and mind seem to work smoothly and efficiently together.

- **Concurrent Performance of Functions :**
- Graphic systems may do two or more things at one time. Multiple programs may run simultaneously.
- When a system is not busy on a primary task, it may process background tasks (cooperative multitasking).
- When applications are running as truly separate tasks, the system may divide the
- processing power into time slices and allocate portions to each application.

## The Graphical User Interface

- A user interface is a collection of techniques and mechanisms to interact with something.
- In a graphical interface the primary interaction mechanism is a pointing device of some kind.
- This device is the electronic equivalent to the human hand.
- What the user inter-acts with is a collection of elements referred to as objects.
- They can be seen, heard, touched, or otherwise perceived

- Objects are always visible to the user and are used to perform tasks
- People perform operations, called actions, on objects.
- modifying objects by pointing, selecting, and manipulating.



## The Web User Interface

- Web interface design is essentially the design of navigation and the presentation of information.
- It is about content, not data.
- The design goal is to build a hierarchy of menus and pages that feels natural, is well structured,
- is easy to use, and is truthful.
- The Web is a navigation environment where people move between pages of information, not an application environment.

- It is also a graphically rich environment.
- Web interface design is also more difficult because the main issues concern information architecture and task flow, neither of which is easy to standardize
- It is more difficult because of the availability of the various types of multimedia, and the desire of many designers to use something simply because it is available.



# GUI versus WEBDESIGN



**Table 2.1** GUI versus Web Design

	<b>GUI</b>	<b>WEB</b>
<b>Devices</b>	User hardware variations limited. User hardware characteristics well defined. Screens appear exactly as specified.	User hardware variations enormous. Screen appearance influenced by hardware being used.
<b>User Focus</b>	Data and applications.	Information and navigation.
<b>Data/ Information</b>	Typically created and used by known and trusted sources. Properties generally known. Typically placed into system by users or known people and organizations. Typically organized in a meaningful fashion. A notion of private and shared data exists.	Full of unknown content. Source not always trusted. Often not placed onto the Web by users or known people and organizations. Highly variable organization. Privacy often suspect.
<b>User Tasks</b>	Install, configure, personalize, start, use, and upgrade programs. Open, use, and close data files. Fairly long times spent within an application. Familiarity with applications often achieved.	Link to a site, browse or read pages, fill out forms, register for services, participate in transactions, download and save things. Movement between pages and sites very rapid. Familiarity with many sites not established.
<b>User's Conceptual Space</b>	Controlled and constrained by program.	Infinite and generally unorganized.
<b>Presentation Elements</b>	Windows, menus, controls, data, toolbars, messages, and so on. Many transient, dynamically appearing and disappearing. Presented as specified by designer. Generally standardized by toolkits and style guides.	Two components, browser and page. Within page, any combination of text, images, audio, video, and animation. May not be presented as specified by the designer—dependent on browser, monitor, and user specifications. Little standardization.

<b>Navigation</b>	Through menus, lists, trees, dialogs, and wizards. Not a strong and visible concept. Constrained by design. Generally standardized by toolkits and style guides.	Through links, bookmarks, and typed URLs. Significant and highly visible concept. Few constraints, frequently causing a lost "sense of place." Few standards. Typically part of page design, fostering a lack of consistency.
<b>Context</b>	Enables maintenance of a better sense of context. Restricted navigation paths. Multiple viewable windows.	Poorer maintenance of a sense of context. Single-page entities. Unlimited navigation paths. Contextual clues become limited or are difficult to find.
<b>Interaction</b>	Interactions such as clicking menu choices, pressing buttons, selecting list choices, and cut/copy/paste occur within context of active program.	Basic interaction is a single click. This can cause extreme changes in context, which may not be noticed.
<b>Response Time</b>	Nearly instantaneous.	Quite variable, depending on transmission speeds, page content, and so on. Long times can upset the user.
<b>Visual Style</b>	Typically prescribed and constrained by toolkit. Visual creativity allowed but difficult. Little significant personalization.	Fosters a more artistic, individual, and unrestricted presentation style. Complicated by differing browser and display capabilities, and bandwidth limitations. Limited personalization available.
<b>System Capability</b>	Unlimited capability proportional to sophistication of hardware and software.	Limited by constraints imposed by the hardware, browser, software, client support, and user willingness to allow features because of response time, security, and privacy concerns.
<b>Task Efficiency</b>	Targeted to a specific audience with specific tasks. Only limited by the amount of programming undertaken to support it.	Limited by browser and network capabilities. Actual user audience usually not well understood. Often intended for anyone and everyone.

(continues)



Table 2.1 (Continued)

	GUI	WEB
<b>Consistency</b>	Major objective exists within and across applications. Aided by platform toolkit and design guidelines. Universal consistency in GUI products generally created through toolkits and design guidelines.	Sites tend to establish their own identity. Frequently standards set within a site. Frequent ignoring of GUI guidelines for identical components, especially controls.
<b>User Assistance</b>	Integral part of most systems and applications. Accessed through standard mechanisms. Documentation, both online and offline, usually provided. Personal support desk also usually provided.	No similar help systems. The little available help is built into the page. Customer service support, if provided, oriented to product or service offered.
<b>Integration</b>	Seamless integration of all applications into the platform environment a major objective. Toolkits and components are key elements in accomplishing this objective.	Apparent for some basic functions within most Web sites (navigation, printing, and so on.) Sites tend to achieve individual distinction rather than integration.
<b>Security</b>	Tightly controlled, proportional to degree of willingness to invest resources and effort. Not an issue for most home PC users.	Renowned for security exposures. Browser-provided security options typically not understood by average users. When employed, may have function-limiting side effects.
<b>Reliability</b>	Tightly controlled in business systems, proportional to degree of willingness to invest resources and effort.	Susceptible to disruptions caused by user, telephone line and cable providers, Internet service providers, hosting servers, and remotely accessed sites.

## General Principles UID

- **1. Aesthetically Pleasing:**
  - Provide meaningful contrast between screen elements.
  - Create groupings.
  - Align screen elements and groups.
  - Provide three-dimensional representation.
  - Use color and graphics effectively and simply.



## 2.Clarity:

- The interface should be visually, conceptually, and linguistically clear, including
  - Visual elements
  - Functions
  - Metaphors
  - Words and Text

### **3.Compatibility:**

- Provide compatibility with the following:
- The user
- The task and job
- The Product
- Adopt the User's Perspective

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## 4. Configurability

- Permit easy personalization, configuration, and reconfiguration of settings.
- Enhances a sense of control
- Encourages an active role in understanding

## 5.Comprehensibility:

- A system should be easily learned and understood: A user should know the following:
  - What to look at
  - What to do
  - When to do it
  - Where to do it
  - Why to do it
  - How to do it

- **6.Consistency:**

- A system should look, act, and operate the same throughout. Similar components should:
  - Have a similar look.
  - Have similar uses.
  - Operate similarly.
  - The same action should always yield the same result
  - The function of elements should not change.
  - The position of standard elements should not change.

## 7.Flexibility:

- A system must be sensitive to the differing needs of its users, enabling a level and type of
- performance based upon:
  - Each user's knowledge and skills.
  - Each user's experience.
  - Each user's personal preference.
  - Each user's habits.

## 10. Efficiency:

- Minimize eye and hand movements, and other control actions.
- Transitions between various system controls should flow easily and freely.
- Navigation paths should be as short as possible.
- Eye movement through a screen should be obvious and sequential.
- Anticipate the user's wants and needs whenever possible