Chapter 1

❖ **Usability requirements**

- **[First Definition]**

– Synonyms for "user-friendly" in Microsoft Word 2002 are easy to use; accessible; comprehensible; intelligible; idiot proof; available; and ready

– But a "friend" also seeks to help and be valuable. A friend is not only understandable, but understands. A friend is reliable and doesn't hurt. A friend is pleasant to be with.

– These measures are still subjective and vague, so a systematic process is necessary to develop usable systems for specific users in a specific context

- **[Second Definition]**

– The U.S. Human Engineering Design Criteria for Military Systems (1999) states these purposes:

  - Achieve required performance by operator, control, and maintenance personnel
  - Minimize skill and personnel requirements and training time
  - Achieve required reliability of personnel-equipment/software combinations
  - Foster design standardization within and among systems

– Should improving the user's quality of life and the community also be objectives?

– Usability requires project management and careful attention to requirements analysis and testing for clearly defined objectives

❖ **Goals for requirements analysis {List & Explain any of them}.**

♦ **Ascertain the user's needs**

- Determine what tasks and subtasks must be carried out
- Include tasks which are only performed occasionally. Common tasks are easy to identify.
- Functionality must match need or else users will reject or underutilize the product.

♦ **Ensure reliability**

- Actions must function as specified.
- Database data displayed must reflect the actual database.
- Appease the user's sense of mistrust.
- The system should be available as often as possible.
- The system must not introduce errors.
- Ensure the user's privacy and data security by protecting against unwarranted access, destruction of data, and malicious tampering.

♦ **Promote standardization, integration, consistency, and portability**

- Standardization: use pre-existing industry standards where they exist to aid learning and avoid errors (e.g. the W3C and ISO standards)
- Integration: the product should be able to run across different

- software tools and packages (e.g. Unix)
- Consistency:
  - ◊ compatibility across different product versions
  - ◊ compatibility with related paper and other non-computer based systems
  - ◊ use common action sequences, terms, units, colors, etc. within the program
- Portability: allow for the user to convert data across multiple software and hardware environments.

♦ **Complete projects on time and within budget**

❖ **What are the factors, which effect user usability? {List}**

- **Physical abilities and physical workplaces**
  - ✧ Basic data about human dimensions comes from research in anthropometry
  - ✧ There is no average user, either compromises must be made or multiple versions of a system must be created
  - ✧ Physical measurement of human dimensions are not enough, take into account dynamic measures such as reach, strength or speed
- **Cognitive and perceptual abilities**
  - ✧ The human ability to interpret sensory input rapidly and to initiate complex actions makes modern computer systems possible
- **Personality differences**

✧ There is no set taxonomy for identifying user personality types

✧ Designers must be aware that populations are subdivided and that these subdivisions have various responses to different stimuli

✧ Myers-Briggs Type Indicator (MBTI)

- extroversion versus introversion
- sensing versus intuition
- perceptive versus judging
- feeling versus thinking

- **Cultural and international diversity**
  - ✧ Characters, numerals, special characters, and diacriticals
  - ✧ Left-to-right versus right-to-left versus vertical input and reading
  - ✧ Date and time formats
  - ✧ Numeric and currency formats
  - ✧ Weights and measures
  - ✧ Telephone numbers and addresses
  - ✧ Names and titles (Mr., Ms., Mme.)
  - ✧ Social-security, national identification, and passport numbers
  - ✧ Capitalization and punctuation
  - ✧ Sorting sequences
  - ✧ Icons, buttons, colors

- ✧ Pluralization, grammar, spelling
- ✧ Etiquette, policies, tone, formality, metaphors

- **Users with physical challenges**
  - ✧ Designers must plan early to accommodate users with disabilities
  - ✧ Early planning is more cost efficient than adding on later
  - ✧ Businesses must comply with the "Americans With Disabilities" Act for some applications
- **Older Adult Users**
  - ✧ Including the elderly is fairly easy
    - Designers should allow for variability within their applications via settings for sound, color, brightness, font sizes, etc. with less distracting animation
- **Younger users**

Chapter 2

❖ Navigating the interface Guidelines:-

- Standardize task sequences
- Ensure that embedded links are descriptive
- Use unique and descriptive headings
- Use check boxes for binary choices
- Develop pages that will print properly
- Use thumbnail images to preview larger images

❖ Accessibility guidelines

- Provide a text equivalent for every non text element
- For any time-based multimedia presentation synchronize equivalent alternatives
- Information conveyed with color should also be conveyed without it
- Title each frame to facilitate identification and navigation

❖ Interaction Style{Explain & Advantage & Disadvantage}

	advantages	disadvantages
Direct Manipulation	1. Visually presents task concepts 2. Allows easy learn &retention 3. Allows errors to be avoided 4. High subjective satisfaction	1. Hard to program 2. Require graphics display and pointing device
Menu selection	▪ Shortens learning ▪ Reduces keystrokes ▪ Structures decision making ▪ Easy support of error handling	▪ Presents danger of many menus ▪ May slow frequent users ▪ Consumes screen space ▪ Requires rapid display rate
Form fillin	1. Simplifies data entry 2. Requires modest training 3. Gives convenient assistance 4. **Permits use of for management tools**	▪ Consumes screen space

Command language	▪ Flexible ▪ Appeals to "power users" ▪ Supports user initiative ▪ Allows convenient creation of user-defined macros	▪ Poor error handling ▪ Requires substantial training ▪ Requires substantial memorization
Natural language	▪ Relieves burden of learning syntax	1. Requires clarification dialog 2. May not show context 3. May require more keystrokes 4. Unpredictable

❖ **Perceptual, Cognitive, & Motor tasks {Explain with example} or [Types of tasks]**

♦ **Perceptual subtask theories** : have been successful in predicting reading times for free text, lists, formatted displays, and other visual or auditory tasks. E.X (finding an item on a display)

♦ **Cognitive subtask theories** : involving short term, working, and long-term memory, are central to problem solving and play a key role in understanding productivity as a function of response time. E.X (planning the sequence of steps needed to pay a bill)

⌗ predicting performance on complex cognitive tasks (combinations of subtasks) is especially difficult; because of the many strategies that might be employed and the many opportunities for going astray

♦ **Motor-task performance times theories** : predictions predicting keystroking or pointing times. E.X (pointing with a mouse).

Chapter 3

❖ **The Four Pillars of Design**

1. **User Interface Requirements**
   - Soliciting and clearly specifying user requirements is a major key to success in any development activity
   - Laying out the user-interface requirements is part of the overall requirements development and management process
   - User interface requirements describe system behavior
   - ♦ **Ethnographic Observation**
     - Identifying and observing the user community in action
     - Discussed later
2. **Guidelines documents and processes**
   - ♦ Theories & Models

• Each project has different needs, but guidelines should be considered for:

⌗ **Words, icons, and graphics**

- Terminology (objects and actions), abbreviations, and capitalization
- Character set, fonts, font sizes, and styles (bold, italic, underline)

- Icons, graphics, line thickness, and
- Use of color, backgrounds, highlighting, and blinking

Screen-layout issues

- Menu selection, form fill-in, and dialog-box formats
- Wording of prompts, feedback, and error messages
- Justification, white space, and margins
- Data entry and display formats for items and lists
- Use and contents of headers and footers

Input and output devices

- Keyboard, display, cursor control, and pointing devices
- Audible sounds, voice feedback, touch input, and other special devices
- Response time for a variety of tasks

Action sequences

- Direct-manipulation clicking, dragging, dropping, and gestures
- Command syntax, semantics, and sequences
- Programmed function keys
- Error handling and recovery procedures

Training

- Online help and tutorials
- Training and reference materials
- Command syntax, semantics, and sequences

3. User- interface Software Tools
   - Algorithms & Prototypes
4. Expert Reviews & Usability Testing
   - Controlled Experiments

Recommendations for guidelines documents.

- Provides a social process for developers
- Records decisions for all parties to see
- Promotes consistency and completeness
- Facilitates automation of design
- Allows multiple levels:
  - Rigid standards
  - Accepted practices
  - Flexible guidelines
- Announces policies for:
  - Education: How to get it?
  - Enforcement: Who reviews?
  - Exemption: Who decides?
  - Enhancement: How often?

Rapid Contextual Design {How-To Guide to Key Techniques for User-Centered Design}.

1. Contextual inquiry

2. Interpretation sessions and work modeling
3. Model consolidation and affinity diagram building
4. Personas
5. Visioning
6. Storyboarding
7. User environment design
8. Paper prototypes and mock-up interviews

❖ **Ethnographic Observation {Guidelines for preparing for the evaluation}.**

- **Preparation**
  - Understand policies in work environments and family values in homes.
  - Familiarize yourself with the existing interface and its history.
  - Set initial goals and prepare questions.
  - Gain access and permission to observe or interview.
- **Field study**
  - Establish a rapport with all users.
  - Observe or interview users in their setting, and collect subjective and
  - Objective quantitative and qualitative data.
  - Follow any leads that emerge from the visits.
  - Record your visits.
- **Analysis**
  - Compile the collected data in numerical, textual, and multimedia databases.
  - Quantify data and compile statistics.
  - Reduce and interpret the data.
  - Refine the goals and the process used.
- **Reporting**
  - Consider multiple audiences and goals.
  - Prepare a report and present the findings.

❖ **Social Impact Statement for Early Design Review {Explain}**

♦ **Describe the new system and its benefits**

- ◊ Convey the high level goals of the new system.
- ◊ Identify the stakeholders.
- ◊ Identify specific benefits.

♦ **Address concerns and potential barriers**

- ◊ Anticipate changes in job functions and potential layoffs.
- ◊ Address security and privacy issues.
- ◊ Discuss accountability and responsibility for system misuse and failure.
- ◊ Avoid potential biases.
- ◊ Weigh individual rights vs. societal benefits.
- ◊ Assess trade-offs between centralization and decentralization.

- ◊ Preserve democratic principles.
- ◊ Ensure diverse access.
- ◊ promote simplicity and preserve what works.

♦ **Outline the development process**

- ◊ Present and estimated project schedule.
- ◊ Propose process for making decisions.
- ◊ Discuss expectations of how stakeholders will be involved.
- ◊ Recognize needs for more staff, training, and hardware.
- ◊ Propose plan for backups of data and equipment.
- ◊ Outline plan for migrating to the new system.

Chapter 4

❖ Expert Reviews

Expert Reviews – It's a stage for expert Person or consultants of the project to define and orientation the designers to modify and improve some errors or excesses to suit user of interfaces.

- There are some reasons takes us to limitation of expert reviews :
  1. If the expert review is not structured in advance.
  2. Experts may not have an adequate understating of the task domain or user communities.
- The expert reviews note the possible problem in the design to discuss with designers, but the solution should left to designers usually.

♦ There are six different types of expert reviews methods, I will list and explain them :

1. Heuristic evaluation. The expert reviewers critique an interface to determine conformance with a short list of design heuristics, It makes an enormous difference if the experts are familiar with the rules and are able to interpret and apply them.
2. Guidelines review. The interface is checked for conformance with the organizational or other guidelines document.
3. Consistency inspection. The experts verify consistency across a family of interfaces, checking for consistency of terminology, fonts, color schemes, layout, input and output formats, and so on within the interface as well as in the training materials and online help.
4. Cognitive walkthrough. The experts simulate users walking through the interface to carry out typical tasks. High-frequency tasks are a starting point, but rare critical tasks, such as error recovery.
5. Metaphors of human thinking (MOT). The experts conduct an inspection that focuses on how users think when interacting with an interface. They consider metaphors for five aspects of human thinking: habit, the stream of thought, awareness and associations, the relation between utterances and thought, and knowing. In experimental settings, this technique seems to perform better than cognitive walkthrough and heuristic evaluation

6. Formal usability inspection. The experts hold a courtroom-style meeting, with a moderator or judge, to present the interface and to discuss its merits and weaknesses.

❖ **Acceptance Test {Explain}**

- ♦ For large implementation projects, the customer or manager usually sets objective and measurable goals for hardware and software performance.
- ♦ If the completed product fails to meet these acceptance criteria, the system must be reworked until success is demonstrated.
- ♦ Rather than the vague and misleading criterion of "user friendly," measurable criteria for the user interface can be established for the following:
  - ◊ Time to learn specific functions
  - ◊ Speed of task performance
  - ◊ Rate of errors by users
  - ◊ Subjective user satisfaction
  - ◊ Human retention of commands over time
- ♦ In a large system, there may be eight or 10 such tests to carry out on different components of the interface and with different user communities.
- ♦ Once acceptance testing has been successful, there may be a period of field testing before national or international distribution.

❖ **What are Evaluation during Active Use? (explain)**

- Successful active use requires constant attention from dedicated managers, user-services personnel, and maintenance staff.
- Perfection is not attainable, but percentage improvements are possible.
- Interviews and focus group discussions
  - Interviews with individual users can be productive because the interviewer can pursue specific issues of concern.
  - Group discussions are valuable to ascertain the universality of comments.
  - Interviews can be costly and time consume.(Dis-advantage)
- Continuous user-performance data logging
  - The software architecture should make it easy for system managers to collect data about
    - The patterns of system usage
    - Speed of user performance
    - Rate of errors
    - Frequency of request for online assistance
  - A major benefit is guidance to system maintainers in optimizing performance and reducing costs for all participants.
- Online or telephone consultants, e-mail, and online suggestion boxes

- Many users feel reassured if they know there is a human assistance available
- On some network systems, the consultants can monitor the user's computer and see the same displays that the user sees

- Online suggestion box or e-mail trouble reporting
  - Electronic mail to the maintainers or designers.
  - For some users, writing a letter may be seen as requiring too much effort.
- Discussion groups, wiki's and newsgroups
  - Permit postings of open messages and questions
  - Some are independent, e.g. America Online and Yahoo!
  - Topic list
  - Sometimes moderators
  - Social systems
  - Comments and suggestions should be encouraged

❖ **What are Controlled Psychologically-oriented Experiments?**

- Scientific and engineering progress is often stimulated by improved techniques for precise measurement.
- Rapid progress in the designs of interfaces will be stimulated as researchers and practitioners evolve suitable human-performance measures and techniques.
- The outline of the scientific method as applied to human-computer interaction might comprise these tasks:
  - Deal with a practical problem and consider the theoretical framework
  - State a lucid and testable hypothesis
  - Identify a small number of independent variables that are to be manipulated
  - Carefully choose the dependent variables that will be measured
  - Judiciously select subjects and carefully or randomly assign subjects to groups
  - Control for biasing factors (non-representative sample of subjects or selection of tasks, inconsistent testing procedures)
  - Apply statistical methods to data analysis
  - Resolve the practical problem, refine the theory, and give advice to future researchers
- Controlled experiments can help fine-tuning the human-computer interface of actively used systems.
- Performance could be compared with the control group.
- Dependent measures could include performance times, user-subjective satisfaction, error rates, and user retention over time.

Chapter : 5

❖ **Examples of Direct Manipulation systems**

♦ **Command line vs. display editors and word processors**

- Training times with display editors are much less than line editors
- Line editors are generally more flexible and powerful
- The advances of WYSIWYG word processors:
  - Display a full page of text
  - Display of the document in the form that it will appear when the final printing is done
  - Show cursor action
  - Control cursor motion through physically obvious and intuitively natural means
  - Use of labeled icon for actions
  - Display of the results of an action immediately
  - Provide rapid response and display
  - Offer easily reversible actions

♦ **Technologies that derive from the word processor:**

- Integration
- Desktop publication software
- Slide-presentation software
- Hypermedia environments
- Improved macro facilities
- Spell checker and thesaurus
- Grammar checkers

♦ **The VisiCalc spreadsheet and its descendants**

- VisiCalc users delighted in watching the program propagate changes across the screen.
- In some cases, spatial representations provide a better model of reality
- Successful spatial data-management systems depend on choosing appropriate:
  - Icons
  - Graphical representations
  - Natural and comprehensible data layouts

♦ **Video games**

- Nintendo Wii, Sony PlayStation, and Microsoft Xbox

- Field of action is visual and compelling
- Commands are physical actions whose results are immediately shown on the screen
- No syntax to remember
- Most games continuously display a score
- Direct manipulation in SimSity
- Second Life virtual world
- Spore
- Myst well received
- DOOM and Quake controversial

♦ **Computer-aided design**

- Computer-aided design (CAD) use direct manipulation
- Manipulate the object of interest
- Generate alternatives easily
- Explain the impact
- Problem solving by analogy to the real-world

♦ **Office automation**

- Xerox Star was a pioneer with sophisticated formatting
- Apple Lisa System
- Rapid and continuous graphical interaction
- Microsoft Windows is a descendant

♦ **Spatial data management**

- The success of a spatial data-management system depends on the skill of the designers in choosing icons, graphical representations, and data layouts that are natural and comprehensible to users.

❖ **Problems with direct manipulation**

- Spatial or visual representations can be too spread out
- High-level flowcharts and database-schema can become confusing
- Designs may force valuable information off of the screen
- Users must learn the graphical representations

- The visual representation may be misleading
- Typing commands with the keyboard may be faster

❖ Principles of Direct Manipulation

1. Continuous representations of the objects and actions of interest with meaningful visual metaphors.
2. Physical actions or presses of labeled buttons, instead of complex syntax.
3. Rapid, incremental, reversible actions whose effects on the objects of interest are visible immediately.

❖ Virtual and Augmented Reality

- Virtual reality breaks the physical limitations of space and allow users to act as though they were somewhere else
- Augmented reality shows the real world with an overlay of additional overlay
- Situational awareness shows information about the real world that surrounds you by tracking your movements in a computer model
- Augmented reality is an important variant
  - Enables users to see the real world with an overlay of additional interaction.
- Successful virtual environments depend on the smooth integration of:
  - Visual Display
  - Head position sensing
  - Hand-position sensing
  - Force feedback
  - Sound input and output
  - Other sensations
  - Cooperative and competitive virtual reality

Chapter : 6

❖ Types of Single Menus:- {It's not about the number of menus it's about tasks}

- **Binary Menus {**Mnemonic letters , Radio Buttons, Button Choice**}**
- **Multiple-item Menus**
- **Multiple-selection menus or check boxes**
- **Pull-down, pop-up, and toolbar menus**
  - Pull-down menus
    - Always available to the user by making selections on a top menu bar
    - Key board shortcuts
      - E.g., Ctrl-C important to support expert user efficiency

- Toolbars, iconic menus, and palletes
  - Offers actions on a displayed object
- Pop-up menus
  - Appear on a display in response to a check or tap with a pointing device.

- **Menus for long lists**
  - Scrolling menus, combo boxes, and fisheye menus
    - Scrolling menus display the first portion of the menu and an additional menu item, typically an arrow that leads to the next set of items in the menu sequence.
    - Combo boxes combine a scrolling menu with a text-entry filed.
    - Fisheye menus display all of the menu items on the screen at once, but show only items near the cursor at full size.

- **Menus for long lists (cont.)**
  - Sliders and alphasliders
    - When items consist of ranges or numerical values, a slider is a natural choice to allow the selection of a value.
    - The alphaslider uses multiple levels of granularity in moving the slider thumb and therefore can support tens or hundreds of thousands of items.
  - Two-dimensional menus
    - "Fast and vast" two-dimensional menus give users a good overview of the choices, reduce the number of required actions, and allow rapid selection.

- **Embedded menus and hotlinks**
  - Embedded menus are an alternative to explicit menus
  - It is natural to allow users reading about people, events, and places to retrieve detailed information by selecting menus in context. (sharing location)

❖ **Menu layout (selection) guidelines.**

1. Use task semantics to organize menus (single, linear sequence, tree structure, acyclic and cyclic networks).
2. Prefer broad-shallow to narrow-deep.
3. Show position by graphics, numbers, or titles.
4. Use items as titles for subtrees.
5. Group items meaningfully.
6. Sequence items meaningfully.
7. Use brief items; begin with the keyword.

8. Use consistent grammar, layout, and terminology.
9. Allow type ahead, jump ahead, or other shortcuts.
10. Enable jumps to previous and main menu.
11. Consider online help, novel selection mechanisms, and optimal response time, display rate, and screen size.

❖ **Menu layout (content organization):-**

- **Titles**
  - For single menus, use a simple descriptive title.
  - For tree-structured menus, use the exact same words in the higher-level menu items as in the titles for the next lower-level menu.
    - E.g. if a menu item is called Business and Financial Services, the next screen should have that phrase as its title.
  - Phrasing of menu items
    - Use familiar and consistent terminology
    - Ensure that items are distinct from one another
    - Use consistent and concise phrasing
    - Bring the keyword to the left
- **Graphic layout and design**
  - Constraints
    - {screen width and length, display rate, character set , highlighting techniques}
- **Establish guidelines for consistency of at least these menu components:**
  - {Titles , Item placement, Instructions, Error messages, Status reports}
- **Techniques**
  - Indentation
  - Upper/lower case characters
  - Symbols such as * or - to create separators or outlines
  - Position markers
  - Cascading or walking menus
  - Magic lens

❖ **Dialog Boxes**

- Combination of menu and form fill-in techniques.
- **Internal layout guidelines**:
  - Meaningful title, consistent style
  - Top-left to bottom-right sequencing
  - Clustering and emphasis

- Consistent layouts (margins, grid, white space, lines, boxes)
- Consistent terminology, fonts, capitalization, justification
- Standard buttons (OK, Cancel)
- Error prevention by direct manipulation

- External Relationship
  - Smooth appearance and disappearance
  - Distinguishable but small boundary
  - Size small enough to reduce overlap problems
  - Display close to appropriate items
  - No overlap of required items
  - Easy to make disappear
  - Clear how to complete/cancel

Chapter : 7

❖ Basic Goals of Language Design

- Precision
- Compactness
- Ease in writing and reading
- Speed in learning
- Simplicity to reduce errors
- Ease of retention over time

❖ Higher-Level Goals of Language Design

- Close correspondence between reality and the notation
- Convenience in carrying out manipulations relevant to user's tasks
- Compatibility with existing notations
- Flexibility to accommodate novice and expert users
- Expressiveness to encourage creativity
- Visual appeal

❖ Six Potential Abbreviation Strategies

- Simple truncation: The first, second, third, etc. letters of each command.
- Vowel drop with simple truncation: Eliminate vowels and use some of what remains.
- First and last letter: Since the first and last letters are highly visible, use them.
- First letter of each word in a phrase: Use with a hierarchical design plan.
- Standard abbreviations from other contexts: Use familiar abbreviations.
- Phonics: Focus attention on the sound.

❖ Command-language guidelines

- Create an explicit model of objects and actions.
- Choose meaningful, specific, distinctive names.
- Try to achieve a hierarchical structure.
- Provide a consistent structure (hierarchy, argument order, and action-object).
- Support consistent abbreviation rules (prefer truncation to one letter).
- Offer frequent users the ability to create macros.
- Consider command menus on high-speed displays.
- Limit the number of commands and ways of accomplishing a task.

Chapter : 8

❖ Keyboard Layouts

- **QWERTY layout**
  - 1870 Christopher Latham Sholes
  - good mechanical design and a clever placement of the letters that slowed down the users enough that key jamming was infrequent
  - put frequently used letter pairs far apart, thereby increasing finger travel distances
- **Dvorak layout**
  - 1920
  - reduces finger travel distances by at least one order of magnitude
  - Acceptance has been slow despite the dedicated efforts of some devotees
  - it takes about 1 week of regular typing to make the switch, but most users have been unwilling to invest the effort
- **ABCDE style**
  - 26 letters of the alphabet laid out in alphabetical order nontypists will find it easier to locate the keys
- **Additional keyboard issues**
  - IBM PC keyboard was widely criticized because of the placement of a few keys
    - backslash key where most typists expect SHIFT key
    - placement of several special characters near the ENTER key
  - Number pad layout
  - wrist and hand placement

Pointing Devices { What are the 6 operations which perform by Pointing Devices? }

Pointing devices are applicable in six types of interaction tasks:

1. **Select:**
   - user chooses from a set of items.
   - used for traditional menu selection, identification of a file in a directory, or marking of a part in an automobile design.
2. **Position:**
   - user chooses a point in a one-, two-, three-, or higher-dimensional space
   - used to create a drawing, to place a new window, or to drag a block of text in a figure.
3. **Orient:**
   - user chooses a direction in a two-, three-, or higher-dimensional space.
   - direction may simply rotate a symbol on the screen, indicate a direction of motion for a space ship, or control the operation of a robot arm.
4. **Path:**
   - user rapidly performs a series of position and orient operations.
   - may be realized as a curving line in a drawing program, the instructions for a cloth cutting machine, or the route on a map.
5. **Quantify:**
   - user specifies a numeric value.
   - usually a one-dimensional selection of integer or real values to set parameters, such as the page number in a document, the velocity of a ship, or the amplitude of a sound.
6. **Text:**
   - user enters, moves, and edits text in a two-dimensional space. The
   - pointing device indicates the location of an insertion, deletion, or change.
   - more elaborate tasks, such as centering; margin setting; font sizes; highlighting, such as boldface or underscore; and page layout.

❖ Speech and auditory interfaces

Opportunities

- When users have vision impairments
- When the speaker's hands are busy
- When mobility is required
- When the speaker's eyes are occupied
- When harsh or cramped conditions preclude use of a keyboard

Technologies

- Speech store and forward
- Discrete-word recognition
- Continuous-speech recognition
- Voice information systems
- Speech generation

Obstacles to speech recognition

- Increased cognitive load compared to pointing
- Interference from noisy environments
- Unstable recognition across changing users, environments, and time

Obstacles to speech output

- Slow pace of speech output when compared to visual displays
- Ephemeral nature of speech
- Difficulty in scanning / searching

❖ Display technology

- Monochrome displays
  - are adequate, and are attractive because of their lower cost
- RGB shadow-mask displays
  - small dots of red, green, and blue phosphors packed closely
- Raster-scan cathode-ray tube (CRT)
  - electron beam sweeping out lines of dots to form letters
  - refresh rates 30 to 70 per second
- Liquid-crystal displays (LCDs)
  - voltage changes influence the polarization of tiny capsules of liquid crystals
  - flicker-free
  - size of the capsules limits the resolution
- Plasma panel
  - rows of horizontal wires are slightly separated from vertical wires by small glass-enclosed capsules of neon-based gases
- Light-emitting diodes (LEDs)
  - certain diodes emit light when a voltage is applied
  - arrays of these small diodes can be assembled to display characters

Chapter : 10

- **Models of response-time impacts**
  - **Response time {Definition}**
  - The number of seconds it takes from the moment users initiate an activity until the computer presents results on the display
  - **User think time {Definition}**
  - The number of seconds the user thinks before entering the next action
- **Designers of response times and display rates in HCI must consider:**
  - complex interaction of technical feasibility
  - cost
  - task complexity
  - user expectations
  - speed of task performance
  - error rates
  - error handling procedures
- **Overall majority of users prefer rapid interactions**
  - Lengthy response times (15 seconds) are detrimental to productivity
  - Rapid response times (1 second or less) are preferable, but can increase errors for complex tasks
- **Display Rate**
  - Alphanumeric displays: The speed in characters per second at which characters appear for the user to read
  - World Wide Web Applications: Display rate may be limited by network transmission speed or server performance
- **Reading textual information from a screen is a challenging cognitive and perceptual task**
  - Users relax when the screen fills instantly- beyond a speed where someone may feel compelled to keep up
- **Cognitive human performance would be useful for:**
  - making predictions
  - designing systems
  - formulating management policies
- Expectations and Attitudes
- Response-time choke
  - A system is slowed down when the load is light and potential performance high
  - Makes the response time more uniform over time and across users, avoiding expectations that can't always be met
  - Response time across web sites varies, It effects user interest and quality assessment
  - Three primary factors influence users' expectations and attitudes regarding response time::
    - Previous experiences
    - The individual's tolerance for delays
    - Task complexity

❖ Variability in Response Time.

- People are willing to pay substantial amounts of money to reduce the variability in their lives. e.g.: The entire insurance industry is based on the reduction of present pleasures
- Goodman and Spence
  - [للتوضيح فقط] Goodman and Spence (1982) measured performance changes as a result of response-time variation in a problem-solving situation. They found no significant performance changes as the variability was increased. The time to solution and the profile of command use were unchanged. As the variability increased, participants took advantage of fast responses by entering subsequent commands immediately, balancing the time lost in waiting for slower responses. Other researchers found similar results.
  - Subjects took more advantage of fast response time by making their subsequent commands immediately and balancing the time lost in waiting for slower responses
- Modest variations in response time (plus or minus 50% of the mean) appear to be tolerable and to have little effect on performance.
- It may be useful to slow down unexpected fast responses to avoid surprising users. This proposal is controversial, but it would affect only a small fraction of user interactions.

Chapter : 11

❖ Error messages

- Phrasing of error messages or diagnostic warnings is critical, especially when dealing with novices
- Avoid
  - imperious tone that condemns user
  - messages that are too generic (e.g. WHAT? or SYNTAX ERROR)
  - messages that are too obscure (e.g. FAC RJCT 004004400400)
- Specificity

Poor	Better
SYNTAX ERROR	Unmatched left parenthesis
ILLEGAL ENTRY	Type first letter: Send, Read, or Drop
INVALID DATA	Days range from 1 to 31
BAD FILE NAME	File names must begin with a letter

- **Constructive guidance and positive tone**
  - Messages should, where possible, indicate what users should do to correct the problem
  - Unnecessarily hostile messages using violent terminology can disturb non-technical users:

- FATAL ERROR, RUN ABORTED
- CATASTROPHIC ERROR: LOGGED WITH OPERATOR
- Negative terms such as ILLEGAL, ERROR, INVALID, BAD should be eliminated or used infrequently

Poor	Better
Run-Time error '-2147469 (800405): Method 'Private Profile String' of object 'System' failed.	Virtual memory space consumed. Close some programs and retry.
Resource Conflict Bus: 00 Device: 03 Function: 01	Remove your compact flash card and restart
Network connection refused.	Your password was not recognized. Please retype.
Bad date.	Drop-off date must come after pickup date.

- **User-centered phrasing**
  - Suggests user controls the interface, initializing more than responding
  - User should have control over amount of information system provides e.g. screen tips; a help button for context-sensitive help or an extensive online user manual
  - Telephone company, "We're sorry, but we are unable to complete your call as dialed. Please hang up, check your number, or consult the operator for assistance", versus "Illegal telephone number. Call aborted. Error number 583-2R6.9. Consult your user manual for further information.'
- **Appropriate physical format**
  - use uppercase-only messages for brief, serious warnings
  - avoid code numbers; if required, include at end of message
  - debate over best location of messages. E.g. Could be:
    - near where problem arose
    - placed in consistent position on bottom of screen
    - near to, but not obscuring relevant information
  - audio signals useful, but can be embarrassing - place under user control
- **Development of effective messages**

- Messages should be evaluated by several people and tested with suitable participants
- Messages should appear in user manuals and be given high visibility
- Users may remember the one time when they had difficulties with a computer system rather than the 20 times when everything went well

- Recommendations
  - Increase attention to message design
  - Establish quality control
  - Develop guidelines
    - Have a positive tone
    - Be specific and address the problem in the user's terms
    - Place the users in control of the situation
    - Have a neat, consistent, and comprehensible format
  - Carry out usability test
  - Collect user performance data

❖ **Error-message guidelines for the end product and for the development process.**

Product

- Be as specific and precise as possible. Determine necessary, relevant error messages.
- Be constructive. Indicate what the user needs to do.
- Use a positive tone. Avoid condemnation. Be courteous.
- Choose user-centered phrasing. State problem, cause, solution.
- Consider multiple levels of messages. State brief, sufficient information to assist with the corrective action.
- Maintain consistent grammatical forms, terminology, and abbreviations.
- Maintain consistent visual format and placement.

Process

- Increase attention to message design.
- Establish quality control.
- Develop guidelines.
- Carry out usability tests.
- Record the frequency of occurrence for each message.

❖ **Nonanthropomorphic design**

- Concerns {reasons for using Nonanthropomorphic design }
  1. attributions of intelligence, autonomy, free will, etc can deceive, confuse, and mislead users

2. important to clarify differences between people and computers
3. users and designers must accept responsibility for misuse of computers
4. although attractive to some people, an anthropomorphic interface can produce anxiety in others
    - computers can make people feel dumb
    - computers should be transparent and support concentrating on the task in hand
5. mature technology should avoid Mumford's obstacle of animism
6. anthropomorphic interfaces may distract users

- Microsoft's ill-fated Clippet character was intended to provide help suggestions
    - Amused some, but annoyed many
    - Disruptive interference
    - Lacked appropriate emotional expressions

- Advocates of anthropomorphic interfaces suggest that they may be most useful as teachers, salespeople, therapists, or entertainment figures
- An alternative design is to present a human author of a package through prerecorded audio or video

❖ **Guidelines for Nonanthropomorphic design:-**

○ Guidelines for avoiding anthropomorphism and building appealing interfaces.

– Be cautious in presenting computers as people.
– Design comprehensible, predictable, and controllable interfaces.
– Use appropriate humans for introductions or guides.
– Use cartoon characters in games or children's software, but usually not elsewhere
– Provide user-centered overviews for orientation and closure.
– Do not use 'I' pronouns when the computer responds to human actions.
– Use "you" to guide users, or just state facts.

❖ **The top ten mistakes of web-based presentation of information:-**

1. Burying information too deep in a web site
2. Overloading pages with too much material

3. Providing awkward or confusing navigation
4. Putting information in unexpected places on the page
5. Not making links obvious and clear
6. Presenting information in bad tables
7. Making text so small that many users cannot read it
8. Using color combinations for text that many users cannot read
9. Using bad forms
10. Hiding (or not providing) features that could help users

❖ Guidelines for using color

1. Use color conservatively
2. Limit the number and amount of colors
3. Recognize the power of color to speed or slow tasks
4. Color coding should support the task
5. Color coding should appear with minimal user effort
6. Color coding should be under user control
7. Design for monochrome first
8. Consider the needs of color-deficient users
9. Color can help in formatting
10. Be consistent in color coding
11. Be alert to common expectations about color codes
12. Be alert to problems with color pairings
13. Use color changes to indicate status changes
14. Use color in graphic displays for greater information density