23CS404: HUMAN COMPUTER INTERACTION

Topic: Overview of HCI, Objectives, Outcomes

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Objectives:

- Understand the fundamental principles of Human-Computer Interaction (HCI) and its importance in designing effective and user-friendly computer systems.
- Learn about the different design approaches, methods, and techniques used in HCI.
- Develop skills in designing, prototyping, and evaluating user interfaces.
- Understand the importance of user-centered design and usability testing in HCI.
- Learn about the latest trends and technologies in HCI, including mobile and ubiquitous computing, artificial intelligence, and virtual reality.

- To gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface design in general, and alternatives to traditional "keyboard and mouse" computing;
- become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task performance by humans;
- be able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks and recognize the limits of human performance as they apply to computer operation; appreciate the importance of a design and evaluation methodology that begins with and maintains a focus on the user;
- be familiar with a variety of both conventional and non-traditional user interface paradigms, the latter including virtual and augmented reality, mobile and wearable computing, and ubiquitous computing; and understand the social implications of technology and their ethical responsibilities as engineers in the design of technological systems. Finally, working in small groups on a product design from start to finish will provide you within valuable team-work experience.

Uses of the Course

- User Experience (UX) Design: Students will learn about the principles and methods of UX design and how to apply them to real-world problems.
- Human-Computer Interaction (HCI) Research: Students will learn about the latest research in HCI and how to design and conduct studies to investigate HCI-related topics.
- Software Development: Students will learn about the importance of HCI in software development and how to design and evaluate user interfaces for software applications.
- Human Factors Engineering: Students will learn about the principles and methods of human factors engineering and how to apply them to design and evaluate user interfaces.
- Data Science and Analytics: Students will learn about the importance of HCI in data science and analytics and how to design and evaluate user interfaces for data visualization and analysis

Applications of the Course:

- Designing User Interfaces for Software Applications: Students will learn how to design and evaluate user interfaces for software applications, including mobile apps, web applications, and desktop applications.
- Designing User Interfaces for IoT Devices: Students will learn how to design and evaluate user interfaces for IoT devices, including smart home devices, wearables, and autonomous vehicles.
- Designing User Interfaces for Virtual and Augmented Reality: Students will learn how to design and evaluate user interfaces for virtual and augmented reality applications, including games, education, and training.
- Designing User Interfaces for Data Visualization and Analysis: Students will learn how to design and evaluate user interfaces for data visualization and analysis, including dashboards, reports, and data storytelling.
- Designing User Interfaces for Accessibility: Students will learn how to design and evaluate user interfaces for accessibility, including designing for users with disabilities, older adults, and children.

Module I: Introduction to User Interface

- Definition of User Interface: The point of interaction between a user and a computer system.
- Importance of Good Design: A well-designed user interface can improve user experience, increase productivity, and reduce errors.
- Benefits of Good Design: Good design can lead to increased user satisfaction, reduced training time, and improved overall system performance.
- Brief History of Screen Design: The evolution of screen design from command-line interfaces to graphical user interfaces (GUIs).
- Graphical User Interface (GUI): A GUI uses visual elements such as icons, menus, and windows to interact with a computer system.
- Principles of User Interface: Consistency, visibility, affordance, feedback, and flexibility.

Module II: Design Process

- 1. Human Interaction with Computers: Understanding human characteristics, such as cognitive abilities and physical limitations, is crucial for designing effective user interfaces.
- 2. Screen Designing: Design goals, screen planning, organizing screen elements, ordering of screen data and content, screen navigation and flow.
- 3. Visually Pleasing Composition: Balancing visual elements, such as color, texture, and typography, to create an aesthetically pleasing interface.
- 4. Technological Considerations: Considering hardware and software limitations, such as screen resolution and processing power, when designing a user interface.

Module III: Windows and Navigation

- 1. Windows: Understanding the different types of windows, such as dialog boxes and pop-up windows, and how to use them effectively.
- 2. Navigation Schemes: Designing navigation schemes, such as menus and tabs, to help users move through a system.
- 3. Selection of Window: Choosing the right window type for a specific task or function.
- 4. Components: Understanding the different components of a user interface, such as text, icons, and multimedia.

Module IV: HCI in the Software Process

- 1. Usability Engineering: Integrating usability principles and methods into the software development process.
- 2. Iterative Design and Prototyping: Designing and testing multiple prototypes to refine a user interface.
- 3. Design Focus: Understanding the importance of design in the software development process.
- 4. Evaluation Techniques: Using various evaluation techniques, such as expert analysis and user testing, to assess the usability of a system.

Module V: Cognitive Models and Ubiquitous Computing

- 1. Cognitive Models: Understanding how users process information and make decisions when interacting with a system.
- 2. Goal and Task Hierarchies: Breaking down complex tasks into smaller, more manageable goals and subtasks.
- 3. Ubiquitous Computing: Designing systems that are integrated into everyday life and environments.
- 4. Virtual and Augmented Reality: Understanding the principles and applications of virtual and augmented reality systems.

Course Outcomes:

- Ability to apply HCI and principles to interaction design.
- Ability to design certain tools for blind or PH people.
- Ability to create, edits, and manages text-based content, as well as understands and responds to system messages.
- Analyze interface problems to recognize what design approach and interaction styles are required in the light of usability standards and guidelines.
- Ability to design and develop an interface by using appropriate HCI techniques that are preferred by the user.

- Students will be able to design and evaluate user interfaces that are intuitive, easy to use, and meet the needs of the target audience.
- Students will understand the importance of user-centered design and usability testing in HCI.
- Students will be able to apply HCI principles and methods to real-world problems and design effective solutions.
- Students will develop skills in communication, teamwork, and project management through group projects and presentations.
- Students will be aware of the latest trends and technologies in HCI and their potential applications in different fields.

Thank You..

Next Video Topic: **Importance of user Interface – definition, importance of good design. Benefits of good design.A brief history of Screen design.**

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Topic: Introduction to HCI & Graphical User Interface

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- Human–computer interaction (HCI), alternatively man–machine interaction (MMI) or computer– human interaction (CHI) is the study of interaction **between people (users) and computers**
- **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

- A basic goal of HCI is
  - to improve the interactions between users and computers
  - by making computers more usable and receptive to the user's needs.
- A long term goal of HCI is
  - to design systems that minimize the barrier between the human's cognitive model of what they want
  - to accomplish and the computer's understanding of the user's task

Why is HCI important

- User-centered design is getting a crucial role!
- It is getting more important today to increase competitiveness via HCI studies (Norman, 1990)
- High-cost e-transformation investments
- Users lose time with badly designed products and services
- Users even give up using bad interface
  - – Ineffective allocation of resources

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, physical limitations and abilities people possess,
  - how information processing systems work,
  - what people find enjoyable and attractive.

- 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 / her needs to the computer.
  - Some common input components are the keyboard, mouse, trackball, one's finger, and one's voice.
- *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.

- 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 Importance of Good Design

- With today's technology and tools, and our motivation to create really effective and usable interfaces and screens, why do we continue to produce systems that are inefficient and confusing or, at worst, just plain unusable? Is it because:
- We don't care?
- We don't possess common sense?
- We don't have the time?
- We still don't know what really makes good design?

- But we never seem to have time to find out what makes good design, nor to properly apply it. After all, many of us have other things to do in addition to designing interfaces and screens.
- So we take our best shot given the workload and time constraints imposed upon us. The result, too often, is woefully inadequate.
- Interface and screen design were really a matter of com- mon sense, we developers would have been producing *almost identical* screens for representing the real world.

The Importance of the Good Design

- A well-designed interface and screen is terribly important to our users. It is their window to view the capabilities of the system.

- It is also the vehicle through which many critical tasks are presented. 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.

Benefits of Good Design

- **Design:**
  Achieving goals within constraints.

  Goals:
  What is the purpose of the design we are intending to produce?
  Who is it for?
  What do they want?

  Constraints:
  what software's/ hardware's we must use?
  What standards we must adopt?
  How much can it cost?
  How much time require to develop?

- **Benefits of Good Design**

  For designing good UI there are 4 E’s
  1) Easy to use
  2) Easy to understand
  3) Error free
  4) Effective for end goal

  Good UI vs Bad UI
  Good UI-
  1) **Intuitive**- People find their way easily
  2) **Familiar**- for the first time they visit , they should feel like they knows how it works
  3)**Leading-** the best UI will lead people from point to point, moving them to ultimate goal

- **Benefits of Good Design**

Bad UI-
1) **Sluggish & Unresponsive-** interaction will be slow.
2) **Complicated-** hard for people to understand
3) **Confusing-** unclear about where the visitor should go next
4) **Inconsistent Design-** Pages will look different
5) **No Target-** there is no clear audience for web site
6) **Lack of social interaction-** Social media plays a big role in business now a days and people like to see that
7)**Readability Issues-** font size, color etc.

The Benefits of Good Design

- Poor clarity forced screen users to spend one extra second per screen.
  - Almost one additional year would be required to process all screens.
  - Twenty extra seconds in screen usage time adds an additional 14 person years.
- The benefits of a well designed screen have also been under experimental scrutiny for many years.
  - 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.
  - Decision making time reduced by 40% resulting in saving 79 person-years

- 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.
- employee satisfaction is increased because aggravation and frustration are reduced.
- Ultimately, that an organization's customers benefit because of the improved service they receive.

- Identifying and resolving problems during the design and development process also has significant economic benefits
- How many screens are used each day in our technological world?
- How many screens are used each day in your organization? Thousands? Millions?
- Imagine the possible savings. Proper screen design might also, of course, lower the costs of replacing "broken" PCs.

A Brief History of Screen Design

- While developers have been designing screens since a cathode ray tube display was first attached to a computer, more widespread interest in the application of good design principles to screens did not begin to emerge until the early 1970s, when IBM introduced its 3270 cathode ray tube text-based terminal.
- A 1970s screen often resembled the one pictured in Figure
- 1.1. It usually consisted of many fields (more than are illustrated here) with very cryptic and often unintelligible captions

TDX95210 THE CAR RENTAL COMPANY 10/11/16 10:25

NAME		TEL		RO
PUD	RD	C	RT	MPD

ENTRY ERROR XX465628996Q.997

COMMAND Ⓟ

Figure 1.1 A 1970s screen.

A Brief History of Screen Design

- It was visually cluttered, and often possessed a command field that challenged the user to remember what had to be keyed into it.
- Ambiguous messages often required referral to a manual to interpret.
- Effectively using this kind of screen required a great deal of practice and patience.
- Most early screens were monochromatic, typically presenting green text on black backgrounds.

- At the turn of the decade guidelines for text-based screen design were finally made widely available and many screens began to take on a much less cluttered look through concepts such as grouping and alignment of elements, as illustrated in Figure 1.2.

- User memory was supported by providing clear and meaningful field captions and by listing commands on the screen, and enabling them to be applied, through function keys. Messages also became clearer.

THE CAR RENTAL COMPANY

- RENTER»

  •Name: ______________________________Telephone: _____
- LOCATION»

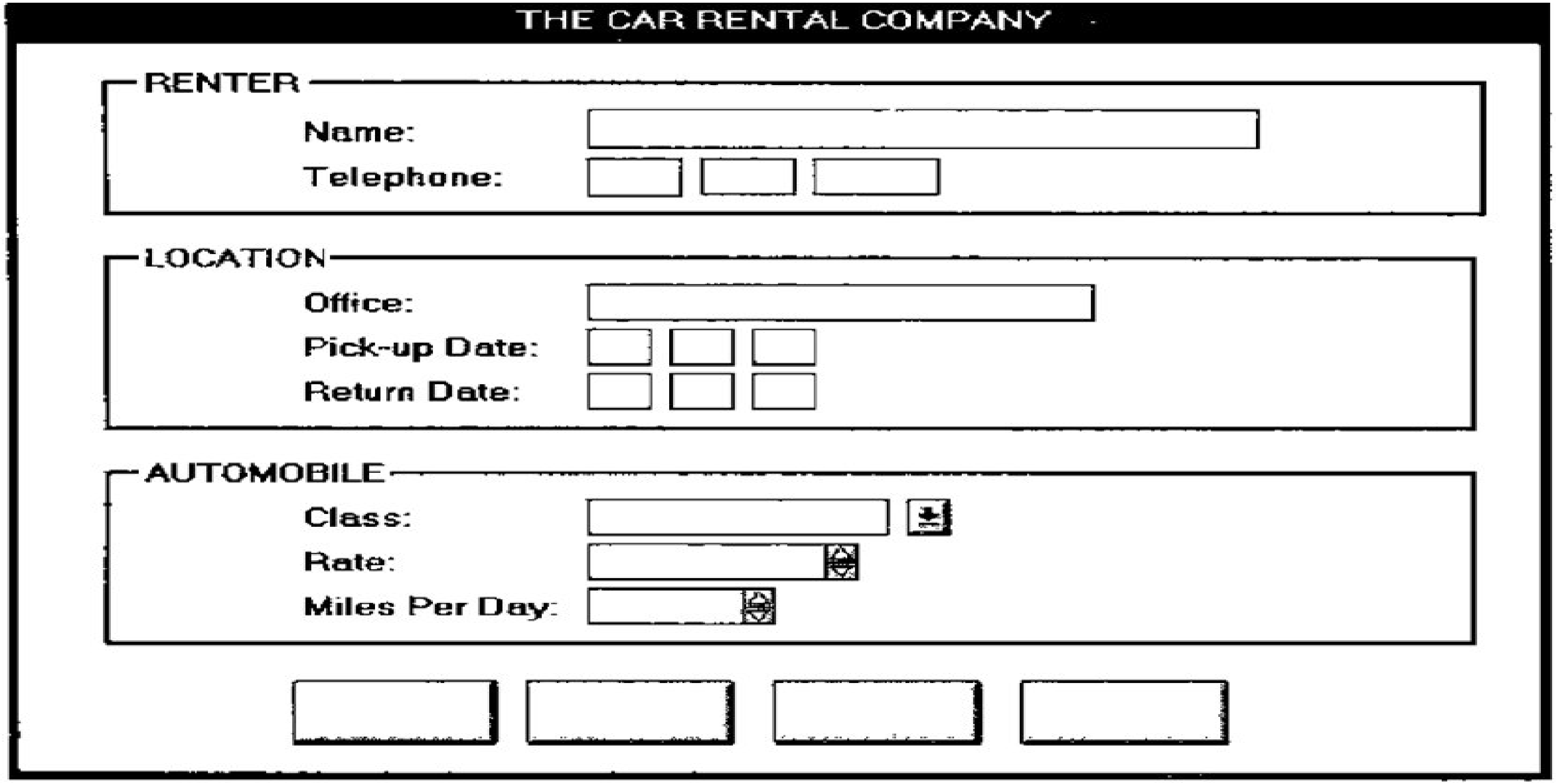
  •Office: _____________________________Pick-up Date: ___________
  Return Date: ________________________
- AUTOMOBIL»
  - Class:________(PR. ST. FU. MD. CO. SC)
  - Rate: ______________________________________Miles per Day:____
- The maximum allowed miles per day is 150. Enter Fl-Help F3-Exit F12=Cancel

1980 s screen.

- These screens were not entirely clutter-free, however. Instructions and reminders to the user had to be inscribed on the screen in the form of prompts or completion aids such as the codes PR and Sc.

- Not all 1980s screens looked like this, however. In the 1980s, 1970s-type screens were still being designed, and many still reside in systems today.

- The advent of graphics yielded another milestone in the evolution of screen design, as illustrated in Figure
- 1.3. While some basic "design principles did not change, groupings and alignment, for example, borders were made available to visually enhance groupings, and buttons and menus for implementing commands replaced function keys.


THE CAR RENTAL COMPANY
RENTER
Name:
Telephone:
LOCATION
Office:
Pick-up Date:
Return Date:
AUTOMOBILE
Class:
Rate:
Miles Per Day:

- Multiple properties of elements were also provided, including many different font sizes and styles, line thicknesses, and colors.
- The entry field was supplemented by a multitude of other kinds of controls, including list boxes, drop-down combination boxes, spin boxes, and so forth.
- These new controls were much more effective in sup- porting a person's memory, now simply allowing for selection from a list instead of requiring a remembered key entry.

- Completion aids disappeared from screens, replaced by one of the new listing controls. Screens could also be simplified, the much more powerful computers being able to quickly present a new screen.

- In the 1990s, our knowledge concerning what makes effective screen design continued to expand. Coupled with ever-improving technology, the result was even greater improvements in the user-computer screen interface as the new century dawned.

THE POPULARITY OF GRAPHICS

- A graphical screen bore scant resemblance to its earlier text-based colleagues.
- Older text-based screen possessed a one dimensional
- Graphic screens assumed a three-dimensional look.
- Controls appeared to rise above the screen and move when activated.
- Information could appear, and disappear, as needed.
- 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, and palettes coexisted with the reliable old text entry field
- More sophisticated text entry fields with attached or dropdown menus of.

Objects and actions were selected through use of pointing mechanisms.

THE CONCEPT OF DIRECT MANIPULATION

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.

A person has the power to access and modify these objects, among which are windows.

A person is allowed to work in a familiar environment and in a familiar way, focusing on the data, not the application and tools.

- **CHARACTERISTICS OF THE GRAPHICAL USER INTERFACE**

- A graphical system possesses a set of defining concepts. Included are sophisticated visual Presentation, pick-and click interaction, a restricted set of interface options, visualization, object orientation, extensive use of a person's recognition memory, and concurrent performance of functions

Sophisticated Visual Presentation:

- Visual presentation is the visual aspect of the interface. It is what people see on the screen.

- 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

PRINCIPLES OF USER INTERFACE DESIGN

- An interface must really be just an extension of a person. This means that the system and its software must reflect a person's capabilities and respond to his or her specific needs.
- It should be useful, accomplishing some business objectives faster and more efficiently than the previously used method or tool did.
- It must also be easy to learn, for people want to do, not learn to do.
- Finally, the system must be easy and fun to use, evoking a sense of pleasure and accomplishment not tedium and frustration.
- The interface itself should serve as both a connector and a separator
- a connector in that it ties the user to the power of the computer, and a separator in that it minimizes the possibility of the participants damaging one another

PRINCIPLES FOR THE XEROX STAR

- The design of the Xerox STAR was guided by a set of principles that evolved over its lengthy development process. These principles established the foundation for graphical interfaces.

- Displaying objects that are selectable and manipulable must be created.
- A design challenge is to invent a set of displayable objects that are represented meaningfully and appropriately for the intended application.

- It must be clear that these objects can be selected, and how to select them must be Self-evident.

- **GENERAL PRINCIPLES**

- The design goals in creating a user interface are described below.
- They are fundamental to the design and implementation of all effective interfaces, including GUI and Web ones.
- These principles are general characteristics of the interface, and they apply to all aspects.
- The compilation is presented alphabetically, and the ordering is not intended to imply degree of importance.

Thank You..

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Topic: Design process

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Design process
Obstacles and pitfalls in development path

- No body ever gets it right for the first time
- Development is chock full of surprises.
- Making contracts to ignore change will never eliminate the need for change
- Designers need good tools.
- Performance design goals
- People may make mistakes while using a good system also

Common pitfalls

- No early analysis and understanding the users needs and expectations.
- A focus on using design features or components .
- No usability testing.
- No common design team vision.
- Poor communication between members of the development team

Designing for people: The five commandments

1. Gain a complete understanding of users and their tasks

2. Solicit early and ongoing user involvement

- involving user from the beginning provides a direct channel to the knowledge they possess about jobs, tasks and needs. User involvement should be based on job or task knowledge not status or position.
- **3. Perform rapid prototyping and testing**
- prototyping and testing will quickly identify problems and allows you to develop solutions. Those should be continually performed during all stages of development to uncover all potential defects
- **4. Modify and iterate the design as much as necessary**
- Design will proceed through series of stages problems detected in one stage may force the developer to revisit a previous stage.

- **5. Integrate the design of all system components**
- The software, the documentation, the help function all are important elements of a graphical system/website & should be developed concurrently
- Complex linkage.
- Inadequate feedback.
- Lack of system anticipation.
- Inadequate error messages

Irritating characters

- **Visual clutter**
- Meaningless graphics and unnecessary and wasteful decoration form a visual noise

- **Impaired information readability**
- Page readability is diminished by poor developer choices, colors and graphics.

- **Incomprehensible components**
- some design elements, icons and graphics, buttons contains no text to explain what they do. Language is also often confusing

Irritating characters

- **Annoying distractions.**
- Animation, scrolling and blinking text distracts users eye and attention and destroy page readability. Automatically presented music or sounds , popup windows interrupts user concentration and wastes time.

- **Confusing navigation.**
- Violates expectations and results in disturbing un expected behavior

- **Inefficient operations**
- Pages contain large graphics, maps, large chunky headings or many colors take longer to download than text.
- **inefficient page scrolling.**
- Long pages requires scrolling frequently which cause irrelevancy or noise
- **Information overload**
- Poorly organized or large amount of information puts heavy mental loads.
- **Outdated information**
- It destroys sites credibility

Design team

- Development
- Human factors
- Visual Design
- Usability assesment
- Documentation
- Training

Human interaction with computers

- **Understanding How People Interact with Computers :**
  - Characteristics of computer systems, past and present, that have caused, and are causing, people problems. We will then look at the effect these problems have -

- **Why people have trouble with computers**

- **Responses to poor design**

- **People and their tasks**

Why People Have Trouble with Computers

- The design of business systems has been the responsibility of programmers, system analysts, system designers who possess extensive technical knowledge but little behavioral training.
- with its extensive graphical capabilities.
- Poorly designed interfaces.
- What makes a system difficult to use in the eyes of its user?

1. **Use of jargon**

- systems speak in a strange language. Learning a system often requires learning a new language
- **2. Non obvious design**
- complex design elements are not obvious. Outcomes may not always be immediate, visible. The overall frame work of the system may be invisible, with the effect that results cannot always be related to the action.

Why People Have Trouble with Computers

- **3. Fine distinctions**
- Different actions may accomplish the same thing or different things may result from the same action. Often these distinctions are minute and difficult to keep track of.
- **4. Disparity in problem-solving strategies**
- People learn best by doing. They have trouble following directions and do not always read instructions before taking an action. These problem solving we will call “Trial and error” through which they get tentative solution, these solutions have low chance of success.
- **5. Design inconsistency**
- The same action may have different names **eg: save and keep, write and list.** The same command may cause different things to happen. The same result may be described differently **eg: not legal and not valid.** Meaningful/ conceptual learning becomes very difficult.

Responses to poor design
1) Psychological

- Typical psychological responses to poor design are:
- **Confusion:** Meaningful patterns are difficult to discover, and the conceptual model or underlying framework cannot be understood or established.
- **Annoyance:** Roadblocks that prevent a task being completed, or a need from being satisfied, promptly and efficiently lead to annoyance. Inconsistencies in design, slow computer reaction times, difficulties in quickly finding information, out dated information are few of many things that may annoy users.

- **Frustration:** An inability to easily convey one's intentions to the computer, or an inability to finish a task or satisfy a need can cause frustration.
  - Inflexible and unforgiving systems are a major source of frustration.
- **Panic or stress:** Unexpectedly long delays during times of severe or unusual pressure may introduce panic or stress. Some typical causes are unavailable systems or long response times when the user is operating under a deadline.
- **Boredom:** Boredom results from improper computer performance (slow response times or long download times) or overly simplistic jobs.

- These psychological responses diminish user effectiveness because they are severe blocks to concentration.

➢ Thoughts irrelevant to the task at hand are forced to the user's attention, and necessary concentration is impossible.

➢ The result, in addition to higher error rates, is poor performance, anxiety, and dissatisfaction

(2) Physical

- Psychological responses frequently lead to, or accompanied by, the following physical reactions.
- **1) Abandonment of the system:** The system is rejected and other information sources are relied upon.
- These sources must be available and the user must have the circumstances to perform the rejection.
- In business systems this is a common reaction of managerial and professional personnel. With the Web, almost all users can exercise this option.

- **2) Partial use of the system:**
- Only a portion of the system's capabilities are used, usually those operations that are easiest to perform or that provide the most benefits.
- Historically, this has been the most common user reaction to most computer systems. Many aspects of many systems often go unused.
- **3) Indirect use of the system:** An intermediary is placed between the user and the computer.
- This requires high status and discretion, it is another typical response of managers or others with authority.

- **4) Modification of the task:**
- The task is changed to match the capabilities of the system.
- This is a usual reaction when the tools are rigid and the problem is unstructured, as in scientific problem solving.
- **5) Compensatory activity:**
- Additional actions are performed to compensate for system inadequacies.
- A common example is the manual reformatting of information to match the structure required by the computer.
- **6) Misuse of the system:**
- The rules are bent to shortcut operational difficulties. This requires significant knowledge of the system and may affect system integrity.

- **7) Direct programming:**
- The system is reprogrammed by its user to meet specific needs. This is a typical response of the sophisticated worker.
- These physical responses also greatly diminish user efficiency and effectiveness.
- **3. People and their tasks**
- The users in today offices and homes is usually over worked and continually interrupted. All computer users do tend to do the following
- 1. they don't read documentation
- 2. they don't understand problems well
- 3. they know little about what information is available to meet their needs.

Important Human Characteristics in Design

- Importance in design are perception, memory, visual acuity, foveal and peripheral vision, sensory storage, information processing, learning, skill, and individual differences.

1) Perception

- perception is our awareness and understanding of the elements and objects of our environment through physical sensation of various senses including sight, sound, touch etc.
- Perception is influenced by experience we tend to match objects or sensations recognized to things we already know other perceptual characters include the following
    - **Proximity** Our eyes and mind see objects as belonging together if they are near each other in space

Important Human Characteristics in Design

- **Similarity** – our eyes and mind see objects as belonging together if they share a common visual property such as colour, size, shape, brightness and orientation.
- **Matching patterns-** we respond similarly to the same shape in different sizes
- **Succinctness-** object having some perfect or simple shape because perfection or simplicity is easy to remember.
- **Closure-** even if something does not closed/terminated by itself, we see it as closed anyway
- **Unity-** objects that form similar shapes are recognized as a group
- **Continuity-** shortened lines may be automatically extended

- **Balance-** we desire stabilization in our environment
- **Expectancies-** perception also influenced by expectancies, sometimes we recognize not what is there but what we expect to be there
- **Context-** context, environment and surroundings also influence individual perception
- **Signals versus noise-** what people will feel important is signals and not important was noise . Noise interferes with the perception of signals to the extent that they are similar to each other. Noise can even make a critical signal

• **Eg:** hidden word puzzle, where meaningful words are buried in a large block of alphabetic characters, meaningful words are masked under meaningless letters

- The goal in design is to utilize our perceptual capabilities so a screen can be structured in the most meaningful and obvious way

- **2) Memory:** Memory is not the most stable of human attributes, as anyone who has forgotten why they walked into a room, or forgotten a very important birthday.

➢ ***Short-term*, or working memory-** It receives information from either the senses or long-term memory but cannot receive both at once. Limited amount of information processing takes place and time last from 10 to 30 sec.

➢ Knowledge, experience and familiarity govern the size and complexity of the information that can be remembered.

- When performing complex tasks working memory can be increased through applying two senses

- 1) vision 2) auditory

- ***Long-term* memory** it contains knowledge we possess, information received in short term memory is transferred to it and encoded within it, storage capacity is unlimited.

- **Mighty memory -** our design should minimize the need for mighty memory by reducing user memory loads. This can be achieved when presenting information in an organized, structured, familiar and meaningful way.

- **3) Sensory Storage** – it is the buffer where the automatic processing of information collected from our senses takes place.

➢ It acts like radar constantly scanning the environment for things that are important to pass on to memory, quick detecting of changes and constantly being replaced by new ones.

➢ Design the interface so that all aspects and elements serve a definite purpose.

➢ Eliminating interface noise will ensure that important things will be less likely to be missed.

- **4) Visual Acuity** – The capacity of the eye to resolve details .

- It is the phenomenon that results in an object becoming more distinct when we turn our eyes toward it and rapidly loosing distinctness as we turn our eyes away.

- **Eg:** patterns of closely spaced lines or dots are seen to shimmer. This movement can be distracting and disturbing. So these patterns must be carefully chosen to avoid the visual distraction.

- **5) Foveal & peripheral vision** –

➢ Foveal vision is used to focus directly on something

➢ Peripheral vision senses anything in the area surrounding the location we are looking at, but what is there cannot be clearly resolved because of limitations in visual acuity.

➢ Both foveal and peripheral vision maintain same time, a cooperative and a competitive relationship

➢ In **cooperative** nature peripheral vision is thought to provide clues to where the eye should go next in the visual search of a screen

- In **competitive** nature peripheral vision can compete with foveal vision for attention.

- **6) Information Processing-** The information that our senses collect that is important enough to do some thing about that has to be processed in some meaningful way.
- There are two levels of information processing
- One level is the highest level , identified with consciousness and working memory. It is limited slow and sequential and is used for reading and understanding

- Second level is lower level and limit of its capacity is unknown.
- Both levels function simultaneously, the higher level perform reasoning and problem solving, the lower level recognize the physical form of information sensed.
- **Eg:** when a screen is displayed you are looking the screen for the first time you are new to system you concentrate on its elements , you constantly look at the screen and its components using higher level processing.
- As you become experienced and familiar with screens they can be easily identified very quickly with just a glance . This is nothing but lower level information processing.

- **7) Mental Models:**
- A mental model is simply an internal representation of a person's current understanding of something.
- Mental models are gradually developed in order to understand something, explain things, make decisions, do something, or interact with another person.
- Mental models also enable a person to predict the actions necessary to do things if the action has been forgotten or has not yet been encountered.
- A person already familiar with one computer system will bring to another system a mental model containing specific visual and usage expectation. If the new system complies with already established models it will be much easier to learn and use.
- A key to forming a transferable mental model of a system is design consistency and design standards

- **8) Movement Control :** Once data has been recognized and an appropriate action decided upon, a response must be made. In many cases the response is a movement.
- In computer systems, movements include such activities as pressing keyboard keys, moving the screen pointer by pushing a mouse or rotating a trackball, or clicking a mouse button The implications in screen design are:
  - Provide large objects for important functions.
  - Take advantage of the "pinning" actions of the sides, top, bottom, and corners of the screen.

- **9) Learning:** Learning is the process of encoding in long-term memory information that is contained in short-term memory.
- It is a complex process requiring some effort on our part. Our ability to learn is important, it clearly differentiates people from machines.
- Given enough time people can improve the performance in almost any task. Too often, however, designers use our learning ability as an excuse to justify complex design.
- A design developed to minimize human learning time can greatly accelerate human performance.
- People prefer to stick with what they know, and they prefer to jump in and get started. Unproductive time spent learning is something frequently avoided.
- People prefer to be active, to explore and to learn by trial and error approach

- Learning can be enhanced if it

1) allows skills acquired in one situation to be used in another (design consistency)

2) provides complete and prompt feedback

3) It requires a person to know only the info needed at the stage of learning process.

- **10) Skill:** The goal of human performance is to perform skillfully. To do so requires linking inputs and responses into a sequence of action.
- The essence of skill is performance of actions or movements in the correct time sequence with adequate precision. It is characterized by consistency and economy of effort.
- Economy of effort is achieved by establishing a work pace that represents optimum efficiency.
- It is accomplished by increasing mastery of the system through such things as progressive learning of shortcuts, increased speed, and easier access to information or data.
- Skills are hierarchical in nature, and many basic skills may be integrated to form increasingly complex ones. Lower-order skills tend to become routine and may drop out of consciousness.
- System and screen design must permit development of increasingly skillful performance

- **11) Individual Differences :** A complicating but very advantageous human characteristic is that we all differ-in looks, feelings, motor abilities, intellectual abilities, learning abilities and speed, and so on.
- In a keyboard data entry task, for example, the best typists will probably be twice as fast as the poorest and make 10 times fewer errors.
- Individual differences complicate design because the design must permit people with widely varying characteristics to satisfactorily and comfortably learn the task or job, or use the Web site.

- In the past this has usually resulted in bringing designs down to the level of lowest abilities or selecting people with the minimum skills necessary to perform a job.
- But technology now offers the possibility of tailoring jobs to the specific needs of people with varying and changing learning or skill levels. Multiple versions of a system can easily be created.
- Design must provide for the needs of all potential users

Human Considerations in Design

- **The User's Knowledge and Experience**
  - The knowledge possessed by a person, and the experiences undergone,shape the design of the interface in many ways. The following kinds of knowledge and experiences should be identified.
- **1) Computer Literacy-** Are users Highly technical such as programmers or experienced? Do they have moderate computer experience, or none at all? Will they be familiar with computer concepts and terms, the keyboard and its keys and mouse etc

- **2) System Experience -** Are users familiar with the interaction requirements of the new system. High, moderate, or low knowledge of a particular system and its methods of interaction
- New users or naïve or novice users depend on system features like menus, prompting information, help screens and instructions.
- They need restricted vocabularies, simple tasks and very informative feed back
- They need practice to move up to expert status.
- They have difficulties in dragging & double clicking mouse, window management and file management.

- Expert users rely upon free recall
- Expect rapid performance
- Need less informative feedback
- Intermediate or intermittent users fall somewhere in between both novice and expert users.
- **3) Application experience**
- Have users worked with similar application? Are they familiar with basic application terms? Does little or no experience exist?
- **4) Task Experience-** Are users experienced with task being automated? If it is an insurance claim system do users have experience with paying claims? Do users possess little or no knowledge of tasks the system will be performing

- **5) Other Systems Use -** will the user using other systems while using the new system? If so they will bring certain habits and experiences to the new system. The more compatibility between the systems, the lower the learning requirements for the new system.

- **6) Education** - what is the general education level of the users? High school, college, or advanced degree. Are degrees in specialized areas related to new system use?
- **7) Reading Level** – for textual portions of the interface the vocabulary and grammatical structure must be easily understood by users. Reading level often be inferred with education level Less than 5th grade, 5th-12th, more than 12th grade.

- **8) Typing Skill -** Is the user a competent typist familiar with standard keyboard layout or other new layouts? Competent typist prefer keyboard than mouse , whereas unskilled typist prefer mouse . Expert (135 WPM), skilled (90 WPM), good (55 WPM), average(40 WPM), or "hunt and peck" (10 WPM). Words Per Minute.
- **9) Native Language or Culture-** Do users speak English, another, or several? Will screen be in English or in another language? Other language often impose different screen layout requirements. Will icons, metaphors meaningful for all the user cultures?
- In conclusion all these needs of user knowledge and experience is independent of one another and also useful to look ahead for future

users .

JOB/TASK/NEED

- **1) Type of System Use- Mandatory users** and , their characteristics are
- Computer is used as a part of employment
- Time and effort for learning a system is willingly invested.
- The user may possess technical background
- The job may consist of a single task or function
- **Discretionary users** characteristics are
- Use of the computer is not absolutely necessary
- No interest of technical details
- Extra efforts to use the system may not be invested
- Voluntary use may have to be encouraged.

- **2) Frequency of Use -** Is system use a Continual, frequent, occasional, or once-in-a-lifetime use of system. Frequency of use affects both learning and memory.
- People who spend lot of time using system are usually willing to spend more time learning how to use it in seeking efficiency of operation and remember easily how to do things.
- **3)Task or Need importance -** How important the task or need for the user, High, moderate, or low importance of the task being performed.
- **4) Task Structure -** How structured is the task being performed? Repetitiveness or predictability of tasks being automated, the task structure is high, moderate, or low

- **5) Social Interactions -** will the user involved in Verbal communication with another person? Is it required or not required
- **6) Primary Training** – Will the system training be Extensive or formal training, self- training through manuals, or no training
- **7) Turnover Rate -** In business systems turn over rate for the job is High, moderate, or low.
- High turnover rates is not good for systems requiring a great deal of learning and training
- Low turnover rates a greater training expense can be justified.

- **8) Job Category-** In business system the user is an Executive, manager, professional, secretary, clerk.
- Executives and managers are discretionary users while clerks are mandatory users.
- Secretaries usually have typing skills and both secretaries and clerks have higher turn over rates than managers and executives.
- **9) Lifestyle -** For Web e-commerce systems user information to be collected includes hobbies, recreational pursuits, and economic status and other personal information

PSYCHOLOCICAL CHRACTERISTICS

- **1) Attitude and Motivation** – User attitude toward the system is positive, neutral or negative? Is motivation high, moderate or low? All these feelings are not caused and controlled by designer. Positive attitude and motivation allows the user to concentrate on the productivity of the system
- **2) Patience-** Is the user patient or impatient? Recent studies of web users indicate they are becoming impatient, they are exhibiting less tolerance for web learning requirements, slow response times, in efficient navigation, for locating desired content.

- **3) Expectations-** What are the users expectations about the system or website? Are they realistic?
- **4) Stress Level-** Will the user be subject to high levels of stress while using the system? Interacting with angry boss or client or customer can greatly increase a persons stress level.
- High levels of stress creates confusion and cause one to forget things
- **5) Cognitive Style-** People differ from how they think and solve the problem. Some people are better at Verbal thinking- working more effectively with words,
- Spatial reasoning- manipulating symbols, pictures etc
- analytic thinkers- systematically analyze the problems
- Intuitive- rely on rules.
- concrete or abstract

PHYSICAL CHARACTRISTICS

- **1) Age-** Are the users children, young adults, middle aged, senior citizens or very elderly? Age can have effect on both computer and system usage. With age the eyes capabilities also deteriorates, affecting screen readability. Memory ability also diminishes.
- **2) Hearing-** As people age, they require louder sounds to hear. Cohen found some preferred sound levels at various ages.
- 25 years preferred sound level in DB is 57, 45 years -65 DB, 65 years- 74 DB, 85 years- 85 DB.
- **3) Vision-** older adults read slowly than younger. There are some specified font styles for older people as well as younger
- **4) Gender-** male or female, women are not as strong as men for moving heavy displays or controls. Significantly men are more color blind than women, so women perform better tasks and screens using color coding.

- **5) Handedness-** A users handedness, left or right, can effect ease of use of an input mechanism.
- **6) Disabilities-** blindness, defective vision, color blindness, poor hearing, deafness can affect performance on a system not designed with these disabilities in mind. This is especially true for web that permits unlimited user access.

Human Interaction Speeds

- The speed at which people can perform using various
- communication methods has been studied by a number of researchers. **Bailey(2000)** has been found typical interaction speeds for various tasks.
- **Reading:** The average adult, reading English prose, has a reading speed in the order of 250-300 words per minute.

  •Proof **reading text on paper** has been found to occur at about 200 words per minute, on a **computer monitor** is about 180 words per minute.

- One technique that has dramatically increased reading speeds is called **Rapid Serial Visual Presentation, or RSVP.** In this technique single words are presented one at a time in the center of a screen.
- New words continually replace old words at a rate set by the reader.
- This is about 3.5 times faster than reading in traditional way
- Bailey concludes that computer technology can help improve reading speeds, but non traditional techniques must be used.

- **Listing**
- Words can be comfortably heard and understood at a rate of 150 to 160 words per minute and it is recommended rate for audio books and video narration.
- **Speaking:**
- **Speaking to a computer**: 150-160 words per minute.
- Speech recognizer miss recognitions often occur .
- **After recognition corrections**: 105 words per minute.

Keying
Typewriter

- **Fast typist key rates:** :150 words per minute and higher
  - **Average typist Key rates : **60-70 words per minute
- **Computer**
  - **Transcription:** 33 words per minute
  - **Composition:** 19 words per minute

- **Two finger typists or hunt and peck**
  - **Memorized text:**. 37 words per minute
  - **Copying text:** 27 words per minute
- **Hand printing**
  - **Memorized text**: 31 words per minute.
  - **Copying text:**22 words per minute.

Understand the Business Function

- Business definition and requirements analysis
  - ➢ Direct methods
  - ➢ Indirect methods
  - ➢ Requirements collection guidelines
- Determining basic business functions
  - ➢ Developing conceptual modes
  - ➢ Understanding mental models
  - ➢ Users new mental model
- Design standards or style guides
  - ➢ Value of standards and guidelines
  - ➢ Document design
  - ➢ Design support and implementation
- System training and documentation
- Training
- Documentation

Business definition and requirement analysis

- Objective here is to establish the need for a system. A requirement is an objective that must be met. There are many techniques for capturing information for determining requirements. These techniques are classified as direct and indirect

- **Direct Methods**

- The significant advantage of the direct methods is the opportunity they provide to hear the users in person and first hand
- **1) Individual Face-to-Face Interview**
- A one to one visit with the user to obtain information. It may be structured or open ended. The interview must have focus on topics to be covered and carefully planned, so data is collected in a framework and ensure that all important aspects are covered thoroughly

- **Advantages** of personal interview are user can be given full attention, gain additional information from user, more time to discuss topics in detail, deeper understanding of users, experience, attitudes, desire and belief.
- **Disadvantages** are costly and time consuming to conduct.
- **2) Telephone interview or survey:**
- Structured interview conducted via telephone. Arranging the interview in advance allows the user to prepare for it.
- They are less expensive than personal interviews
- Disadvantage is impossible to gather contextual information

- **3) Traditional Focus Group**
- A small group of users and a moderator brought together to verbally discuss the requirements and a typical session lasts for 2 hours. The purpose of this focus group is to inquire users experience, attitudes, beliefs, and desires to obtain their reactions about ideas or prototypes
- **4) Facilitated Team Workshop**
- It is also similar to traditional focus group but less formal. Team workshops have had the potential to provide much useful information. It requires more time to organize and run

- **5) Observational Field Study**
- Users are observed and monitored for an extended time to learn what they do. observation provides good insight into tasks being performed, the working environment and conditions.
- However it is time consuming and expensive. Video recording of the observation sessions will permit detailed task analysis.
- **6) User-Interface Prototyping**
- A demonstration model or early prototype is presented to users to uncover user interface issues and problems.

- **7) Usability Laboratory Testing**
- A special laboratory is constructed and users brought to perform actual newly designed tasks. They are observed and results measured and evaluated to establish the usability of the product at that point of time.
- Problems uncovered may result in modification of the requirements
- Usability labs generate much useful information but are expensive to create and operate

- **8) Card Sorting for Web Sites**
- A technique to establish groupings of information for Web sites.
- Potential content topics are placed on individual index cards and users are asked to sort the cards into groupings that are meaningful to them.
- Card sorting assists in building the sites structure, map and page content.

INDIRECT METHODS

- An indirect method of requirements determination is one that places an intermediary between the developer and the user. This intermediary may be electronic or another person.

1) MIS(Management Information System) Intermediary

- A company representative who defines the users goal and needs to designers and developers fulfils this intermediary role

- **2) Paper Surveyor Questionnaire**

- A paper survey or questionnaire is administered to a sample of users using traditional mail methods to obtain their needs. They have potential to be used for a large target audience located most anywhere and are much cheaper than customer visits. However they have low return rate often generating responses from users very happy or unhappy.

- **3) Electronic Surveyor Questionnaire**
- A questionnaire or survey is administered to a sample users via e-mail or the web. Characteristics, advantages and disadvantages are similar to paper surveys and questionnaires. However these are less expensive and response is returned much faster compared to paper surveys
- **4) Electronic Focus Group**
- A small group of users and a moderator discuss the requirements online using workstations.
- Electronic focus group is similar to traditional focus group except that the discussion is accomplished electronically using specialized software on a workstation, e-mail or website.

- **5) Marketing and Sales**
- Company representatives who regularly meet customers obtain suggestions or needs, current and potential.
- **6) Support Line**
- Information is collected by the unit that helps customers with day to day problems like customer support, technical support, help desk and so on. This is fairly inexpensive and target user audience is correct. The focus of this methods is usually on problems.
- **7) E-Mail or Bulletin Board**
- Problems, questions and suggestions by users posted to a bulletin board, a guest book or through e-mail are gathered and evaluated. The focus of this method is also usually on problems.

- **8) User Group**
- Improvements suggested by customer groups who assemble periodically to discuss system and software usage are evaluated.
- **9) Competitor Analyses**
- Reviews of competitors products or websites can also be used to gather ideas, uncover design requirements and identify tasks. The designers can perform this evaluation.
- **10) Trade Show**
- Customers at a trade show can be exposed to a prototype and asked for comments. This method is dependent on knowledge level of a customer.

- **11) Other Media Analysis**
- An analysis of how other media , print or broadcast, present the process, information or subject matter of interest.
- **12) System Testing**
- New requirements and feedback from ongoing system/product testing can be collected, evaluated and implemented as necessary.
- **Requirement collection guidelines**
- Keil and carmel(1995) evaluated the suitability and effectiveness of various requirements gathering methods by collecting data on 28 projects in 17 different companies. Each requirements collection method was defined as a **developer-user link**.

1. Establish 4-6 different developer links
2. Provide most reliance on direct links

Determining Basic Business Functions

- Major system functions are listed and described, including critical system inputs and outputs.
- A flowchart of major functions is developed. The process the developer will use is summarized as follows:
  - Gain a complete understanding of the user's mental model based upon:
    - The user's needs and the user's profile.
    - A user task analysis.
    - -- Develop a conceptual model of the system based upon the user's mental model. This includes:
- Defining objects.
- Developing metaphors.

Understanding the User's Mental Model

- The next phase in interface design is to thoroughly describe the expected system user or users and their current tasks.
- A goal of task analysis, and a goal of understanding the user, is to gain a picture of the user's mental model.
- **A mental model is an internal representation of a person's current conceptualization and understanding of something.**
- Mental models are gradually developed in order to understand, explain, and do something.
- Mental models enable a person to predict the actions necessary to do things if the actions have been forgotten or have not yet been encountered

Performing a Task Analysis

- User activities are precisely described in task analysis
- Task analysis involves breaking down the user's activities to the individual task level.
- Provides complete description of all user tasks and interactions.
- Work activities are studied using the techniques just reviewed, direct observation, interviews, questionnaires, or obtaining measurements of actual current system usage.
- One result of task analysis is listing of the user's current tasks.
- Another result is a list of objects the users see as important to what they do

Developing Conceptual Models

- The output of the task analysis is the creation, by the designer, of a conceptual model for the user interface.
- **A conceptual model is the general conceptual framework through which the system's functions are presented.**
- Such a model describes how the interface will present objects, the relationships between objects, the properties of objects, and the actions that will be performed.
- A conceptual model is based on the user's mental model. Since the term mental model refers to a person's current level of knowledge about something, people will always have them.

- Since mental models are influenced by a person's experiences, and people have different experiences, no two user mental models are likely to be exactly the same.
- Each person looks at the interface from a slightly different perspective. The goal of the designer is to make easy for the user the development of useful *mental model of the system*.
- This is accomplished by presenting to the user a *meaningful conceptual model of the system* .

- When the user then encounters the system, his or her *existing mental model* will, hopefully, mesh well with the system's conceptual model.
- The system mental model the user derives is based upon system's behavior, including factors such as the system inputs, actions, outputs (including screens and messages), and its feedback and guidance characteristics, all of which are components of the conceptual model.
- Documentation and training also play a formative role.

Guidelines for Designing Conceptual Models

- **Reflect the user's mental model, not the designer's.**
- user will have different expectation than the designers so the mental models of user and designer will be different. The user is concerned with task to be performed while the designers model is focused on design of interface.
- **Draw physical analogies or present metaphors.**
- A metaphor to be effective must be widely applicable within an interface. metaphors that are partially or occasionally applicable should not be used

- **Comply with expectancies, habits, routines, and stereotypes.**
- create a system that builds on knowledge, habits, routines and expectancies that already exist. Use familiar associations avoiding the new and unfamiliar.
- **Provide action-response compatibility.**
- All system responses should be compatible with the actions that evoke them.
- **Make invisible parts and process of a system visible.**
- Systems are composed of parts and processes, many of which are invisible to user. Making invisible parts of a system visible will speed up the process of developing correct mental models

- **Eg:** moving a document between files. In command language interface the document must be moved through a series of typed commands. The file is moved invisibly and the user assumes correctly unless an error message is received. In a graphical direct manipulation system the entire process is visible, with the user literally picking up the file in one folder by clicking on it and dragging it anther folder.
- **Provide proper and correct feedback.**

1. Provide continuous indication of status
2. Provide visible results of actions
3. Display actions in progress
4. Provide clear, constructive and correct error messages.

- **Avoid anything unnecessary or irrelevant.**
- Never display irrelevant information on the screen also do not overuse display techniques or use them in meaningless way like too much color.
- **Provide design consistency.**
- design consistency reduces the number of concepts to be learned. Inconsistency requires the mastery of multiple models
- **Provide documentation and a help system that will reinforce the conceptual model.**
- consistencies and metaphors should be explicitly described in the user documentation which will assist in learning the system

Defining Objects

- Determine all objects that have to be manipulated to get work done. Describe:

- The objects used in tasks.

- Object behavior and characteristics that differentiate each kind of object.

- The relationship of objects to each other and the people using them.

- The actions performed.

- The objects to which actions apply.

- - State information or attributes that each object in the task must preserve, display,or allow to be edited.

- Identify the objects and actions that appear most often in the workflow.
- Make the several most important objects very obvious and easy to manipulate

Developing Metaphors

- A metaphor is a concept where ones knowledge about one thing is used to understand something else
- Choose the analogy that works best for each object and its actions.
- Use real-world metaphors.
- Use simple metaphors.
- Use common metaphors.
- Multiple metaphors may coexist.
- Use major metaphors, even if you can't exactly replicate them visually.
- Test the selected metaphors.

The users new mental model

- When the system is implemented and a person interacts with the new system and its interface an attempt will be made by the person to understand the system based on the existing mental model.
- If the designer has correctly reflected the users mental model in design a feeling that interface is intuitive will develop and continuous interaction with the system may influence and modify the users concept of the system and his or her mental model may be modified as well
- If the new system does not accurately reflect the users existing mental model, the results include breakdowns in understanding, confusion, errors, loss of trust and frustration

- When system designers have known in advance there was a gap between their conceptual model and the mental model the user would bring to new system they will try to bridge this gap through extensive documentation and training.
- The problem with this approach is people are unproductive while being trained, people rarely read the documentation and training materials.

Design standards or style guides

- A design standard or style guide describes the appearance and behavior of the interface and provides some guidance on proper use of system components
- It also defines the interface standards, rules, guidelines that must be followed in detail design
  - **Value of standards and guidelines**
- Developing and applying design standards or guidelines achieves design consistency
- This is valuable to **users** because the standards and guidelines
- 1) allow faster performance

Value of standards and guidelines

2) reduce errors
3) reduce training time
4) develop better system utilization
5) improve satisfaction
6) improve system acceptance

- They are valuable to system **developers** because they

1) increase the visibility of the human – computer interface
2) provide more programming and design aids, reducing programming time
3) reduce redundant effort

- **Value of standards and guidelines**

4) reduce training time

5) provide a benchmark for quality control testing.

- **Document design**

- Include checklists to present principles and guidelines. Checklists provide ease in scanning, ease in referring to key points and make a document more readable.
- Provide a rationale(explanation) for why the particular guidelines should be used
- Provide rationale describing the conditions under which various design alternatives are appropriate.

- **Document design**

- Include concrete examples of correct design.
- Design the guideline document, be it paper or electronic, by following recognized principles for good document design. This greatly enhances reliability.
- Provide good access mechanisms such as thorough index, a table of contents and checklists.
- An unattractive or hard to use document will not be inviting and consequently will not be used.

- **Design support and implementation**

- Use all available references sources in creating the guidelines. References include the text, other books on user interface design, project specific guidelines and style guides for interface design and web design.
- Use development and implementation tools that support the guidelines established. Development tools make the design process much easier.
- Begin applying the guidelines immediately

System training and documentation needs

- Training and documentation are also an integral part of any development effort

• Training

- System training will be based on user needs, system conceptual design, system learning goals and system performance goals
- Training may include such tools as video training, manuals, online tutorials, reference manuals, quick reference guides and online help.

• Documentation

- System documentation is a reference point, a form of communication and more concrete design- words that can be seen and understood.
- It will also be based on user needs, system conceptual design and system performance goals
- As with training any potential problems can be identified and addressed earlier in the design process , reducing latter problems and modification costs.

Thank You..

CS4206PE : HUMAN COMPUTER INTERACTION

Topic: Screen Designing

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Screen designing

- **How to distract the screen user**
    - Unclear captions
    - Improper type and graphic emphasis
    - Misleading headings
    - Irrelevant and unnecessary headings
    - Inefficient results
    - Cluttered and cramped layout

- Poor quality of presentation
    - Legibility
    - Appearance
    - arrangeemnt
- Visual inconsistency
- Lack of design features
- Over use of 3D presentations
- Overuse of too many bright colors
- Bad typography

Variety of distractions

- Numerous audio and visual interruptions
- Extensive visual clutter
- Poor information readability
- In comprehensible screen components
- Confusing and inefficient navigation
- Inefficient operations
- Excessive or inefficient page scrolling
- Information overload
- Design in cosistency
- Outdated information

What screen users want

- an orderly clean clutter free appearance
- An obvious indication of what is being shown and what should be done with it.
- Expected information located where it should be.
- A clear indication of what relates to what, including headings, options, captions, data etc.
- Plain and simple english
- A clear indication of when an action can make a permanent change in data.
- A simple way of finding out what is in a system and how to get it out

What screen users do

- **Identifies a task to be performed or need to be fulfilled.**

- the task may be very structured, including activities such as :
- Enter this data from this form into the system, Answer a specific question regarding the status of an order, Collect the necessary information from a customer to make a reservation.
- Alternatively the task may have some structure but also includes more free form activities, including answering questions such as what are my customers needs and which of our products features are best suited for them.
- Finally the need may be very general like, where should I take a vacation near a beautiful beach

What screen users do

- **Decides how the task will be completed or need fulfilled.**

- For a structured or semi structured task a set of transaction screens will be available. The proper transaction is identified and the relevant screen series are retrieved. To satisfy a general need will require browsing or searching through screens.

- **Manipulates the computers controls.**

- To perform the task or satisfy the need , the keyboard, the mouse and other similar devices are used to select choices from lists, choose commands to be performed.

What screen users do

- **Gathers necessary data.**

- Using structured and semi structured transaction screens information is collected from its source like a form, a coworker, a customer. This information is identified on the screen through control manipulation.

- **Forms judgments resulting in decisions relevant to task**

- Structured transactions will require minimal decision making. Has all the data been collected and is the data valid? Has the transaction been successfully accepted by the system? If not what is the reason?

- Semi structured transaction in addition may require decisions like which set of screens should I use to complete the process?

- To satisfy a general need will require decisions like, where should I look to get my answer? Which link should I follow? Is this all information I need/ how do I order it?

Interface Design goals

- To make interface easy and pleasant to use, then the goal in design is to :
- Reduce visual work
- Reduce intellectual work
- Reduce memory work
- Reduce motor work
- Eliminate burdens or instructions imposed by technology.
- The result will always be improved user productivity and increased satisfaction.

Screen meaning and Purpose

- Each screen element
  - ➢ Every control
  - ➢ All text
  - ➢ Screen organization
  - ➢ All emphasis
  - ➢ Each color
  - ➢ Every graphic
  - ➢ All screen animation
  - ➢ All forms of feedback
- All elements of a screen Must
  - ➢ have meaning to screen users
  - ➢ Serve a purpose in performing tasks
  - If an element does not have a meaning do not include it in on the screen because it is a noise.

organizing screen elements

- Visual clarity is achieved when the display elements are organized and presented in meaningful ways
- Clarity is influenced by many factors

1. Consistency in design
2. A visually pleasing composition
3. A logical and sequential ordering
4. Presentation of proper amount of information
5. Groupings and alignment of screen elements

- What must be avoided is visual clutter created by indistinct elements, random placement and confusing patterns

organizing screen elements

- Consistency

- Consistency improves learning, it establishes an expectation
  - ➢ Provide real world consistency, reflect a persons experience, expectations.
  - ➢ Provide internal consistency
    - ✓ operational and navigational procedures
    - ✓ visual identity or theme
    - ✓ Componenet
      - ❑ organization
      - ❑ Presentation
      - ❑ Usage
      - ❑ Locations
  - ➢ Follow the same conventions
  - ➢ Deviate only when there is clear benefit to user

organizing screen elements

- Inconsistencies forces one to memorize and remember a variety of different ways to do something.
- It also can be distracting causing a person to wonder why things are different
- Inconsistency also creates screen variation that makes it difficult to notice another variation that may be important for a persons task or need
- So its better to maintain consistency with the real world in which a person already exists.

ordering of screen data & content

- Divide information into units that are logical,meaningful and sensible.
- Organize by interrelationships between data.
- Provide an ordering of screen units of elements depending on priority.
- Possible ordering schemes include
  - Conventional
  - Sequence of use
  - Frequency of use
  - Function
  - Importance
  - General to specific
- form groups that cover all possibilities.
- Ensure that information is visible.
- Ensure that only information relative to task is presented on screen.

- An organizational scheme‘s goal is to minimize number of information variables the user must retain in short term memory. A logical, meaningful and sensible arrangement of screen data and content will lower this memory requirement.

- **UPPER LEFT STARTING POINT**

➢ provide an obvious starting point in the screen’s upper left corner. This is near the location where visual scanning begins and will permit left-to-right, top-to-bottom reading of information.

screen navigation and flow

- Provide an ordering of screen information and elements that:
  - is rhythmic guiding a person's eye through display
  - encourages natural movement sequences.
  - minimizes pointer and eye movement distances.
- Locate the most important and most frequently used elements or controls at top left.
- Maintain top to bottom , left to right flow.
- assist in navigation through a screen by
  - Aligning elements
  - Grouping elements
  - Use of line borders

screen navigation and flow

- Through focus and emphasis, sequentially , direct attention to items that are
    - critical
    - Important
    - Secondary
    - Peripheral
- Tab through window in logical order of displayed information.
- locate command button at the end of the tabbing order sequence,
- when groups of related information must be broken and displayed on separate screens, provide breaks at logical or natural points in the information flow.

screen navigation and flow

- In establishing eye movement through a screen, also consider that the eye trends to move sequentially , for example –
  - From dark areas to light areas
  - From big objects to little objects
  - From unusual shapes to common shapes.
  - From highly saturated colors to unsaturated colors.
- These techniques can be initially used to focus a person's attention

screen navigation and flow

- Maintain top to bottom, left to right through the screen. This top to bottom orientation is recommended for information entry for the following reasons –
  - ➢ Eye movements between items will be shorter.
  - ➢ Control movements between items will be shorter.
  - ➢ Groupings are more obvious perceptually.
  - ➢ When one's eyes moves away from the screen and then back, it returns to about same place it left, even if it is seeking next item in sequence.

screen navigation and flow

- Most product style guides recommend a left to right orientation.
- Our earliest display screens reflected this left to right entry orientation.
- Top to bottom orientation is also recommended for presenting displays of read only information tht must be scanned.

Visually pleasing composition

- Provide visually pleasing composition with the following qualities –
  - ➢ balance
  - ➢ Symmetry
  - ➢ Regularity
  - ➢ Predictability
  - ➢ Sequentiality
  - ➢ Economy
  - ➢ Unity
  - ➢ proportion
  - ➢ Simplicity
  - ➢ Groupings.
  - Visually pleasing composition draws attention conveying a positive message clearly and quickly.

Balance

- Create screen balance by providing an equal weight of screen elements, left and right, top and bottom.
- Dark colors, unusual shapes and larger objects are heavier, whereas light colors, regular shapes and small objects are lighter .
- opposite to balance is instability.

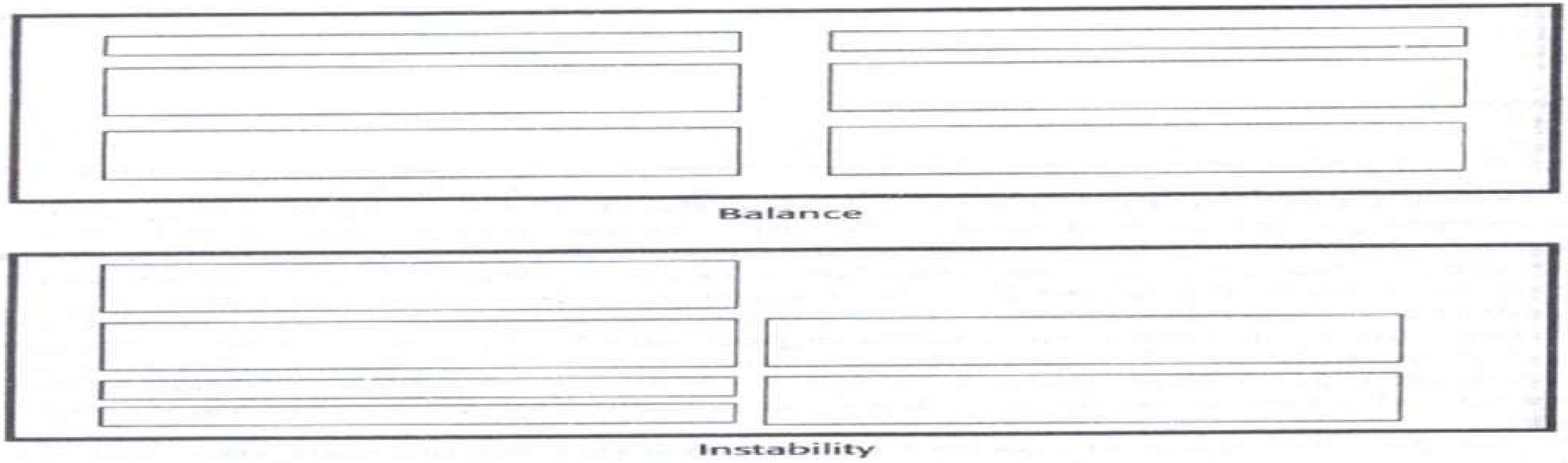


Figure 3.1 Balance (versus instability).

symmetry

- Create symmetry by replicating elements left and right of the screen centerline
- A unit on one side of the centerline is exactly replicated on the other side, this exact replication creates formal balance.
- Opposite of this is asymmetry.
- .

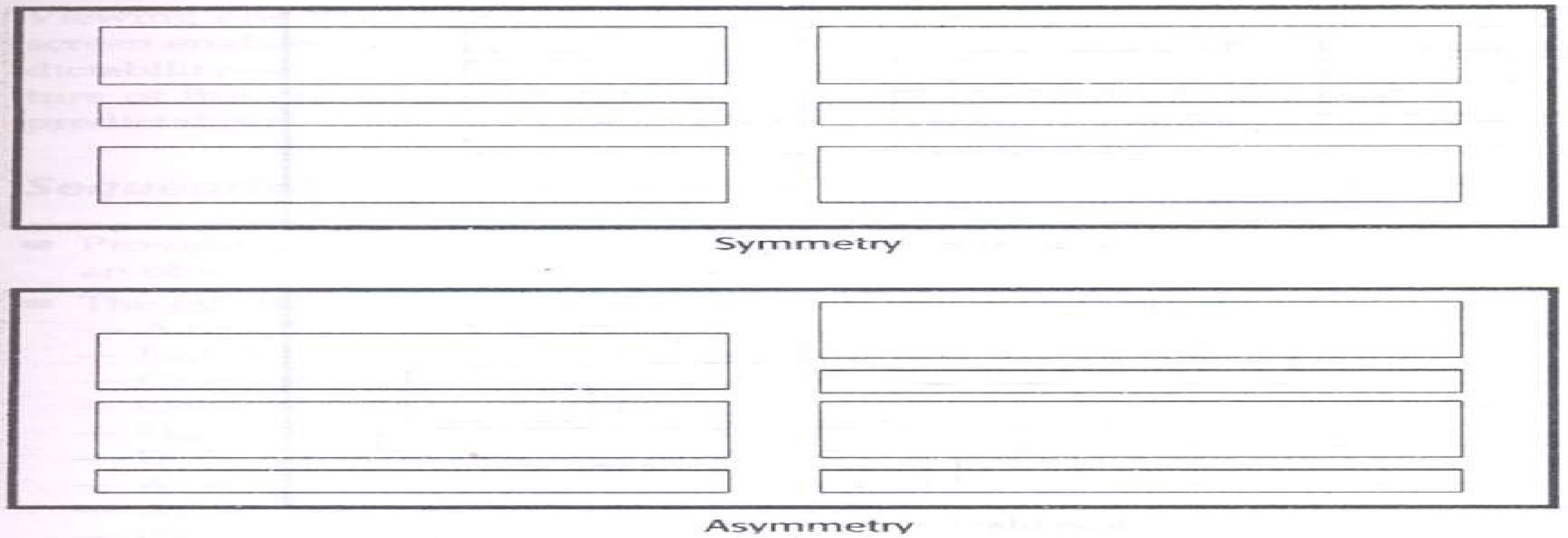


Figure 3.2 Symmetry (versus asymmetry).

Regularity

- Create regularity by establishing standard and consistently spaced horizontal and vertical alignment points.
- It is also achieved by using elements similar in size, shape, color and spacing.
- Opposite is irregularity, exists when no plan or principle is apparent

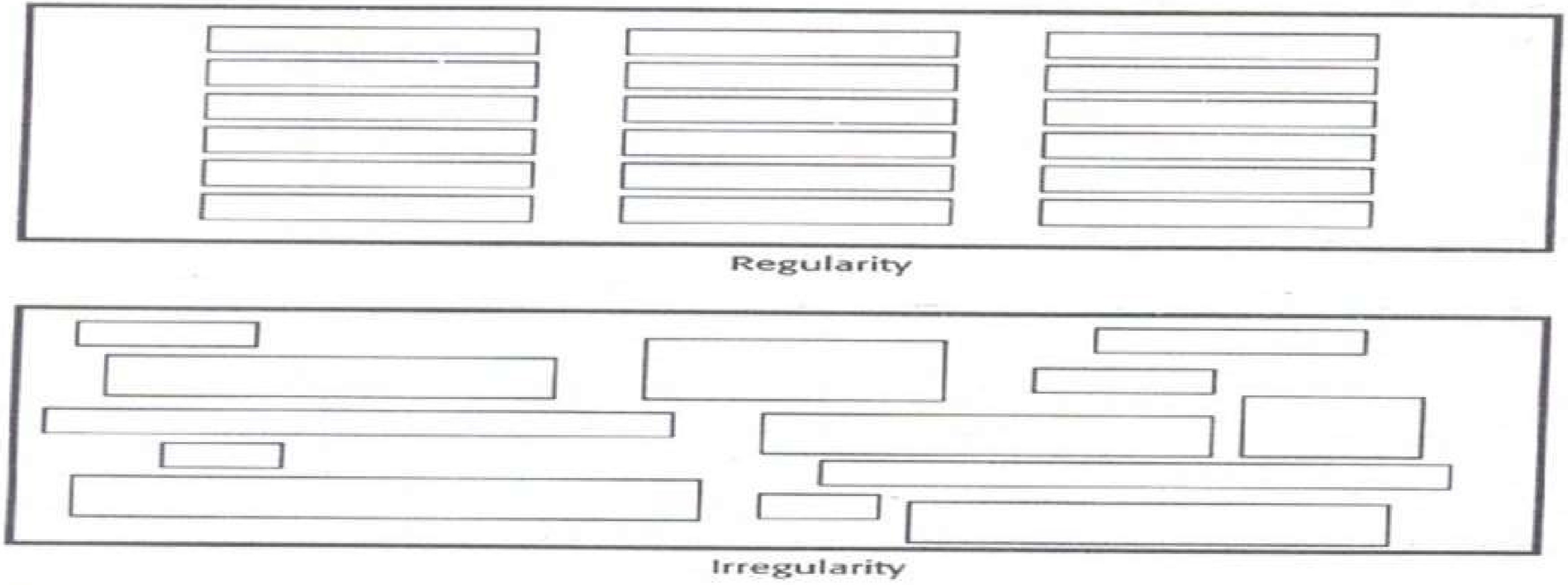


Figure 3.3 Regularity (versus irregularity).

Predictability

- Create predictability by being consistent and following conventional orders and arrangements.
- Viewing one screen enables one to predict how another screen will look, viewing part of the screen enables one to predict how the rest of the screen will look
- Predictability is also enhanced through design consistency
- Opposite is spontaneity. Inability to predict the structure of the remainder of a screen.

Predictability

- .

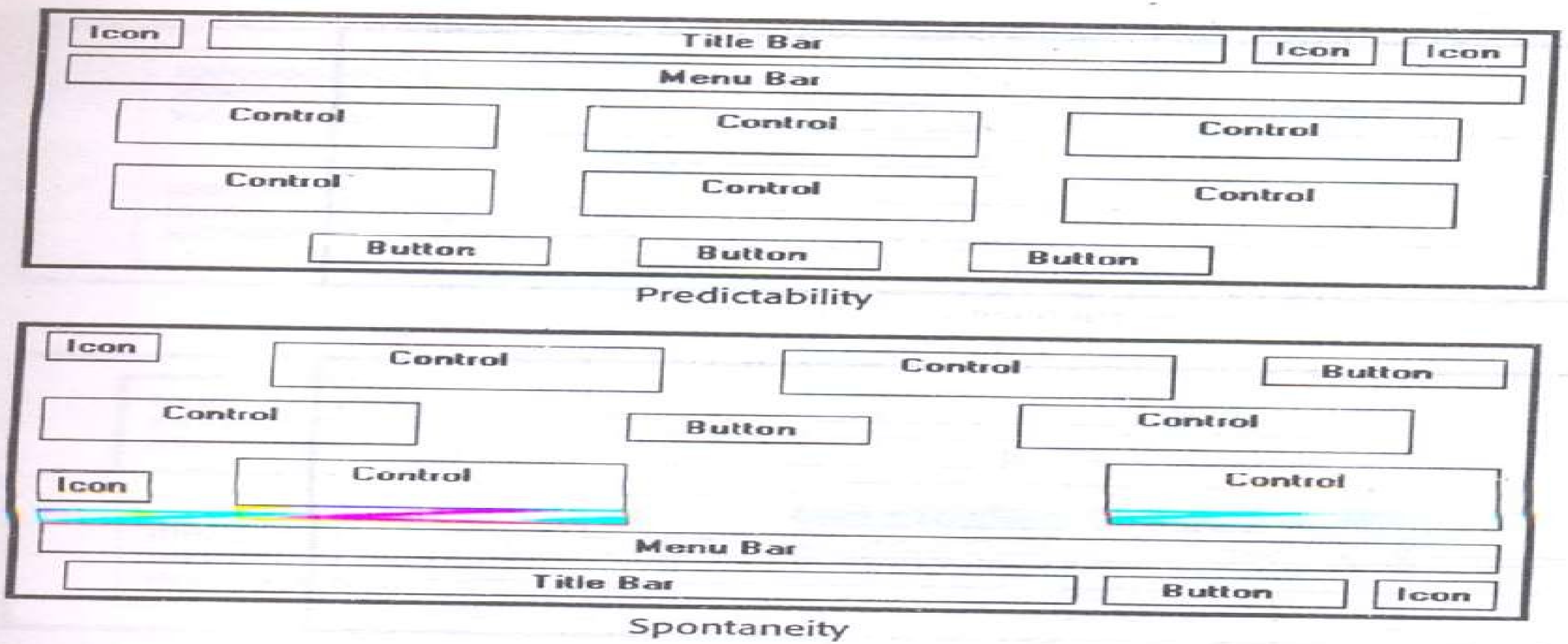
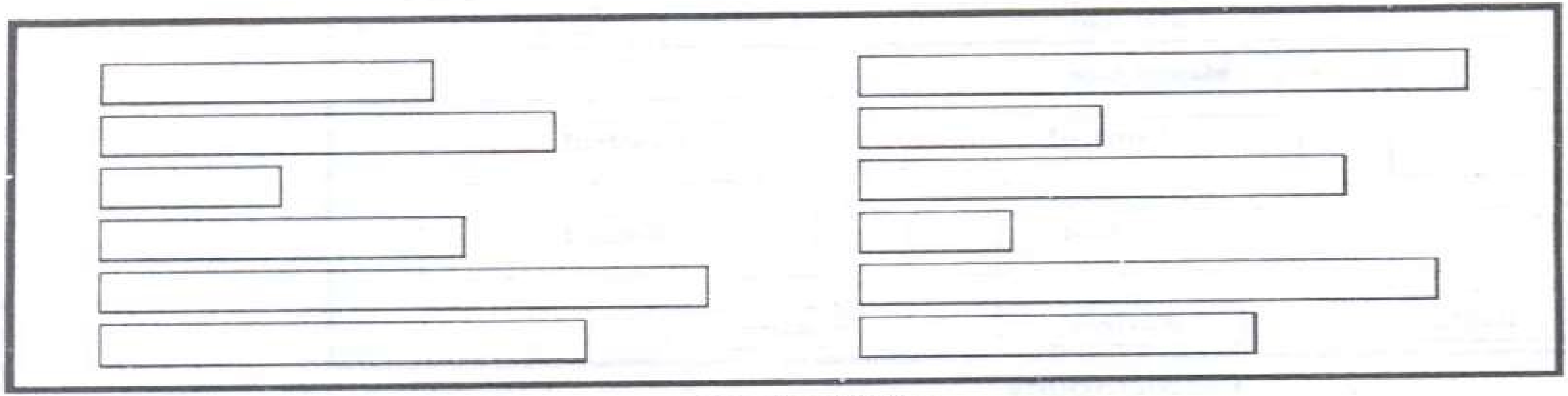


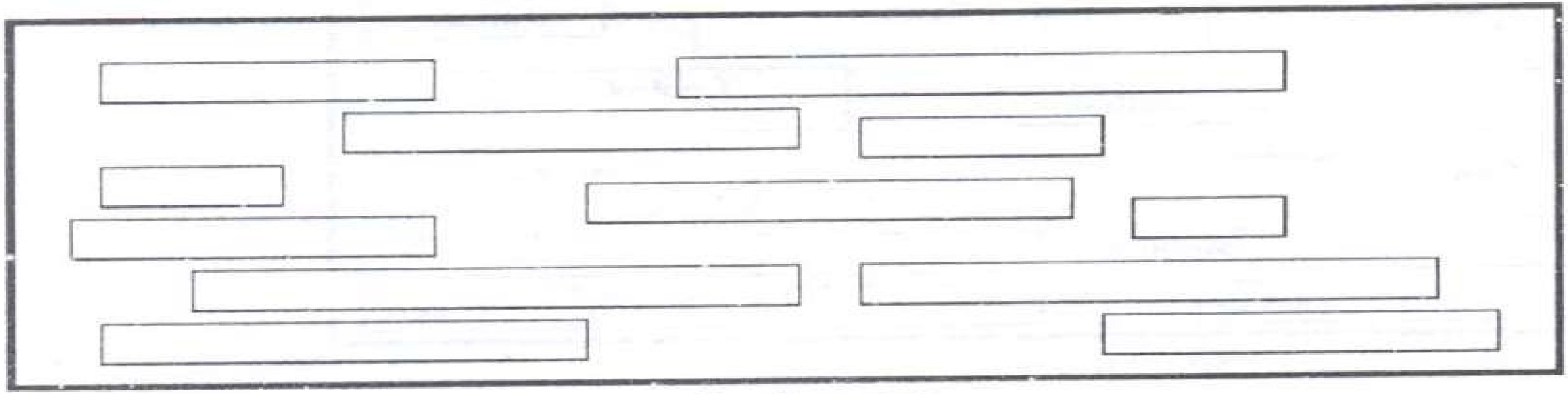
Figure 3.4 Predictability (versus spontaneity).

sequentiality

- Provide sequentiality by arranging elements to guide the eye through the screen in an obvious, logical, rhythmic and efficient manner.
- The eye trends to be attracted to :
- A brighter element before one less bright
- Isolated elements before elements in a group
- Graphics before text
- Color before black and white
- Highly saturated colors before those less saturated.
- Dark areas before light areas
- A big element before a small one
- An unusual shape before a usual one
- Big objects before little objects



Sequentiality



Randomness

Figure 3.5 Sequentiality (versus randomness).

Economy

- Provide economy by using as few styles, display techniques and colors as possible.
- **Economy in screen design means mobilizing just enough display elements and techniques to communicate the desired message.**
- The opposite is **intricacy**, the use of many elements just because they exist.

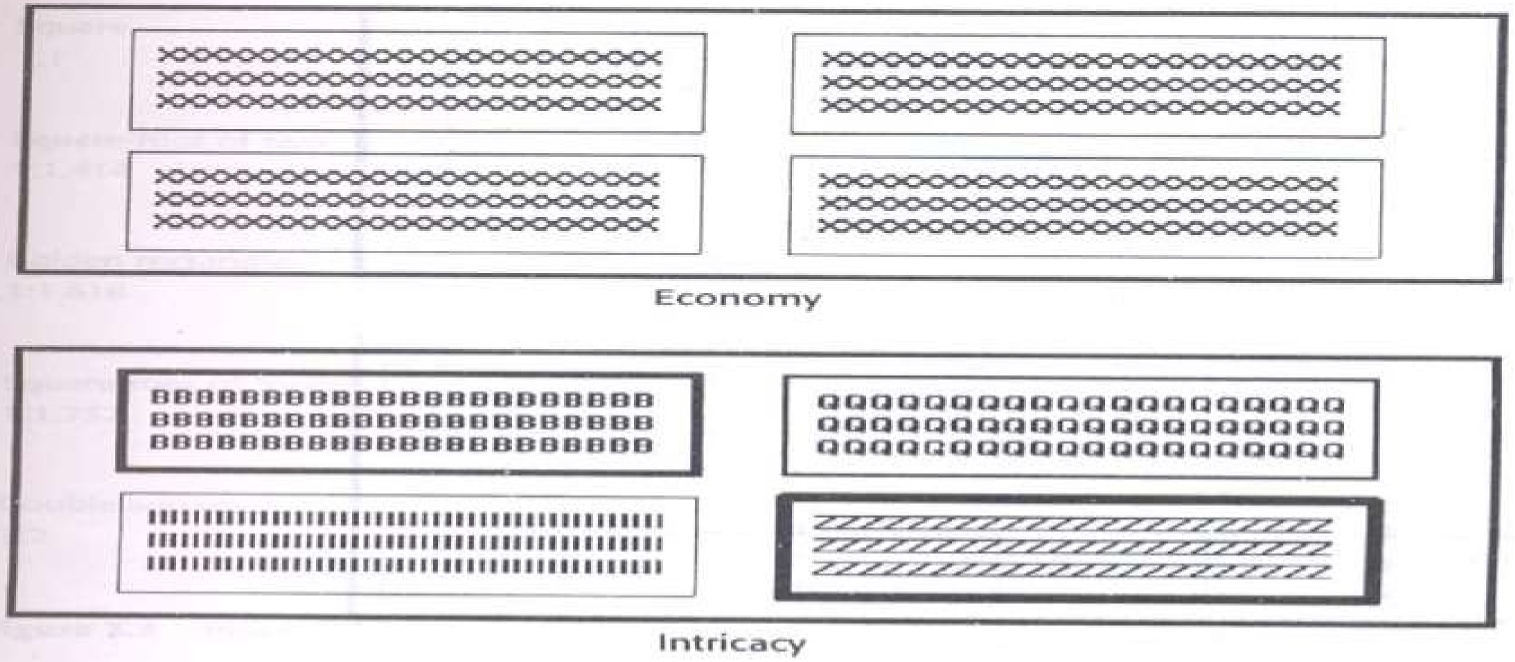


Figure 3.6 Economy (versus intricacy).

Unity

- Create unity by
- --- using similar sizes, shapes, colors for related information
- --- leaving less space between elements of a screen than the space left at the margins.
- The opposite of unity is **fragmentation**, each piece representing its own character.

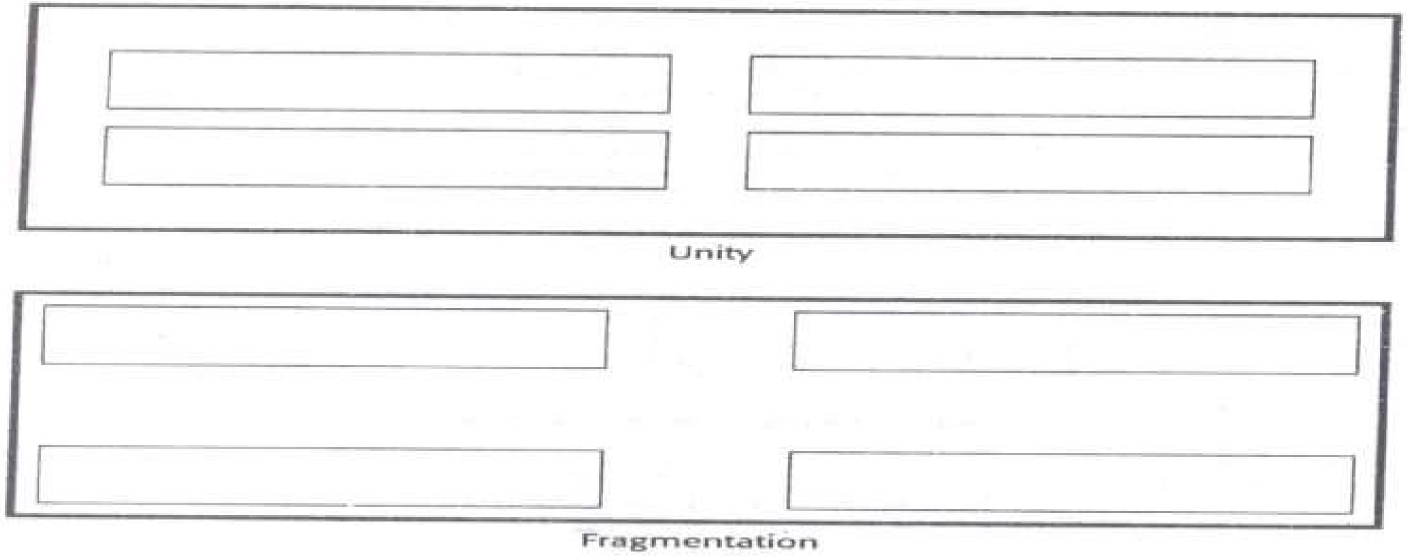


Figure 3.7 Unity (versus fragmentation).

Proportion

- Create windows and groupings of data or text with aesthetically pleasing proportions.

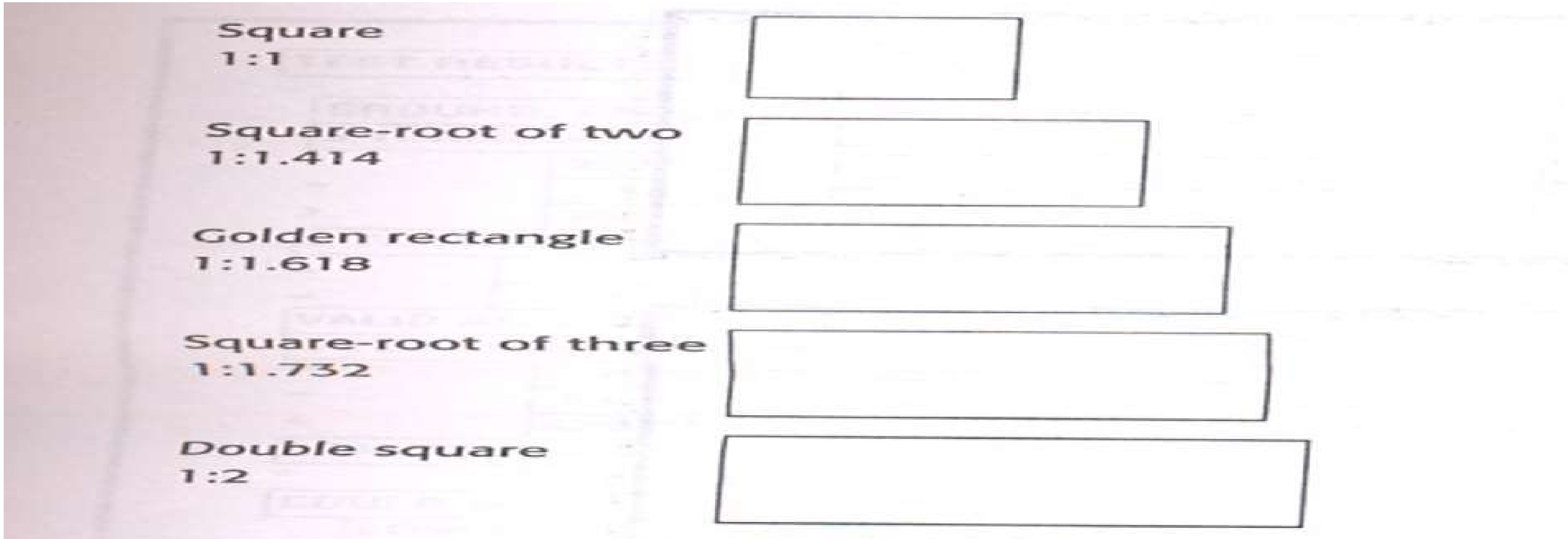


Figure 3.8 Pleasing proportions.

Simplicity

- Optimize the number of elements on a screen, within limits of clarity.
- Minimize the alignment points
- Opposite is complexity
- Measure of complexity was derived by Tullis in 1983, this measure involves following steps

1) draw a rectangle around each element on a screen, including captions, controls, headings, data, title etc
2) Count the number of elements and horizontal alignment points (the number of columns in which a field inscribed by a rectangle starts)
3) Count the number of elements and vertical alignment points (the number of rows in which a field inscribed by a rectangle starts)

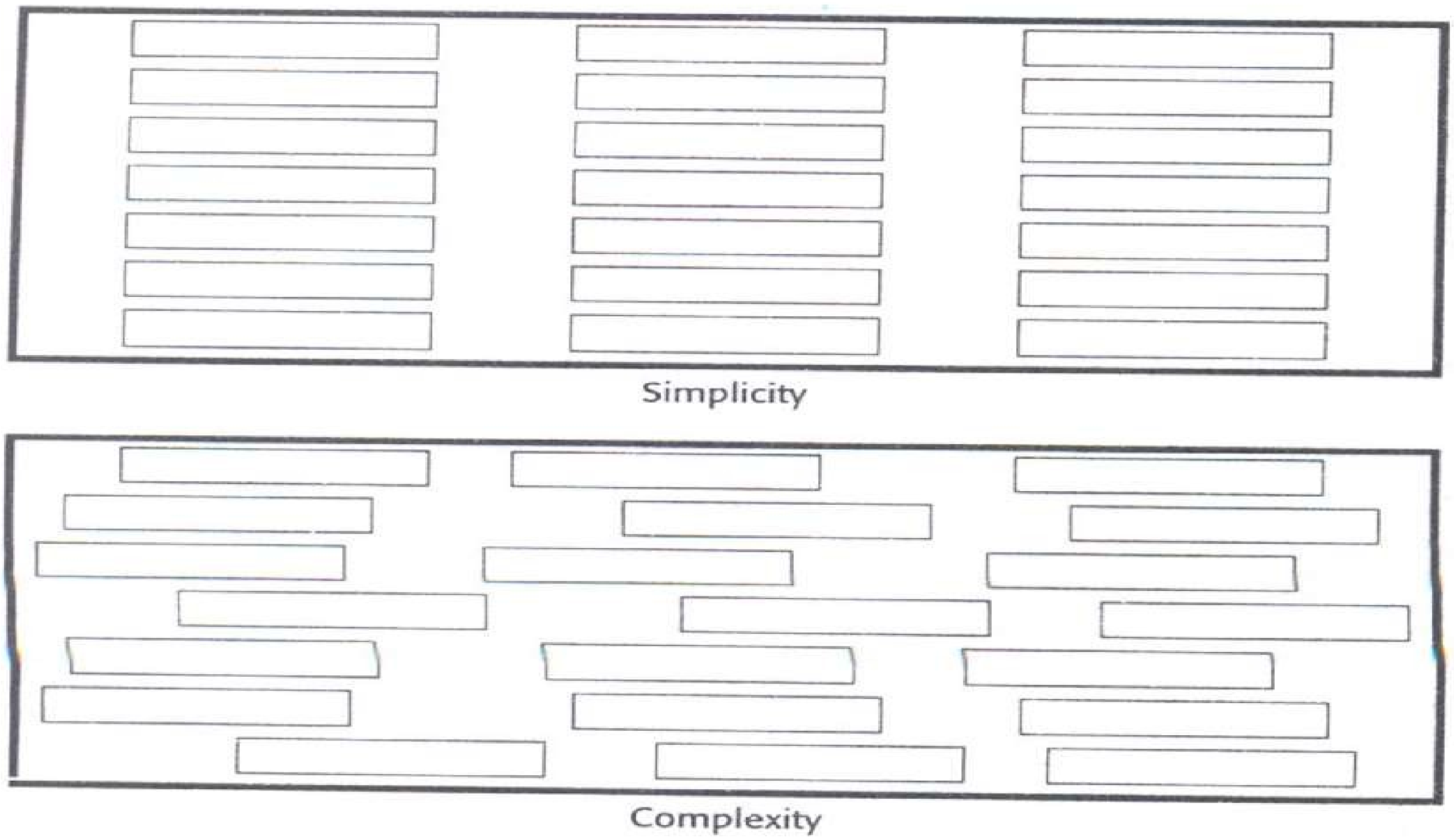


Figure 3.9 Simplicity (versus complexity).

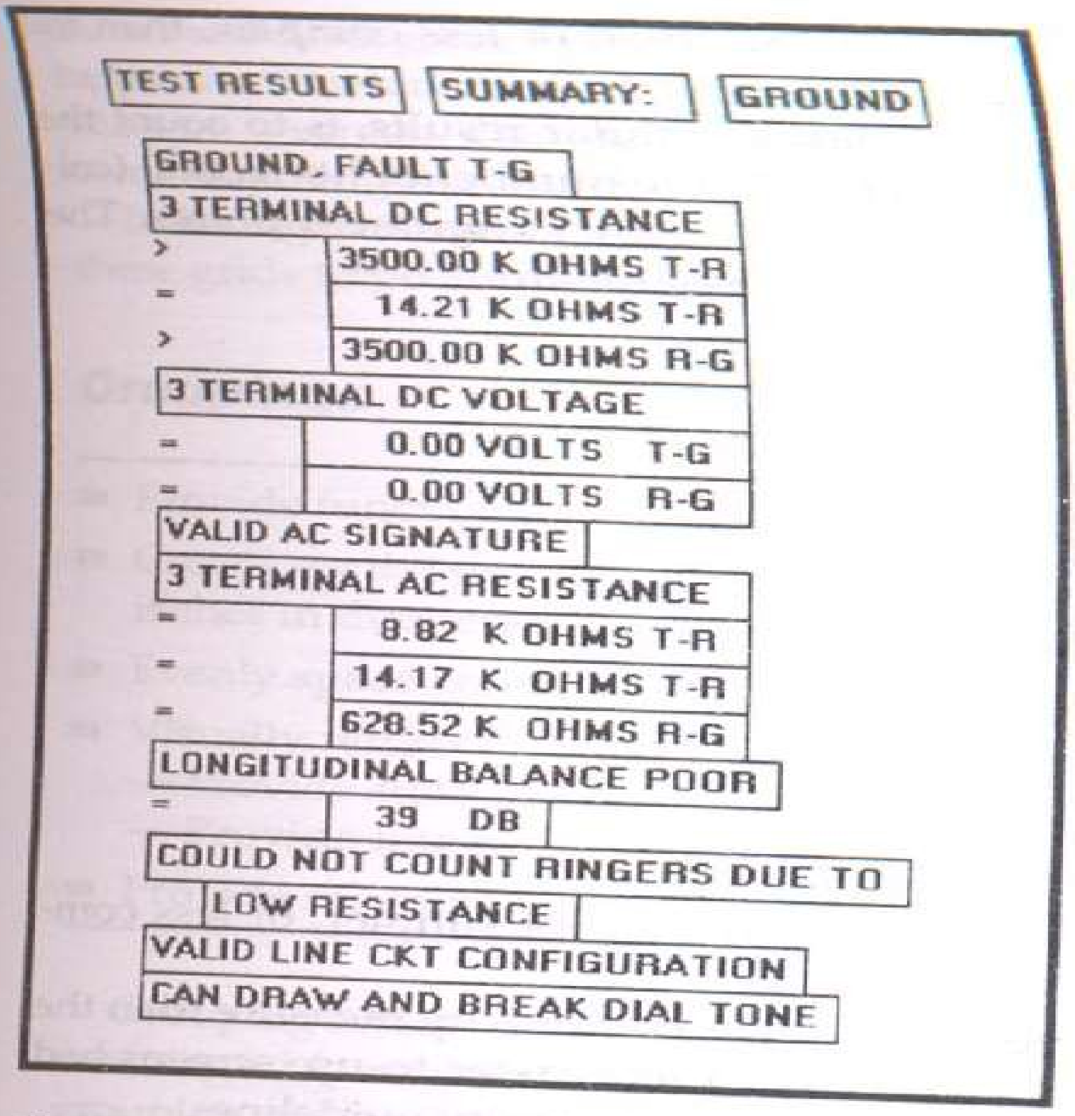


Figure 3.10 Original screen, from Tullis (1981), with title, captions, and data inscribed by rectangles.

- Figure 3.11 (redesigned):
  18 fields with 7 horizontal (column) alignment points = 43 bits.
  18 fields with 8 vertical (row) alignment points = 53 bits.
  Overall complexity = 96 bits.

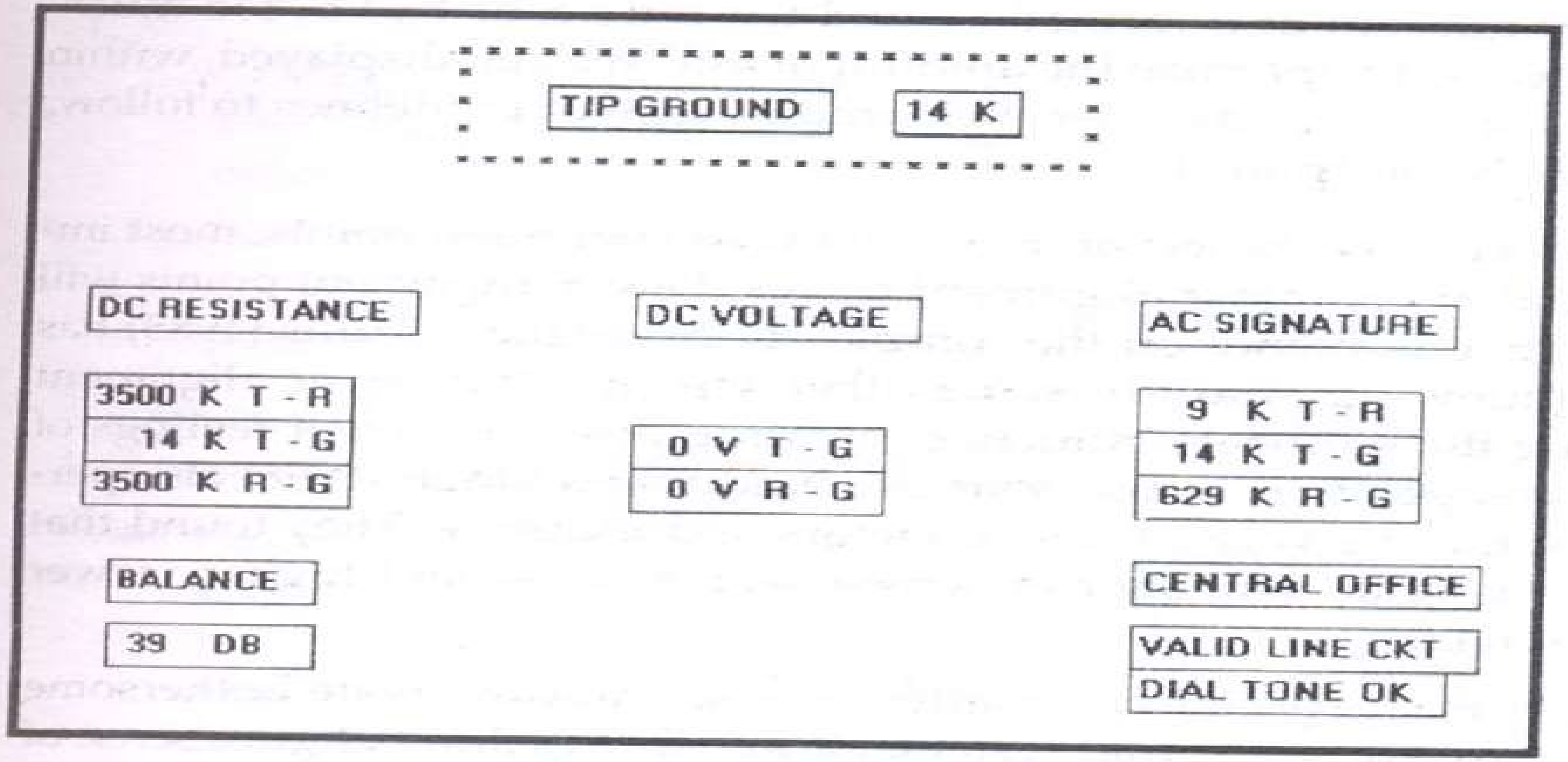


Figure 3.11 Redesigned screen, from Tullis (1981), with title, captions, and data inscribed by rectangles.

Groupings

- Grouping screen elements improves in establishing structure , meaningful relationships and results in faster screen search.

Grouping using borders

- Provide functional groupings
- Create spatial groupings
- Provide meaningful titles for each grouping
- Incorporate line borders
- Do not exceed three line thickness
- Create lines consistent in height and length
- For adjacent groupings with borders where ever possible
- Use rules and borders sparingly

Grouping using White Space

- Provide adequate separation between groupings through liberal usage of white space.
- For web pages carefully consider white space so that it should minimize the need for scrolling.

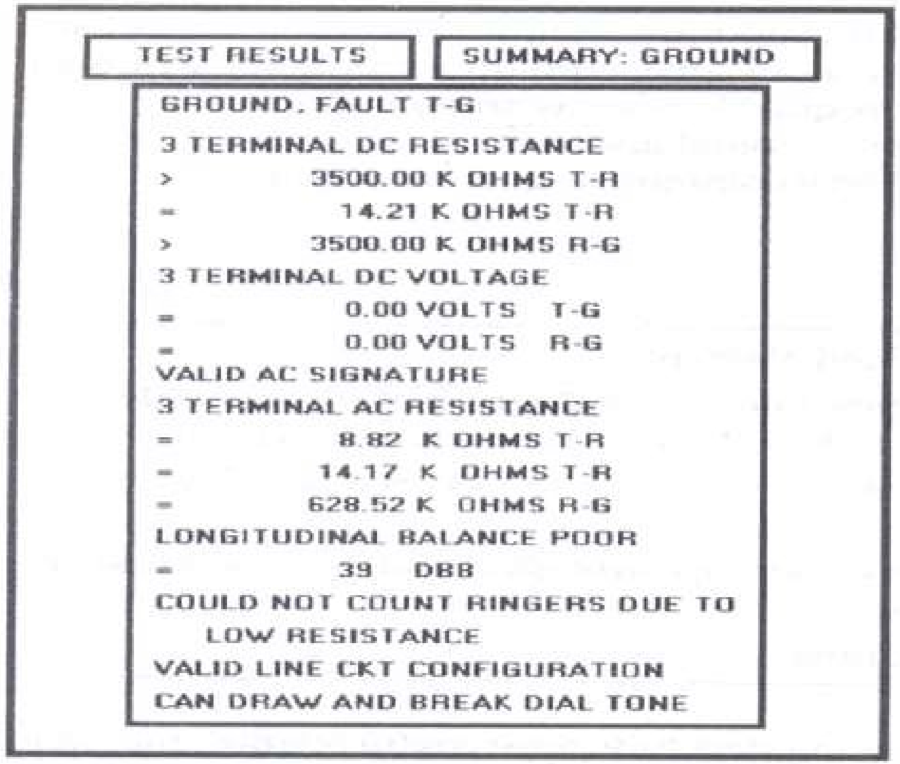


Figure 3.12 Original screen, from Tullis (1981), with grouping indicated by bold boxes.

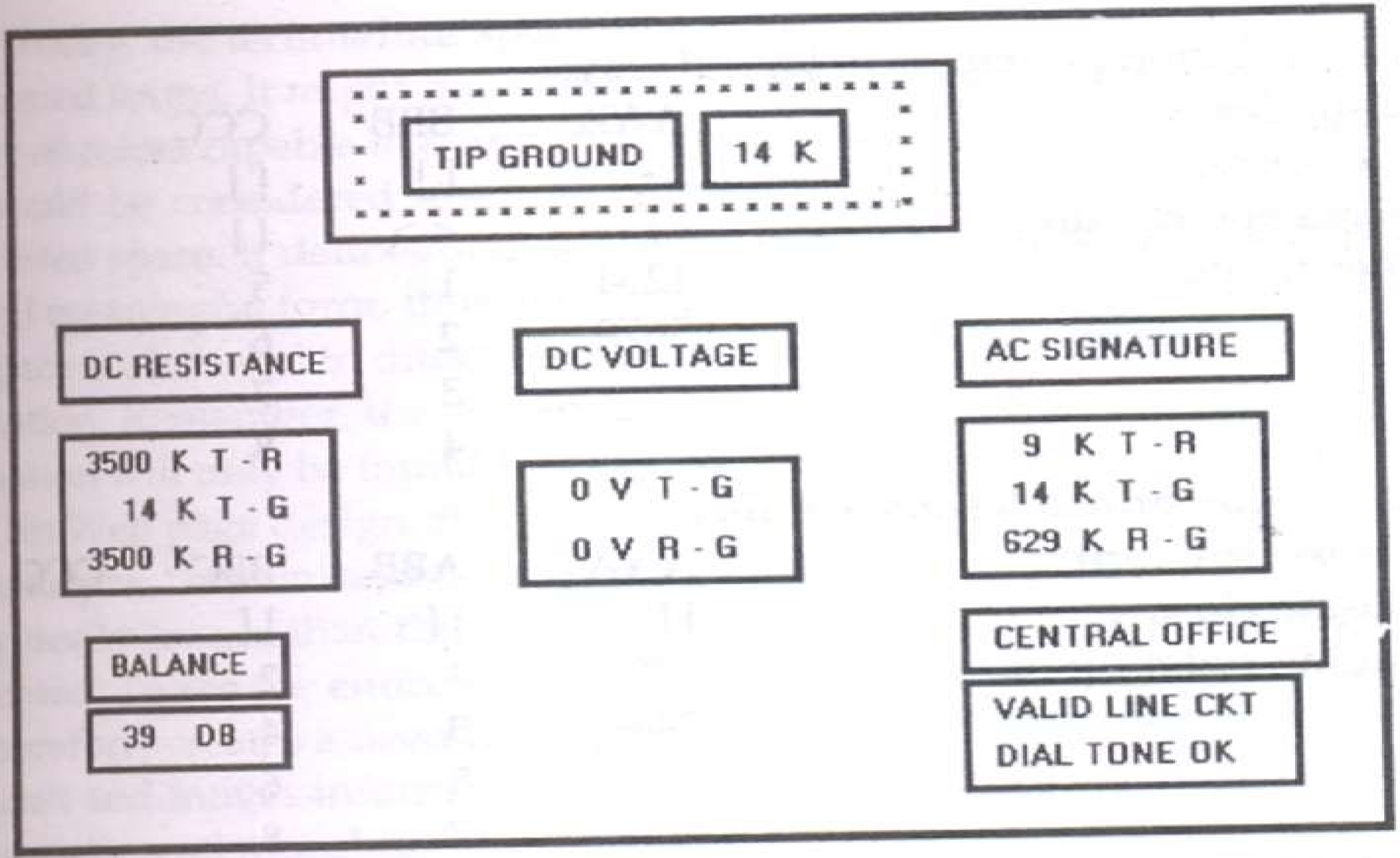


Figure 3.13 Redesigned screen, from Tullis (1981), with grouping indicated by bold boxes.

BASIC
DRAPE
COLOR
CODES
blk 0
bro 1
red 2
orn 3
yel 4
grn 5
blu 6
pur 7
gry 8
wht 9

Tournament
Scores
Ralph 67
Stanley 76
Bob 99

24 tables
96 chairs
16 beds

Trip
Lugg
Suit
Wate
Golf
Tenni
Kids

Get note to Roger
on solution to Park
District's tree
problems.

Poor screen design
can destroy underlying
excellence in software
and hardware. Graphic
design details are not
cosmetic matters or
decorative touches.

MURPHY'S LAW
If it can go wrong
it will go wrong.
It can and it
really did!

What do the following
have in common?
Sydney Swans
New Zealand All Blacks
Chicago Bears
So Africa Springboks

FIB CONTRACT
paragraph to
the new
purchase agreement
of 9/9.96.

Dinner at 7:30

FORECAST Today,
partly cloudy, high
about 95. Tonight,
colder, increasing
clouds. Heavy snow
possible by morning.

Caberne
Chardon
Fume Bl
Petite Si
Sauvign
Zinfande

This is an
illustration of
the effect
that the use
of graphical
boundaries
has on the
perception of
groups on a
screen.

Figure 3.14 The effect of line or graphical borders. Groupings without borders.

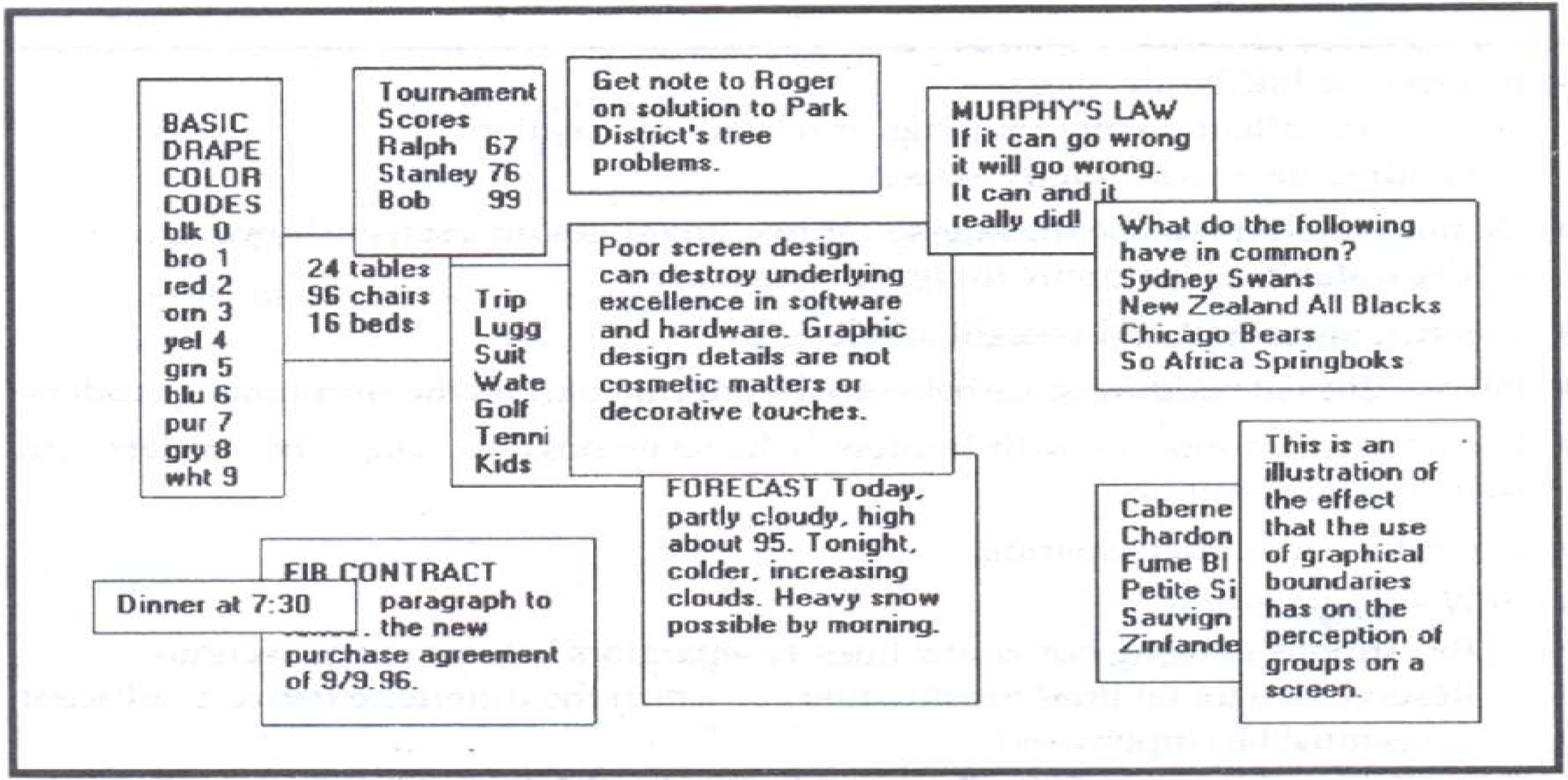


Figure 3.15 The effect of line or graphical borders. Groupings with borders.

Visual style in web page design

- Maintain a consistent and unified visual style throughout the pages of an entire web site
- Base the visual style on:
- ☾ the profile and goals of the website owner
- ☾ the profile, tastes and expectations of the web site user.

Amount of Information

- Present **proper amount of information:**
- ☾ too little information is inefficient leading to more memory usage.
- ☾ too much information is confusing leading to longer visual search times.
- **Present all necessary information** for performing an action or making a decision on one screen, whenever possible.
- ☾ people should not have to remember things from one screen to the next.
- **Screen Density:** one objective measure of “how much” should go on a screen has been developed:”**density”**

Amount of Information

- **Density is a calculation of the proportion of display character positions on the screen or an area of the screen containing something.**
- Density is related to complexity . Increasing the density of display increase time and error.
- two types of density **overall density** & **local density**
- **Web Page Size**
- minimize page length- restrict to two or three screens of information
- place critical or important information at the very top so it is always viewable when page is opened- locate it within top 4 inches of page.

Scrolling and Paging

- Scrolling:
  - — Avoid scrolling to determine a page's contents.
  - — Minimize vertical page scrolling.
  - — When vertical scrolling is necessary to view an entire page:
    - • Provide contextual cues within the page that it must be scrolled to view its entire contents.
    - • Provide a unique and consistent "end of page" structure.
  - — Avoid horizontal page scrolling.
- Paging:
  - — Encourage viewing a page through "paging."
  - — Create a second version of a Web site, one consisting of individual screens that are viewed through "paging."

Scrolling and paging

- **Avoid scrolling to determine page contents:**
- a page's subject should be immediately recognizable. Elements crucial to identify a pages content must be viewable without requiring page scrolling
- **Minimize vertical scrolling:**
- Some scrolling may be necessary to view the entire page contents. Minimize that requirement for vertical scrolling by avoiding unnecessary graphics and white spaces.
- **Provide contextual scrolling and a unique end of page structure**
- lower parts of the page may be overlooked especially when the visible portion appears to satisfy the users needs. Provide contextual cues to the user that part of the page is hidden and viewing entire page will necessitate scrolling.
- To identify the page bottom, provide a visually unique and consistent ending on all pages. A row of navigation links and other elements such as copyrights, e-mail address & other contact information can signify " the end" of the page

Scrolling and paging

- **Avoid horizontal scrolling**
- while some vertical scrolling is now acceptable in web page design, horizontal scrolling must be avoided. A page too wide to be completely displayed will requires continuous scrolling as reading is performed which is inefficient.
- **Encourage use of paging**
- Full screen paging on the web can be done by using page-up and page-down keys or clicking the scroll bar page-up and page-down icons. Text is then moved by number of lines equaling screen size which is always faster than scrolling a line at a time.

Distinctiveness

- Individual screen controls, and grouping controls, must be perceptually distinct, distinctiveness can be enhanced through separation and contrast
- ☾ screen controls
- >> should not touch a window border
- >> should not touch each other
- ☾ Field and group borders
- >> should not touch a window border
- >> should not touch each other
- ☾ Buttons
- >> should not touch a window border
- >> should not touch each other
- **A button label should not touch the button border**
- **Adjacent screen elements must be displayed in colors or shades of sufficient contrast with one another**

Focus and emphasis

- ➢ Visually emphasize the
  - ✓ most prominent element
  - ✓ Most important elements
  - ✓ Central idea or focal point
- ➢ De emphasize less important elements- to designate an element as not active dim it or gray it out.
- ➢ To ensure that avoid
  - ✓ too many screen elements are emphasized.
  - ✓ screen clutter
  - ✓ using too many emphasize techniques

Focus and emphasis

- To provide emphasis use techniques such as :
  - ✓ Higher brightness
  - ✓ Reverse polarity
  - ✓ Larger and distinctive font
  - ✓ Underlining
  - ✓ Blinking
  - ✓ Line rulings
  - ✓ Contrasting colors
  - ✓ Larger size
  - ✓ Positioning
  - ✓ Isolation
  - ✓ Distinctiveness
  - ✓ White space

1. **Brightness:** a brighter element has a good attention getting quality and no disturbing features. At the same time do not use more than two brightness levels on a screen if it has any fault it will display screen elements improperly and even causing it to disappear.
2. **Reverse polarity:** it means displaying dark text on light background or reverse of it.
3. **Fonts:** differences in fonts have a moderate attention getting capability . Their varying sizes and shapes can be used to differentiate screen components. If you want to use multiple fonts never use more than 2 styles and three sizes on a screen.
4. **Underlining:** it is an attention getting mechanism which should be used conservatively and carefully. In GUI it is used to designate commonly used mnemonics, in web it is used to designate navigation links

- **5. Blinking:** it has very high attention getting capability but it reduces the text readability and is disturbing to most people. So it should be reserved for urgent situations and times when a quick response is necessary.
- **6. colors:** use color to emphasize and assist in the identification of screen components. Some colors appear brighter than others . Display no more than 4 colors at one time.
- **7. Avoid too much emphasis:** an emphasized element must attract users eye . Emphasis will loose it attracting value if too many different items on a screen are emphasized. Minimization of clutter also assists a user in focusing on the most crucial part of a screen.

- **8. Web page emphasis:** the dynamic nature of web and its available screen design tools raises other emphasis considerations. in appropriate page backgrounds may degrade an emphasis techniques usability.

Presenting Information Simply and Meaningfully

- Provide legibility.
  — Information is noticeable and distinguishable.
- Provide readability.
  — Information is identifiable, interpretable, and attractive.
- Present information in usable form.
  — Translations, transpositions, and references to documentation should not be required to interpret and understand information.
- Utilize contrasting display features.
  — To attract and call attention to different screen elements.
- Create visual lines.
  — Implicit and explicit, to guide the eye.
- Be consistent.
  — In appearance and procedural usage.

1. **Legibility :** it is distinguishableness. Information should be noticeable and distinguishable, is the information present is of proper kind and adequate size and clarity for users of all ages? Is the contrast between text and its background adequate?

2. **Readability:** information is identifiable, interpretable and attractive. Is the information written at an understandable level for all users? Is it direct simple and easy to comprehend.

- words are given more distinctive shapes by letter **“ascenders”** and **“descenders”**
- **eg: Ascenders** are letter strokes that raise above ‘x’ , **explain- e,a,x are identical in height where as the tops of ‘l’ and ‘i’ raise above ‘x’.**
- **Descenders** are letter strokes that drop below the x- **the bottom of ‘p’ in explain**

- **3. usability**: screen information should be presented in a directly usable form. Translations, transpositions and references to documentation should not be required to interpret and understand the information
- **4. Contrasting display features:** using contrasting display features to call attention to different screen elements
- **5. Create visual lines:** eye should be guided vertically or horizontally implicitly through the screen.
- **6. Consistency**: Methods chosen to present information must always be consistent in visual appearance and procedural usage .

Typography

1) **Font types and families:** use simple common and readable fonts like " times new roman, verdana etc" that provides clarity on most screens.

- Use no more than 2 families compatible in terms of line thickness, capital letter height and so on.
- never mix families within the same race as typographic noise will be created.
- Assign a separate purpose to each family.
- Allow one family to dominate.

Font Size

- Use no more than three sizes.
  — Consider "X" height.
- For graphical systems use:
  — 12 point for menus.
  — 10 point for windows.
- For Web pages use:
  — 12–14 points for body text.
  — 18–36 points for titles and headings.
- For line spacing use one to one and one-half times font size.
- Never change established type sizes to squeeze in more text.

Chapter headings:	24-point bold
Section headings:	18-point bold
Subsection headings:	14-point bold
Paragraph headings:	12-point bold
Body text:	10-point
Annotations/footnotes:	8-point

abcdefghijklmnopqrstuvwxyz

abcdefghijklmnopqrstuvwxyz

abcdefghijklmnopqrstuvwxyz

Figure 3.20 Types with same point size and different x heights (from top to bottom, Gatsby, Times Roman, and Avant Garde).

Font Styles and Weight

- Use no more than:
  - Two styles of the same family.
    - Standard and *italic*.
    - *Italic* is best presented in a serif font.
  - Two weights.
    - Regular and **bold**.
    - **Bold** is best presented in a sans serif font.
- Use *italics* when you want to call attention.
- Use **bold** when you want to call attention or create a hierarchy.
- In Web pages, use an <u>underline</u> only to indicate a navigation link.

Typography

- **4) Font case**
- **Use mixed case for :**
- -- control captions
- -- Data
- -- Control choice descriptions
- -- Text
- -- Informational messages
- -- Menu descriptions
- -- Button descriptions

Typography

- **consider using upper case for:**
- -- Title
- -- Section Headings
- -- Subsection headings
- --Caution and Warning messages
- -- words or phrases small in point size
- **Use all lower case with caution.**

Typography

- **5) Defaults**
- -- for graphical systems use standard system fonts. **ex: Microsoft windows 90 default font is MS Sans Serif 8 point.**
- --for web pages design for the default browser fonts. Not all browsers provide the same typographic operations. Many older browsers supports only 2 fonts times new roman and courier. New browsers supports many fonts.
- -- consider that user may change the fonts

Typography

- **Consistency-**
- Establish a consistent hierarchy and convention for using typefaces, styles and sizes
- -- decide on a font for each different level of importance in the hierarchy.
- --communicate hierarchy with changes in size, weight and color.
- **7) Paper versus screen reading**
- Provide a facility for printing out a hard copy of documents

Screen Elements

1. Captions/labels

- Identify controls with captions or labels
- Fully spell them out in a language meaningful to the user
- Display them in normal intensity
- Use a mixed case font
- Capitalize the first letter of each significant word
- End each caption with colon(:)
- Choose distinct captions that can be easily distinguished from other captions

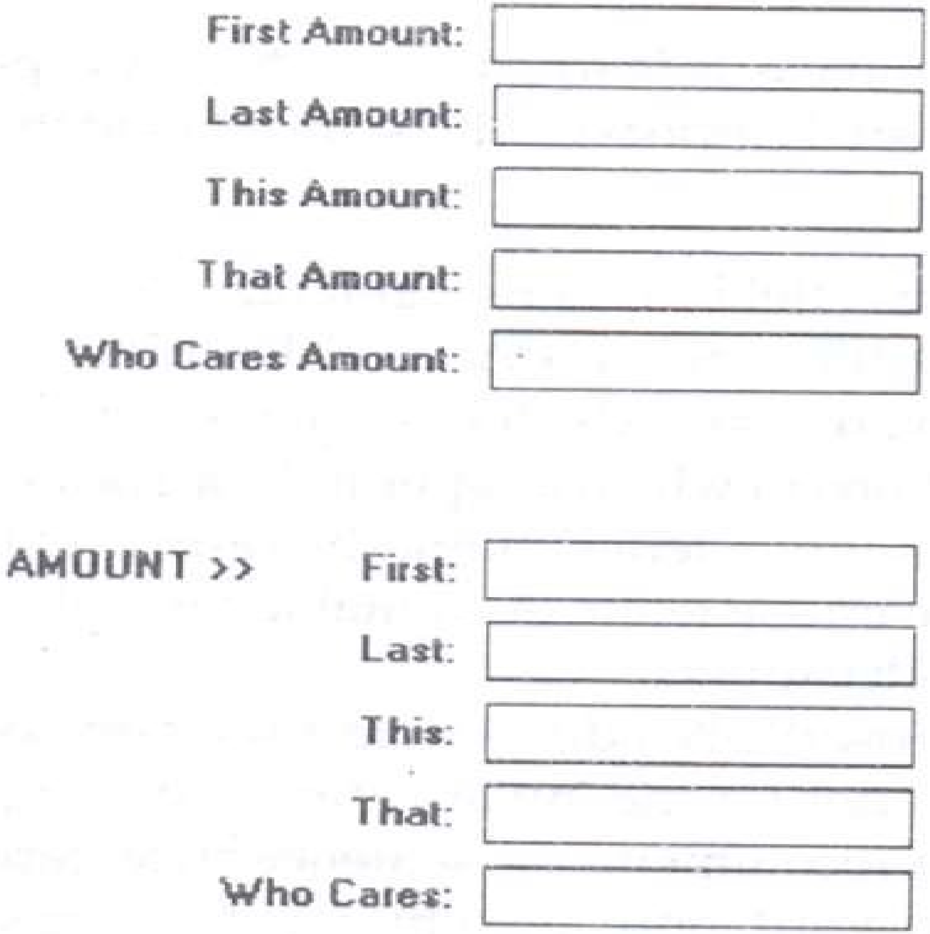


Figure 3.21 Providing better control caption discrimination. (The redundant word "amount" is incorporated into a heading.)

Screen Elements

- **2. Data Fields**
- For entry or modifiable data fields, display data within a line box and a reverse polarity box
- For inquiry or display/ read only screens, it is best for the data to be presented on the background of the screen. This permits easier scanning and information location.
- Visually emphasize the data fields.

Control Captions/Data Fields

- Differentiate captions from data fields by using:
  - — Contrasting features, such as different intensities, separating columns, boxes, and so forth.
  - — Consistent physical relationships.

Figure 3.22

- For single data fields:
  - — Place the caption to left of the data field.

Figure 3.23

  - — Align the caption with the control's data.
  - — Alternately, place the caption above the data field.
  - —Align captions justified, upper left to the data field.

Figure 3.24

  - — Maintain consistent positional relations within a screen, or within related screens, whenever possible.
- For multiple listings of columnar-oriented data, place the caption above the columnized data fields.

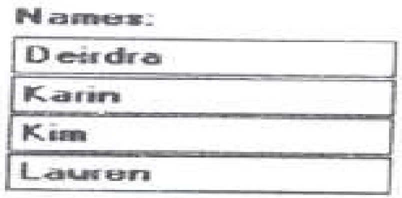


Figure 3.25

Control Caption/Data Field Justification

- 1. First Approach
  — Left-justify both captions and data fields.
  — Leave one space between the longest caption and the data field column.

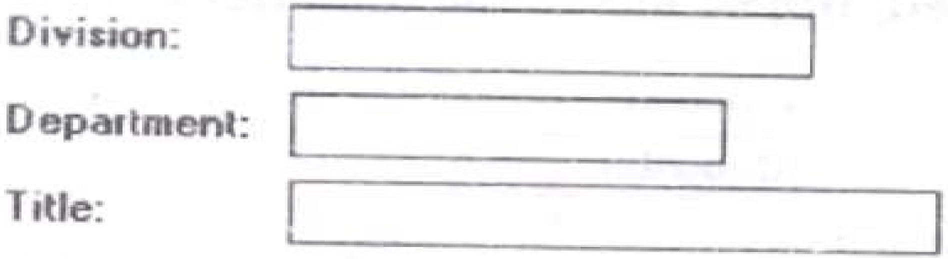


Figure 3.26

- 2. Second Approach
  — Left-justify data fields and right-justify captions to data fields.
  — Leave one space between each.

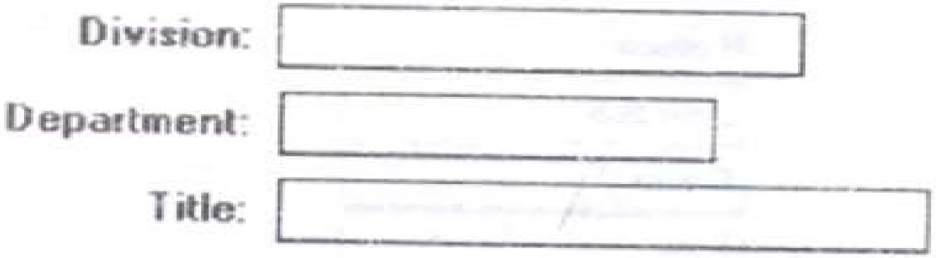


Figure 3.27

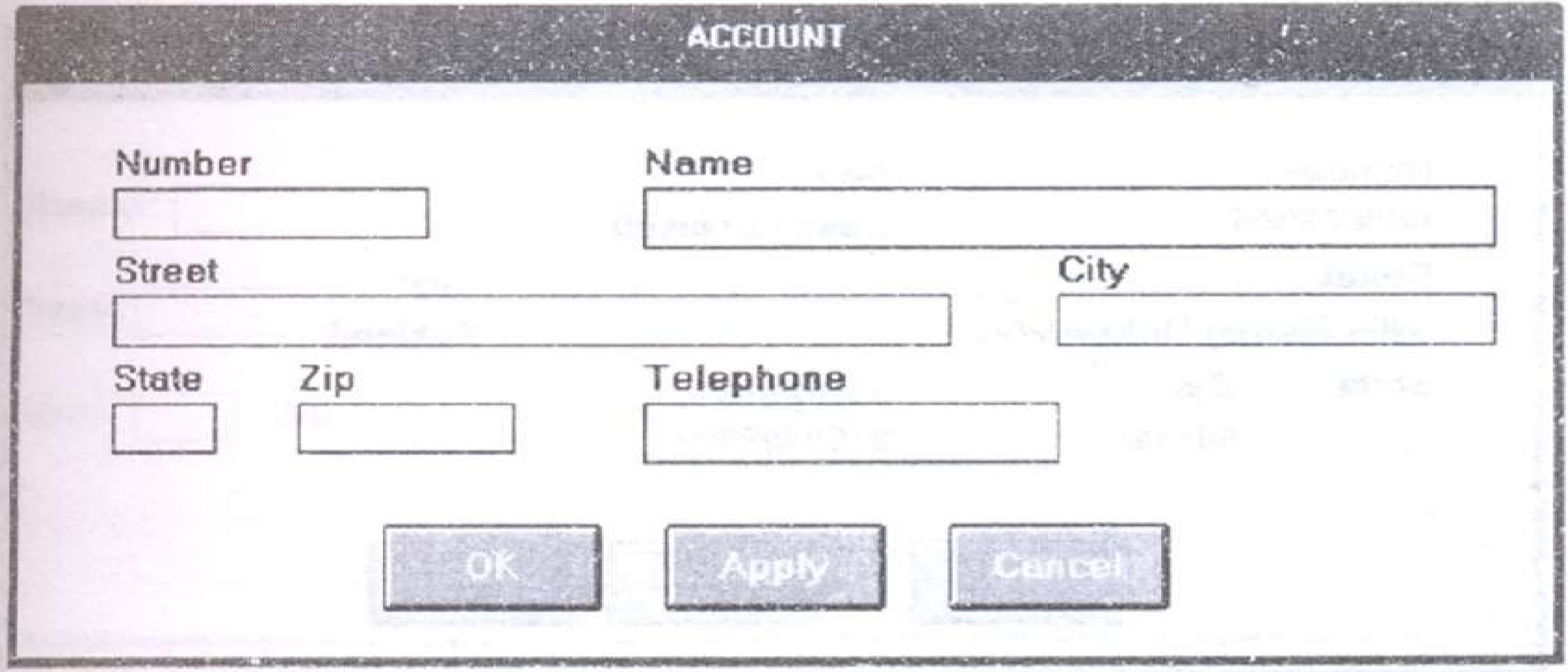


Figure 3.28 Entry screen with captions above single data fields. Captions distinct from data but with poor alignment and organization of fields. Left-to-right orientation and no groupings. Fair readability.

Justification of single captions and data fields can be accomplished in several ways. These include:

A. Left-justifying captions; data field immediately follows caption.

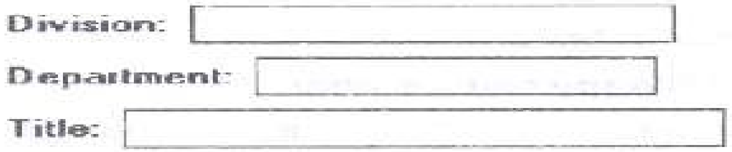


Figure 3.45

B. Left-justifying captions; left-justifying data fields; colon (:) associated with captions.

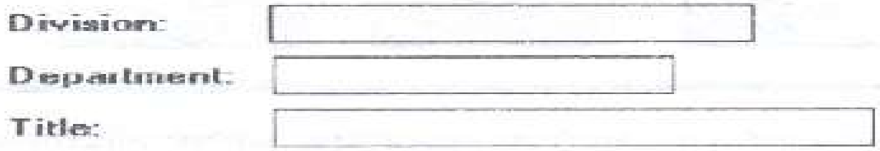


Figure 3.46

C. Left-justifying captions; left-justifying data fields; colon (:) associated with data field.

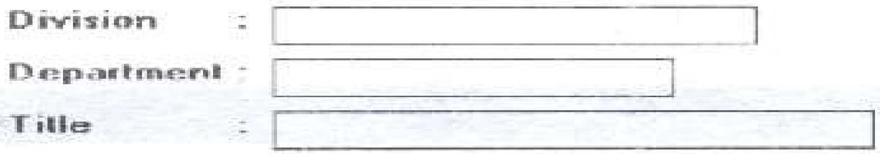


Figure 3.47

D. Right-justifying captions; left-justifying data fields.

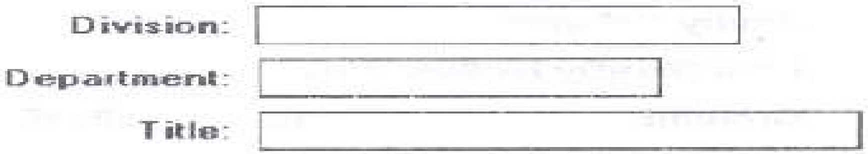


Figure 3.48

Special Symbols

- consider special symbols for emphasis
- Separate symbols from words by a space
- Eg: DELEGATES >>
- **Headings**

1) **Control section headings**

- Provide meaningful heading that clearly describes the relationship of the grouped controls
- Locate the section headings above the screen controls, separated by one space line
- Alternatively headings may be located within a border surrounding a grouping justified to the upper left corner.
- **2) Control sub section headings**
- **3) Field group Headings**

- **4) Web Page Headings**
- **Control headings-** for groupings of controls follow the control headings guideline
- **Page and text headings-** provide a meaningful page heading, text headings and sub headings that describes the content and nature of the page that follows
- Establish a hierarchy of font sizes, styles and weights depend on importance of the content
- **Instructions**
- - incorporate instructions on a screen as necessary for the user:
- ☾ In a position just preceding the part of a screen to which they apply
- ☾ easily distinguishable by displaying them in a unique style and color

- We will be having few more techniques like
- Completion aids
- Keying procedures
- - key strokes
- - tabbing
- - manual tab vs autoskip

Information retrieval on web

- The most sought after web commodity is content.
- Behavior is often goal driven.
- Reading is no longer a linear activity.
- Impatience.
- Frequent switching of purpose.
- Web users access site for different reasons: a focused search for a piece of information or an answer less focused for browsing or surf.
- High tech capabilities , fancy graphics do not compensable for inefficient or poor content.

- **Initial focus on attention**
- when a web page is presented it will be scanned in a clockwise direction, people being influenced by its title, graphics, shape, text, graphics and color
- **Page perusal(page reading/inspecting)**
- Focusing on page content users are first drawn to the page text particularly headings, captions, summaries and notes. If the page does not appear to be relevant to users needs or goals quickly it will be removed.
- **Scanning guidelines**
- ☾ **organization:**
- --minimize eye movement through the entire page.
- --provide groupings of information

- **--**organize content in logical and obvious way

- ☾ **writing**
- -- provide a meaningful title so that the purpose of the
- page should be easily identifiable by its headings and sub headings
- --concisely/compactly write the text
- --write short paragraphs containing only one idea
- --use the inverted pyramid style of writing(starts with conclusion and followed by expanded detail)
- --use bulleted and numbered lists
- --array information in tables
- --provide concise summary
- ☾ **presentation**
- --**highlight:** key information carrying words or phrases and important concepts.

Browsing

- website browsing is analogous to shopping . A person walks into a store(website), looks around(the page), gets a feel for the place(presentation style, layout etc), looks for signs of interest(headings, summaries etc) and then decides to stay or leave
- **Browsing guidelines**
- ☾ facilitate scanning
- ☾ provide multiple layers of structure
- ☾ make navigation easy
- ☾ respect users desire to leave
- ☾ upon returning help the users to reorient themselves

- **Searching**
- people search web when they have specific goal or need for which they seek an answer. Their focus may be something specific like a document, product. Using search engine in your site reduces users work to search for some thing.
- **Problems with search facilities**
- ☾ not understanding the users
- ☾ difficulties in formulating the search
- ☾ difficulties in presenting meaningful results
- **Search facility guidelines**
- the purpose of search facility is to bring back information not data . Specifically answers to questions, the shortest, clearest are what

really matter

- ☾ **know your search user**
- **--**identify the level of expertise of the user
- --anticipate the nature of every possible query, the kind of information desired, the type of information being searched, how much information will result from the search
- -- plan for the users switching purpose during the search process
- -- plan for the flexibility in the search process
- **Express the search**
- ☾ **what :** for in site facilities structure the searching function to the web sites information and the users needs.
- **--** integrate searching and browsing
- ☾ **where:** make the search facility prominent on the home page or to

include search facility on every page

Express the search

- ☾ **How:**
- --permit users to specify the extent of searches within a section, across a site, within specified sources, globally
- -- provide methods of specifying search parameters including keywords, phrases, variants like case insensitivity, partial matches, synonyms
- -- provide spell checker
- -- provide search controls including
- -- a text box- size should be large enough to enter a minimum of 20 characters, font and font size
- --structured controls like check boxes, drop down list boxes.
- -- a command button label: search, location: to the right of search text box

Express the search(cont)

- -- provide separate interfaces for simple and advanced search
- -- provide guidance and assistance like provide clear instructions, offer offline help, offer a search wizard.
- **Progressive search refinement**
- allow the user to control the size of the result by providing a simple mechanism to
- **--**first perform rapid rough search that reports only the number of items in the result set or a preliminary list of topical matches
- then perform a refinement phase to narrow the search and retrieve the desired result

- **Launch the search**
- permit search activation by clicking on the command button or pressing the return key
- in search refinement permit the changes to a parameter to automatically produce new set of results
- **Present meaningful results**
- **goal:** provide exactly the information or answer the user is looking for and present it in a language and format that is easy to understand and use
- **criteria summary** present a summary of search criteria with the search results
- **explanatory message:** provide a meaningful message to explain search outcomes and indicate how many items compose the search result.

- **Present meaningful results**
- ☾ **results presentation**: present textual listing that is concise, clear and easily scannable
- ´ ☾ **permit the user to** modify the result set sequencing, cluster the result set by an attribute value.
- ´ ☾ **for multipage listings make obvious the link to the next search result page. For results with only one item immediately present the result page**.

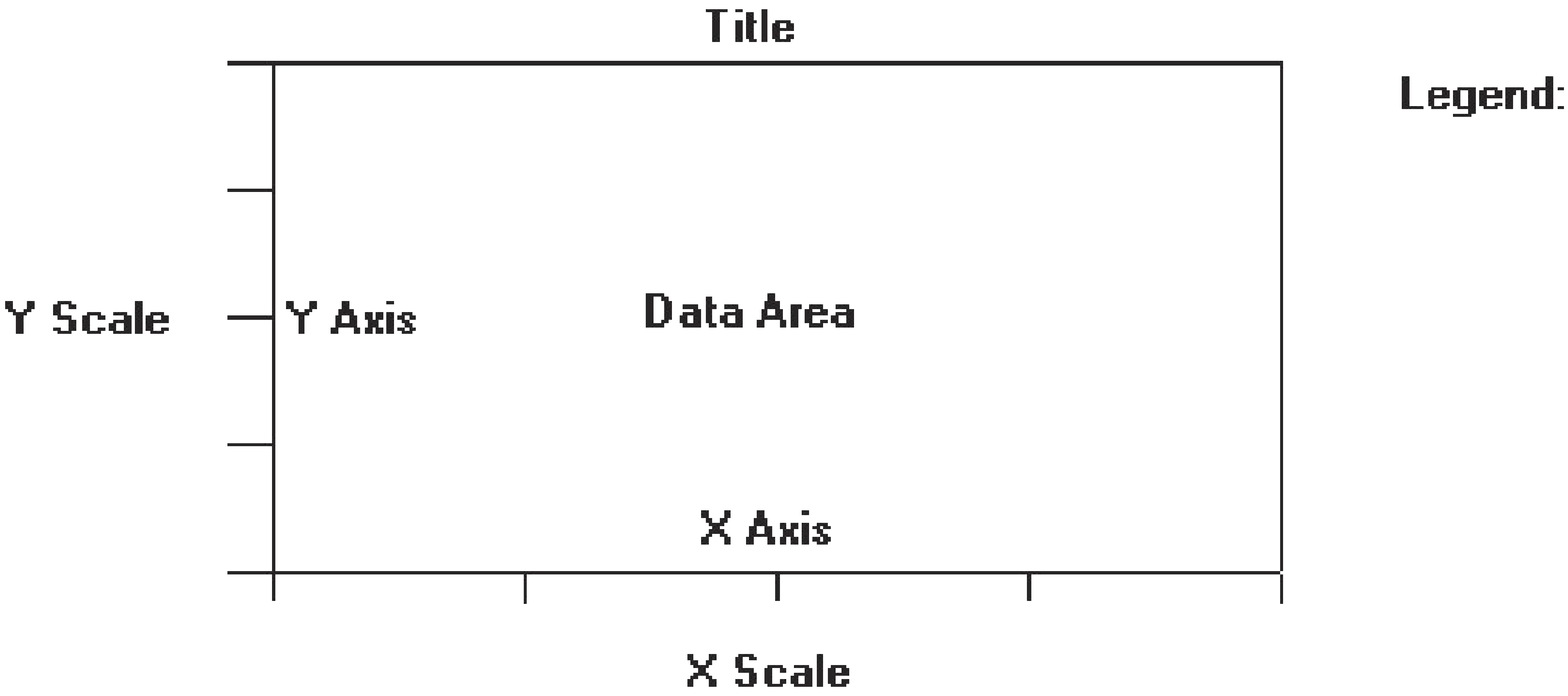
Statistical graphics

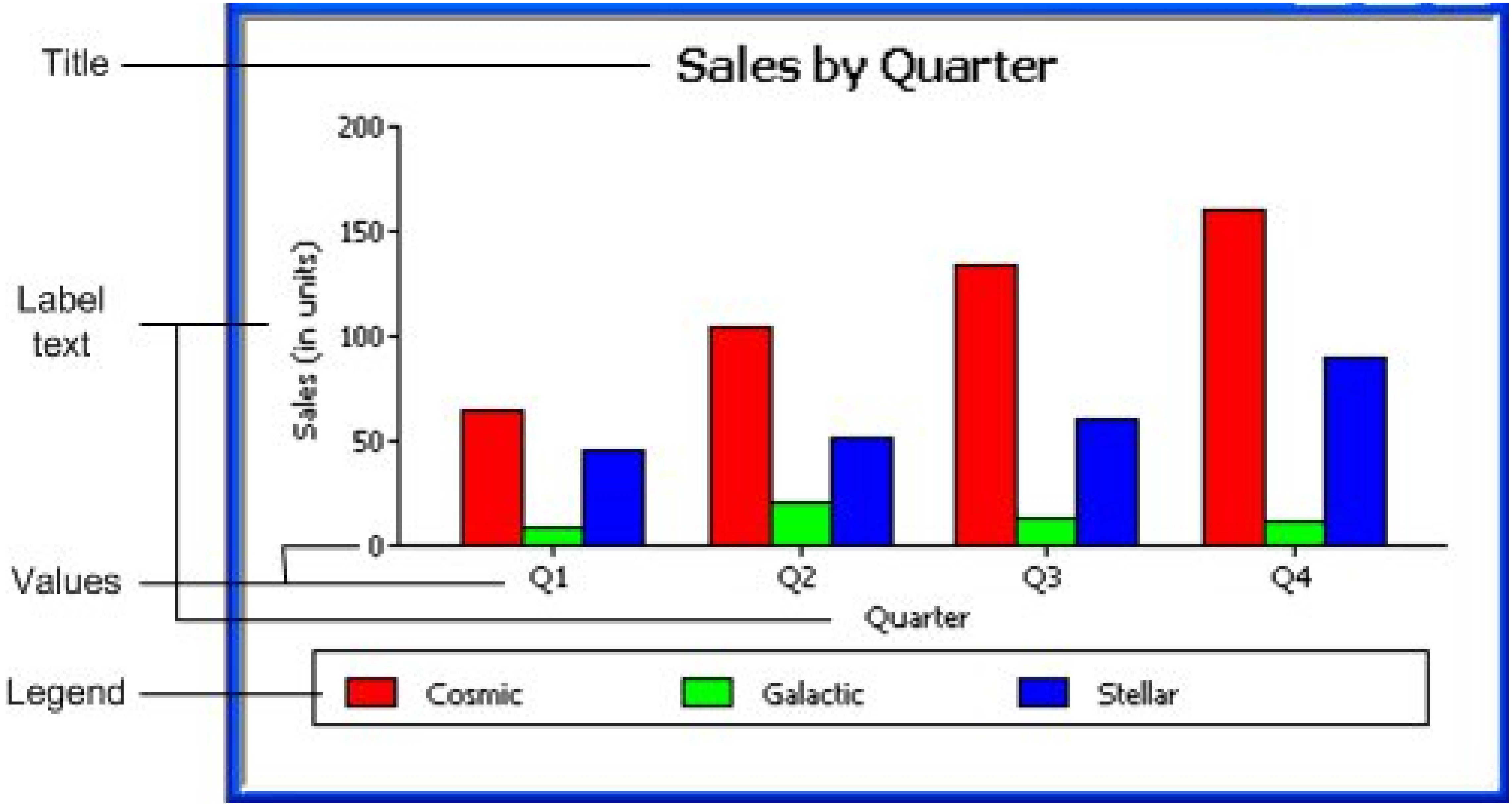
- A statistical graphic is data presented in a **graphical format**.
- A well designed statistical graphic also refered to as **chart or graph,** consists of complex ideas communicated with clarity, precision and efficiency.
- It gives viewer the greatest number of ideas in the shortest time and in the smallest space and with least possible clutter
- **Use of statistical graphics**

- reserve for material that is rich, complex or difficult

- **Components of a statistical graphic**
- Most statistical graphics have at least two axes, two scales, an area to present the data, a title, and sometimes a legend or key, as illustrated in Figure in next slide

Statistical graphics



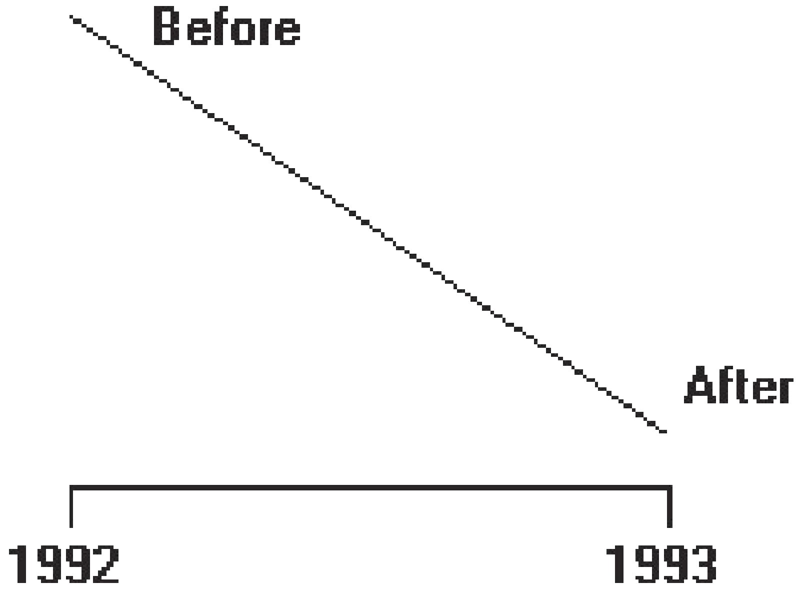

Title
Label
text
Values
Legend
Sales by Quarter
200
150
100
50
0
Sales (in units)
Q1
Q2
Q3
Q4
Quarter
Cosmic
Galactic
Stellar

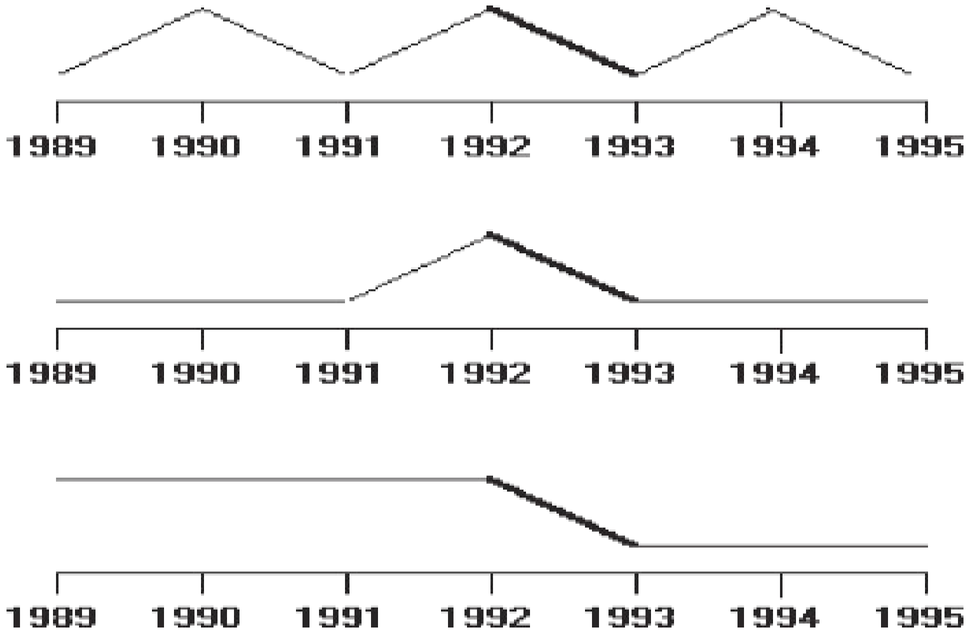
Components of a statistical graphic(cont)

- **Guide lines for graphic components include following**
- **1) Data Presentation**
- **a) emphasize the data :** a persons attention should be drawn to the measured quantities.
- **b) Minimize non data elements:** non data elements like decorations, elaborate grid lines, extensive labels draw attention to them selves and mask the data. So, non data elements should be minimized
- **c) Minimize redundant data:** information that reproduce the same value over and over should be minimized/ eliminated. Use redundancy only if necessary
- **d) Show data variation not design variation :** each part of a graphic generates visual expectations about its other parts. The expectancies created in one part should be fulfilled in other parts so the viewers does not confuse about changes in design with changes in data which leads to ambiguity.

Components of a statistical graphic(cont)

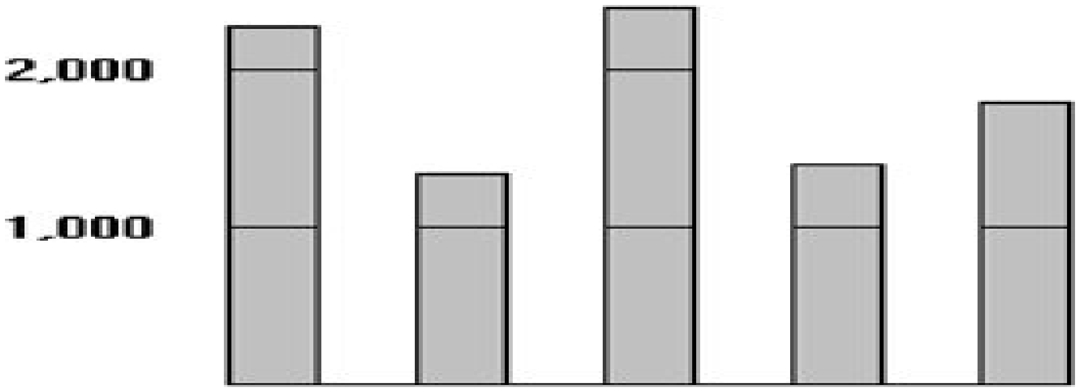
- **e) Provide proper context for data interpretation:** Data for making comparisons or establishing trends must always be included to provide a proper reference point. “Thin” data must be viewed with suspicion. The graphic in Figure 1, for example, might have a number of possible interpretations, as illustrated in Figure 2. All important questions must be foreseen and answered by the graphic.





Components of a statistical graphic(cont)

- **f) Employ data in multiple ways, whenever possible:** Parts of a graph can be designed to serve more than one purpose. A piece of data may at the same time convey information and also perform a design function usually a non data function



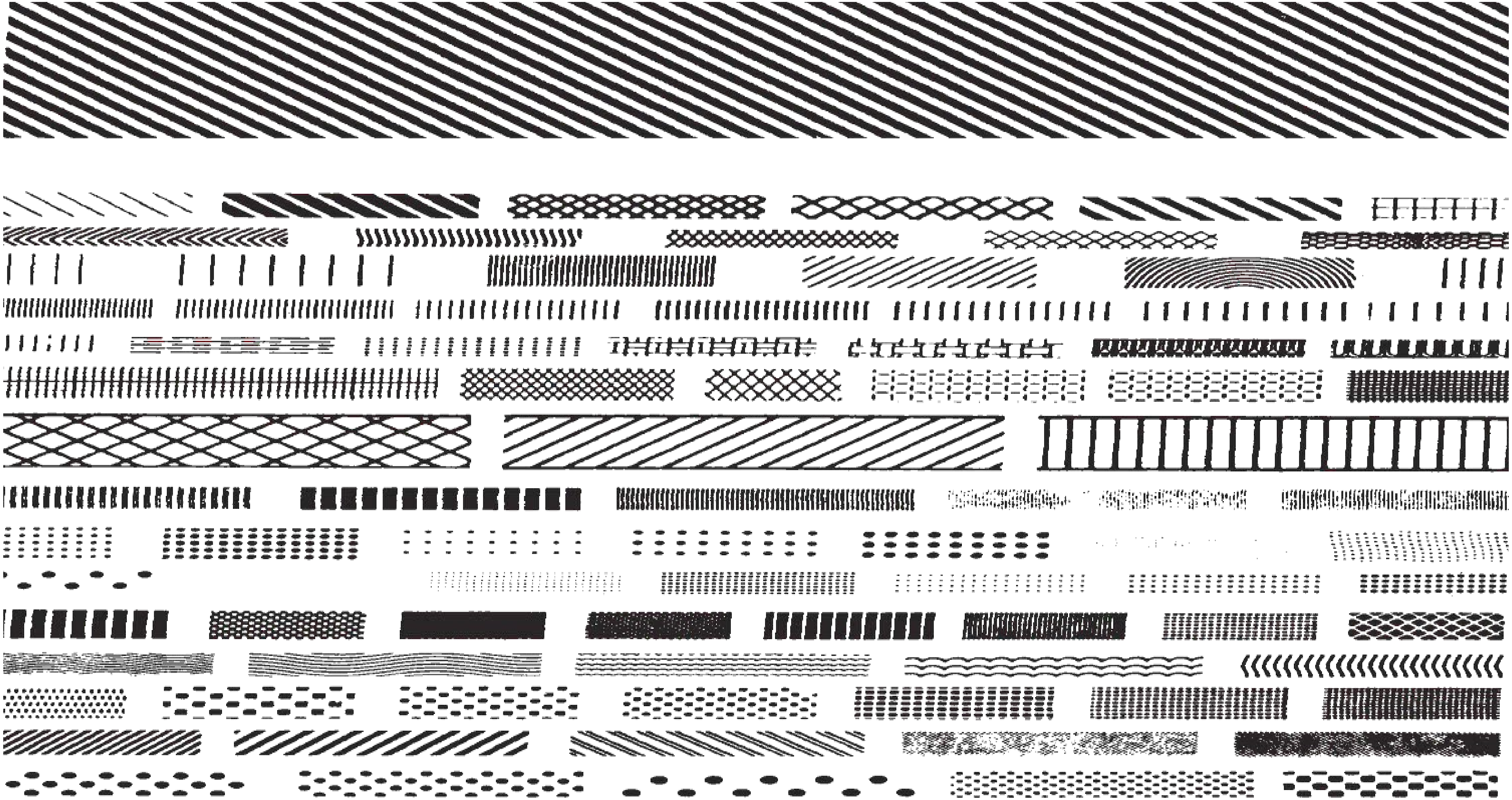
- In **FIG** A piece of data (line in the bars) performing a non data function

Components of a statistical graphic(cont)

- **g) Maximize data density:** In graphics more is better than less—the greater amount of information displayed, the larger the number of visual comparisons that can be made, improve understanding.
- Data density of a graphic can be maximized in two ways: enlarging the data matrix or shrinking the graphic.
- **Enlarging the data matrix** involves displaying as much information as possible.
- **Shrinking the graphic** means reducing it in size, but screen resolution may impose limitations on how much shrinking can be performed.
- If visual differentiation in the types of data being displayed is necessary, use simple coding methods in the areas represented.
- **Some possible coding alternatives include:** Varying shades or densities, Labeling with words, Varying colors.

Components of a statistical graphic(cont)

- **h) Avoid unnecessary embellishment(beautification) of grids, vibration, ornamentation:** All pieces of a graphic must tell the viewer something new. An unnecessary embellishment is "chartjunk." It does not add anything new to the graphic's meaning.
- Non data elements and redundant data are forms of chartjunk. Three other kinds are vibration, heavy grids, and ornamentation.
- A grid carries no information, contributes noise, and focuses attention away from the data. An excessively heavy grid can even mask the data. Grids should be suppressed or eliminated so they do not compete with the data.
- when small patterns lines, boxes, or dots are viewed, they shimmer or vibrate. This vibration can be distracting.



Components of a statistical graphic(cont)

- When the graphic is overwhelmed by decoration, it is very ineffective.
- **Ornamentation** can take many forms: extensive use of color when it is not necessary; creating multidimensional graphics when single dimensional will do; pointless use of vibrating patterns, or forcing data into a graphic when a table would work

Components of a statistical graphic(cont)

I) Fill the graph's available area with data: For ease of interpretation and efficiency, the graphic's data should fill up the entire display area within the axes.

- **Axes**

1. Values on an axis should increase as they move away from the origin.
2. Use the horizontal axis (X) to show time or cause of an event (the independent variable).
3. Use the vertical axis (Y) to show a caused effect (the dependent variable).

- Scales and shading

- **place ticks to marks scales on the outside edge of each axis.** Placing them outside will prevent a tick from interfering with data located near the axis

- **employ a linear scale.**

- **mark scales at standard or customary intervals.** Familiar standard intervals are 1, 2, 5, 10, and multiples of 10. Familiar customary intervals include the days of the week and the months of the year.

- **Start a numeric scale at zero.** Using zero as the starting point on a scale improves visual comparisons since zero is an expected starting point. If a zero point is omitted because of the nature of the data, this omission should be clearly indicated in the graphic.

- Scales and shading

- \- **Keep the number of digits in a scale to a minimum-** Smaller numbers improves understanding. Round off all numbers to two digits or less. However, place zeros in front of decimal numbers so the decimal point is not missed.

  \- **display only a single scale on axis.** Avoid multiple scales associated with a single axis. multiple scales can be confusing and can lead to interpretation errors. Meanings can also be greatly distorted. If multi scale graphs must be used, permit the user to select any data curve individually and have the computer highlight its corresponding scale.

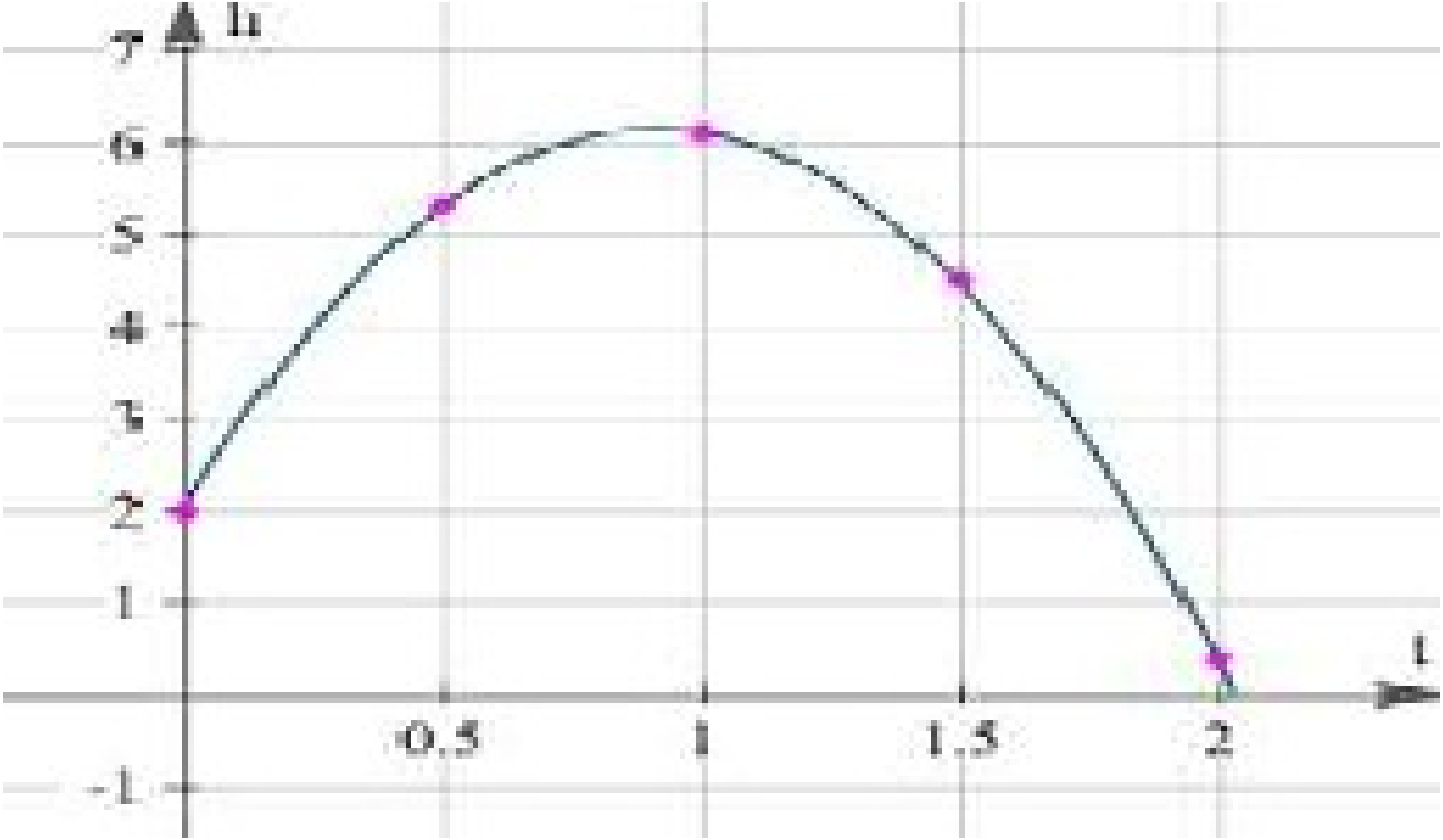
- Scales and shading

- **provide aids for scale interpretation** When reading accuracy is extremely critical, provide computer assistance for interpretation.

- **clearly label each axis**

- **consider duplicate axis for large scale data** The readability of large data matrices is improved if the X-axis scale appears at the top as well as the bottom of the graph, and the Y-axis scale at the right as well as the left side.

- **Provide scaling consistency** across two or more related graphics. If comparisons made between multiple graphs use same scale .
- **Proportion** Provide accurate proportion of the displayed surfaces to the data they represent.
- Provide proper proportion by:
- ☾ Conforming to the shape of the data.
- ☾ Making the width greater than the height.
- **Lines**
- ☾ Data lines should be the heaviest.
- ☾ Axes lines should be of medium weight.
- Extend the lines entirely around the graphic.
- ☾ Grid lines should be very thin or absent.



h
7
6
5
4
3
2
1
-1
0.5
1
1.5
2
t

- Scales and shading

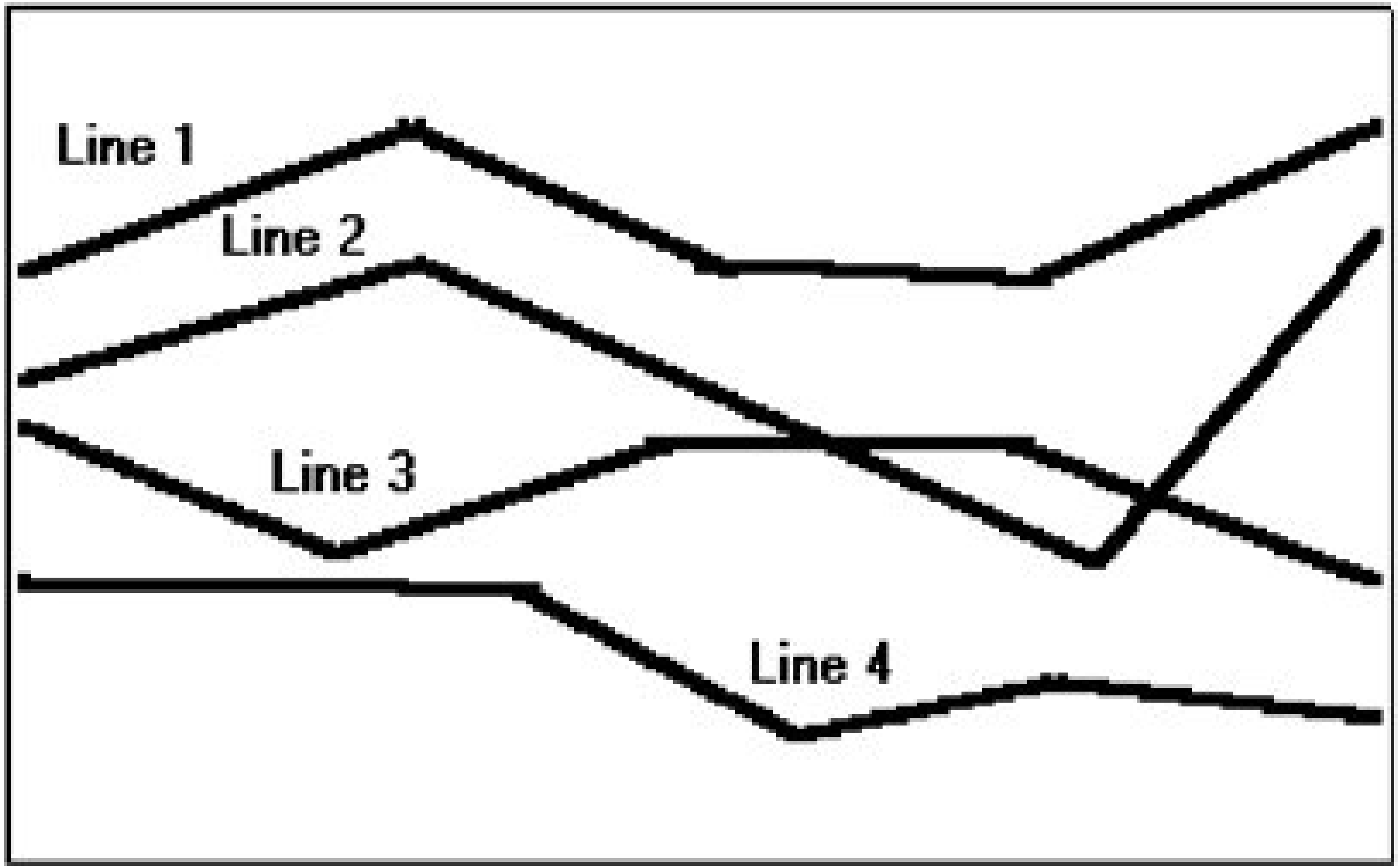
- **Labeling** each scale axis should be clearly labeled in a conventional left – right reading orientation. A complete description of the values, with measurement units should be provided

- Employ clear, detailed and thorough labelling.
- Maintain a left-to-right reading orientation.
- Integrate the labelling with the drawing. Do not curve letters to match the shape of curved lines.
- Use only one typeface, font, and weight. For emphasis, use different type sizes.
- Do not separate labelling from the data through ruled lines.
- Provide information about the source of the data.
- Use a legend for complicated graphs.

- Scales and shading

- **Title**
  - Create a short, simple, clear, and distinctive title describing the purpose of the graphic.
  - Position the title above, centred, or left-aligned to the rectangle formed by the extended axes.
  - Spell it out fully, using a mixed-case or uppercase font.
  - **Types of statistical graphs**
- Statistical graphics may take many forms

➢ **curve and line graphs** can be used to show relationships between sets of data defined by two continuous variables. They are especially useful showing data changes over time.


Line 1
Line 2
Line 3
Line 4

Types of statistical graphs

- ✓ **Single graph** If several curves must be compared, display them in one combined graph.
  - ✓ **Four or five maximum** Display no more than four or five curves in a single graph. As more curves or lines are added to a graph, visually discriminating among them becomes more difficult. The maximum number of lines presented should be limited to four or five.
  - ✓ **Label identification** Identify each curve or line with an adjacent label whenever possible.
  - ✓ **Legend** If a legend must be included, order the legend to match the spatial ordering of the lines.

Types of statistical graphs

- ✓ **Tightly packed curves** For tightly packed curves or lines, provide data differentiation through a line coding technique. Common coding techniques include different colors and line types.
- ✓ **Important or critical data** Highlight curves or lines representing important or critical data. If one curve or line in a multiple-line graph is of particular significance, highlight that curve (high intensity, different color, and so on) to call attention to it.
- ✓ **Comparing actual and projected data** When a curve or line must be compared to a standard or critical value, display a reference curve or line reflecting that value.

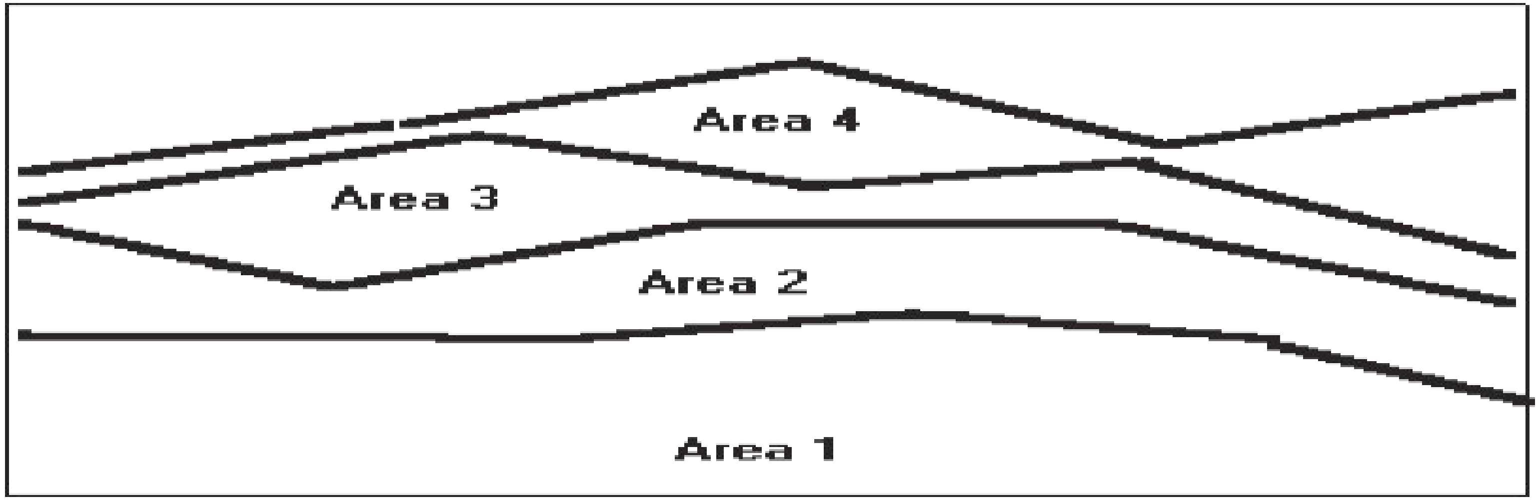
Types of statistical graphs

- ✓ **Data differences** If the difference between two sets of data must be determined, display the difference itself as a curve or line. This is preferable for the user to visually compare the two values and calculate the difference between them.

➢ **Surface charts**

- the curves or lines are stacked above one another to indicate individual amounts. Each boundary height is determined by the height of the line below it, and the area between each line or curve is differently coded, usually by textures or shading.

Types of statistical graphs



Surface Charts

✓ **Ordering**

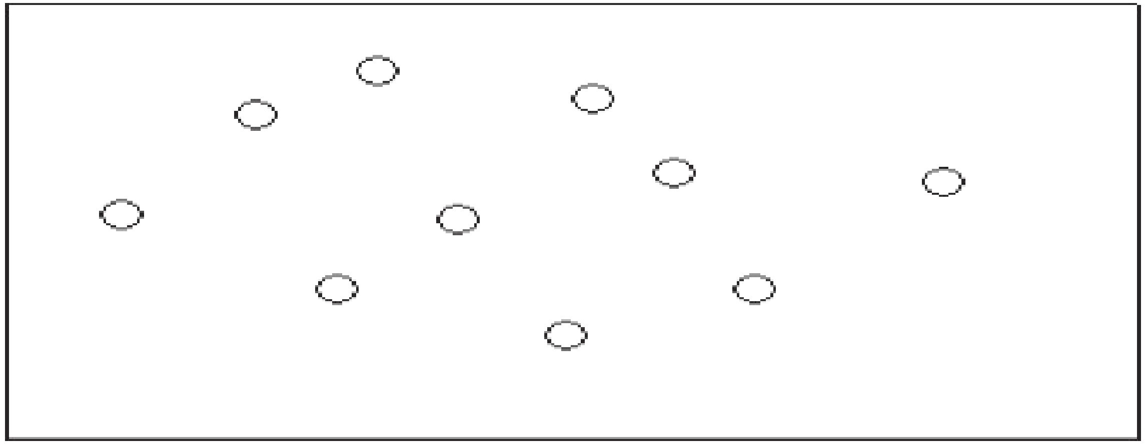
- Order the data categories so that:
- ☾ The least variable is at the bottom, and the most variable at the top.
- ☾ The largest is at the bottom and the smallest at the top.

Types of statistical graphs

- ✓ **Coding schemes** Use different texture or shading coding schemes. Ensure that the coding scheme chosen for each area is visually distinguishable from all the others. Place darker shades or colors toward the bottom.
- ✓ **Labels** Labels with a left-to-right reading orientation should be included within textured or shaded bands

Scatter plots

- these are used to show relationships among individual data points in a two-dimensional array. A point is displayed on the plot where the X-axis and Y-axis variables intersect



Scatter Plots

Scatter plots

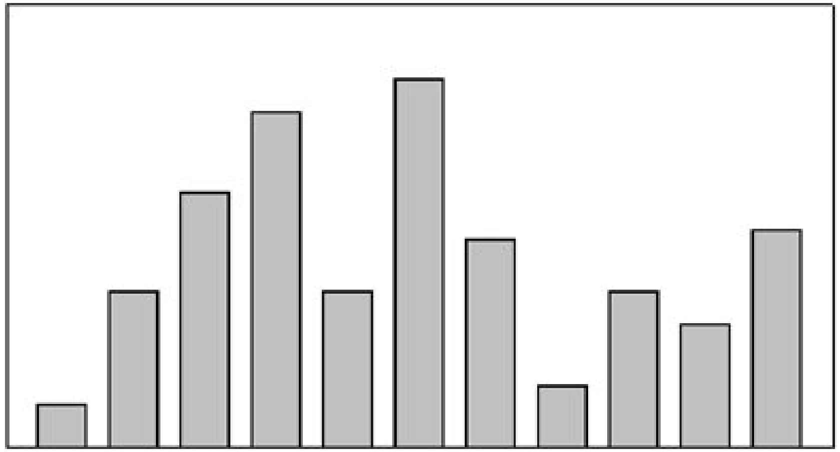
- ✓ **two dimensions** Limit scatter plots to two dimensions. Three-dimensional scatter- plots do not yield clear displays.
- ✓ **Consistent intervals** Maintain consistent scale size intervals. Inconsistent spacing size between scale ticks on the two axes will disfigure the displayed data.
- ✓ **Distinguishable plots.** Construct the plot points of distinguishable, equal sized circles, squares, rectangles, or diamonds. These symbols may be filled in or empty. Color may also be used to designate the points. when using color, different colors can look different in size, and some people using the graphic may be colorblind.

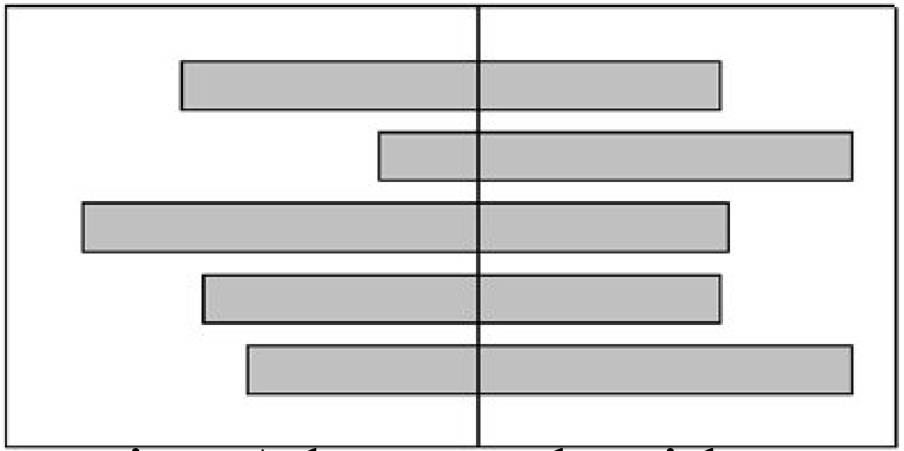
Scatter plots

- ✓ **multiple data sets** If there is more than one set of data on the plot, use different symbols for each data set’s points.
- ✓ **Significant points** Visually distinguish significant points. Points of particular significance on scatter plots can be made distinctive through highlighting techniques such as the use of high intensity, different colors, or different shapes.

Bar graphs

- these are used to show a few differences between separate entities or to show differences in a variable at a few discrete intervals. A bar graph consists of a series of bars extending from a common origin or baseline





- A bar graph with a common origin point. A bar graph with separately plotted high and low points.

- ✓ **consistent orientation** While bars may be oriented either horizontally or vertically, a consistent orientation should be maintained for bars displaying similar information.
- **Use vertical bars** when the item being counted is of greatest interest.(best suited for frequency counts)
- **Use horizontal bars:** When the data labels are long and To highlight the information rather than the count.(used for time durations)

✓**Meaningful organization** Use a meaningful organizing principle, such as volumes, dates, or alphabetical. If no meaningful principle exists, arrange the bars so that the length of bars are in ascending or descending order.

Bar graphs

- ✓**Bar spacing** Space the bars for ease of visual comparison. Comparison of bars should be accomplishable without eye movement.
- Generally, the spacing between bars should be one-half or less of the bar width.
- If groupings of bars are presented, leave the space between the groupings.
- ✓**Differentiation** If different kinds of bars must be easily distinguished, provide differentiation through a coding technique such as the use of color, texture, or shading.

Bar graphs

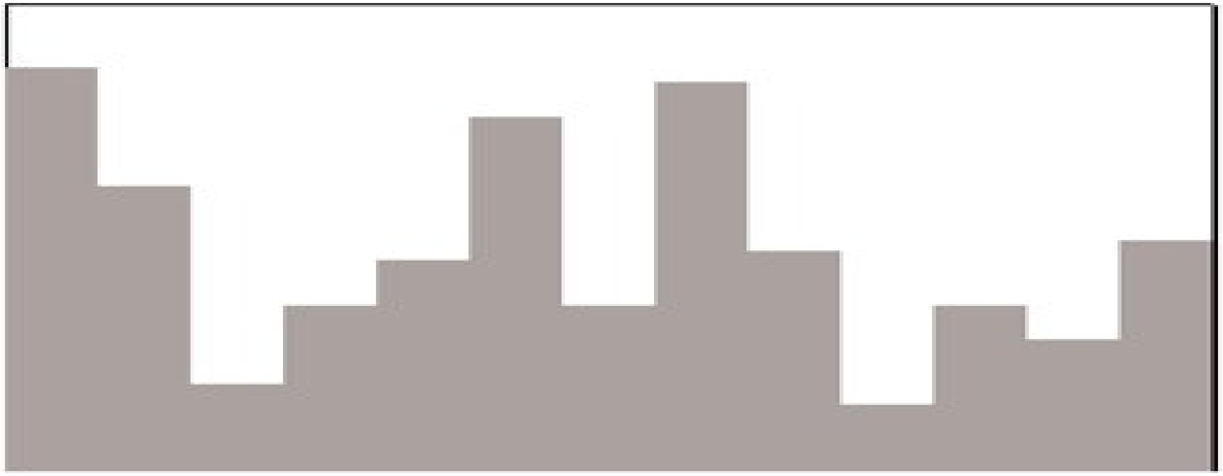
- ✓**Important or critical data** Highlight important or critical data. If one bar represents data of unusual significance, call attention to that bar through a different coding technique. Related groups of bars should be ordered in a consistent manner.
- ✓**Related bar ordering** Provide a consistent ordering for related groups of bars.
- ✓**Reference index** When bars must be compared to some standard or critical value, display a reference line to assist that comparison.

Bar graphs

- ✓**Labelling** A label associated with each bar, in left-to-right reading orientation, is preferable to a separate legend. Place labels below, or to the left of, the baseline.
- If the labels on a horizontal bar chart are short, left-align them.
- If they are long, right-align them to the axis.
- If groups of bars are repeated, it is only necessary to label one group rather than all bars in all groups.

Bar graphs

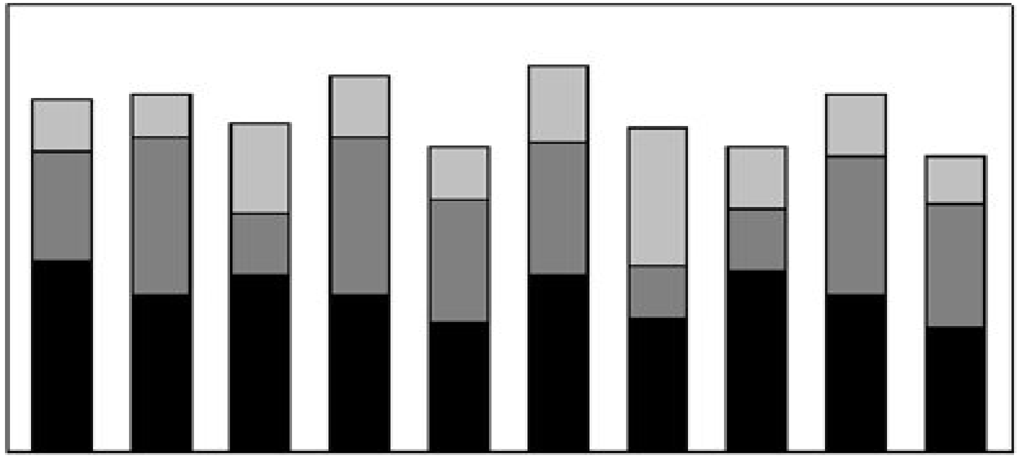
- **Histograms or step charts:** When a great many pieces of data must be compared, consider histograms or step charts. These are bar graphs without spaces between each of the bars



Histogram or step chart

Segmented or stacked bars.

- These bars are similar to bar graphs except that the bar is segmented into two or more pieces reflecting the component values, as
- illustrated in Figure



Segmented or stacked bar graph

Segmented or stacked bars.

- ✓**Data category ordering** To provide consistency, order the data categories in the same sequence for all bars. Order data categories to show least variable at bottom and most variable at top. Irregularities in the bottom segment will affect those above it.
- ✓**Large segments** Limit the number of segments to those that are big enough to be seen and labeled. If small segment components exist, group them into an "other" category.
- ✓**Coding schemes** Use different texture or shading coding schemes. Ensure that the coding scheme chosen for each segment is visually distinguishable from all others. Place darker shades or colors toward the bottom or toward the left.

- **Segmented or stacked bars.**
  - ✓**Labeling** Associate labels with bars and segments. Labels, with a left-to-right reading orientation, are preferable to legends.
- **Flow charts** If the data to be displayed flows in a complex, yet sequential, process, consider using a flowchart to schematically represent it. Flowcharts can also be used to assist in problem solving to which a solution can be reached by answering a series of questions.
  - ✓**Order of steps**
  - One logical ordering scheme is to follow a sequence of operations or processes from start to finish. Other potential ordering schemes include placing the most important decisions first

Flow charts

- If no logical order is apparent, order the flowchart to minimize the length of the path through it. If some decision paths are more likely to occur than others, minimize the length of the most likely path.

✓**Orientation** Orient the chart following common flowchart reading conventions such as left-to- right and top-to-bottom.

✓**Coding conventions** Follow common flowchart coding conventions to distinguish elements. Follow existing shape coding conventions for the kinds of boxes being displayed.

- ✓**Arrows** use arrows to indicate directional relations and sequential links.
- ✓**Highlighting** Contrasting display techniques, such as high intensity or color, should be used to call attention to relevant paths or elements.
- ✓**One decission at each step** Multiple decisions reduce flowchart size.
- ✓**Consistently order and word all choices** Be consistent in all option ordering and wording.

Pie chart

- a circle broken up into pie-shaped pieces, can be used to show division of a total into its component parts.
- Bar graphs, however, usually permit more accurate estimates of proportions. Experts caution against the use of pie charts because:

- ☾ They provide no means of absolute measurement.
- ☾ They cannot represent totals greater than 100 percent.
- ☾ They can only represent a fixed point in time.
- ☾ Human estimation of relationships is more accurate with linear than with angular representations.

Pie chart

- If pie charts are used
- ☾ They must add up to 100 percent.
- ☾ Use five segments or fewer to minimize confusion.
- ☾ Each segment should take up at least 5 percent (18 degrees) of the circle.
- ☾ Place the largest segment starting at 12:00.
- ☾ Directly label each segment in the normal reading orientation.

- ☾ Include numbers with segment labels to indicate percentages of absolute values.
- ☾ Texture or colour coding selected for segments should not highlight one segment over another (unless it is intended).
- ☾ Highlight segments requiring particular emphasis through a contrasting display technique or by “exploding” it.
- ☾ Never tilt a pie

Technological consideration -interface design

- Interface design is also affected by the physical characteristics of the display device and the characteristics of the interfaces controlling software.

Graphical systems

- Screen design must be compatible with the capabilities of the system –
  - ✓ system power
  - ✓ Screen size
  - ✓ Screen resolution
  - ✓ Display colors
  - ✓ Other display features

Technological consideration -interface design

- **Graphical systems**
  - ✓ **system power** A slow processing speed and small memory may prevent effective use of a system. A system must be powerful enough to perform all necessary actions promptly, responsively, and meaningfully.
  - ✓ **Screen size** Through the years, the physical size of an available monitor’s screen area has been gradually increasing. seeing all the contents of one window is preferable to seeing small parts of many windows, the operational complexity of multiple windows is not wanted, or visual noise is being eliminated.

Technological consideration -interface design

- **Graphical systems**
  - ✓**Screen resolution** Screen resolution is the horizontal and vertical height of a screen in pixels. Poor screen resolution may prevent effective use of a graphical system by not permitting sharp and realistic drawings and shapes. Window structure and icon design may be severely affected.
  - ✓**Display colors** The colors used must be accurately and clearly presented in all situations.

Technological consideration -interface design

- ✓ **Other display features** techniques such as higher brightness, reverse polarity, different font sizes and styles, underlining, blinking, line rules and boxes, color, and white space.
- Before beginning design, the designer must be aware of what capabilities exist, how they may be most effectively used, and what their limitations are.
- The design must be compatible with the system platform and any development and implementation tools being used. The design may also take into consideration any available platform style guide. Finally, the design must effectively utilize the various available display features or attributes.

- Screen design must be compatible with the capabilities of the
  - ✓**Platform compatibility** The design must be compatible with the windowing platform being used like Apple, Microsoft windows
  - ✓ **development and implementation tool compatibility**
  - A ***toolkit*** is a library of controls or widgets such as menus, buttons, and scroll bars. Toolkits have a programmatic interface and must be used by programmers. They are usually for a specific windowing platform. Example of toolkits include OpenLook .
  - An ***interface builder*** is a graphical tool that helps a programmer create dialog boxes, menus, and other controls. It provides a palette to select and position controls, and to set properties.

• Interface builders are limited to use in laying out the static parts of the interface. They cannot handle the parts of the interface that involve graphical objects moving around.

• A ***user interface management system*** **(UIMS)** extends the features of a builder by also providing assistance with creating and managing the insides of windows. Examples include HyperCard and Visual Basic.

✓ **Platform style guide** To achieve design consistency in interface design most providers have developed style guidelines for system developers

- These guidelines specify the appearance and behaviour of the user interface. They describe the windows, menus, and various controls available, including what they look like and how they work. They also provide some guidance on when to use the various components.
- Product style guides vary in their ability to control compliance with the guidelines they present. Some present strict requirements, leading to excellent consistency across applications; others provide little guideline compliance control.
- Examples of industry-produced guidelines include IBM's *System Application Architecture Common User Access (SAA CUA)* and Microsoft's *The Windows Interface Guidelines for Software Design.*

Browser

- ✓ **compatibility** The entire Web page content should be accessible from the browsers of all users, presenting content as consistently and predictable as possible.
- use browser defaults as much as possible, designing for what everyone can see.
- Never assume that the designed page will look exactly the same to users as it does to the designer. Test the design on all browsers, operating systems, computer platforms, and all versions of the each.

- ✓ **monitor size and resolution**
  - Design within the boundaries of an image safe area for all browsers.
  - Present images at a resolution appropriate for all users’ monitors.
- ✓ **fonts** Use fonts that can be displayed on a variety of browsers.
  - Different default font types and sizes may exist, depending on the type of browser, browser version, and operating system the browser runs on.

Browser

- ✓ **Color** Use colors that succeed on a variety of browsers and platforms.
- The colors used must be accurately and clearly presented in all situations
- Design using a browser safe, cross-platform palette of 216 colors. It is sometimes referred to as a “Web safe” color palette.
- ✓ **Bandwidth** The amount of data that can travel through a communication channel in a given amount of time is called bandwidth.
- Design for the most commonly used bandwidth.

Browser

- ✓**Version** To provide universal access to a Web site, provide multiple versions that support multiple browsers.
- Make use of browser **"sniffers,"** programs on the server that detect the user's browser type and determine which version should then be downloaded.
- Always provide a text only version of the Web site. This will be necessary as long as users with small displays and low bandwidths exist, users with text-only browsers, and those who turn off image display.

other considerations

✓ **Downloading**

- Provide fast page download times, no more than 8 to 10 seconds per page.
- Minimize the use of design techniques that cause longer download times.
- ☾ Long pages.
- ☾ Large chunky headings.
- ☾ Numerous or large graphics and images.
- ☾ Animation.
- ☾ Excessive amount of colour.
- ☾ Excess use of frames.

other considerations

✓**Downloading**

- Provide enough information to the user so that whether or not to request a download can be determined, including:
- ☾ Program or document description.
- ☾ Type of download.
- ☾ Size of download.
- ☾ Download version.
- ☾ Estimated loading time.
- ☾ Special operating requirements.

other considerations

✓ **Currency**

- Currency means trustworthiness to many users**.**
- Update the Web site regularly to keep information current. The nature of the Web implies timeliness. Outdated information casts doubts on a Web site's credibility.

✓ **Page printing** Some people prefer to read hard copy, especially anything longer than half a page.

- Provide a means to print easily with minimal effort by:
- ☾ Groups of related pages.
- ☾ Individual pages.
- ☾ Sections of pages.

other considerations

- ✓ **Maintainability** Provide easy Web site maintainability to sustain its currency.
- Change must be easily accommodated as the Web site grows
- Remove outdated information and expired links, link old pages to those newly created.
- Properly designed, modular system pages covering specific topics can be updated quickly without needing to change and reformat large amounts of information.

Thank You..

CS4206PE : HUMAN COMPUTER INTERACTION

Topic: Windows & Components

P. Aruna

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Develop System Menus and Navigation Schemes

- Menus are a major form of navigation through a system and, if properly designed, assist the user in developing a mental model of the system.
- **The structures of menus.**
- **The functions of menus.**
- **The content of menus.**
- **Formatting menus.**
- **Writing menus.**
- **Navigation using menus.**
- **Web site navigation and links.**
- **Types of graphical menus.**

Develop System Menus and Navigation Schemes

Structures of Menus

- Menus vary from very simple to very complex. They may range from small dialog boxes requesting the user to choose between one of two alternatives, to hierarchical tree schemes with many branches and level of depth.
- A menu’s structure defines the amount of control given to the user in performing a task. The most common structures are the following.
- Single menus, sequential linear menus, simultaneous menus, hierarchical menus, connected menus, event trapping menus

Develop System Menus and Navigation Schemes

Structures of Menus

1) Single Menus

- This is simplest form of menu, a single screen or window is presented to seek the user's input or request an action to be performed.

- ○ Choice 1
- ○ Choice 2
- ○ Choice 3

Develop System Menus and Navigation Schemes

Structures of Menus

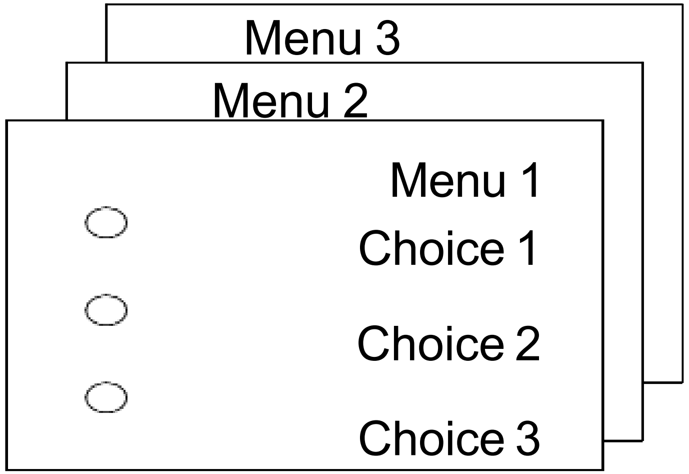
1) Single Menus

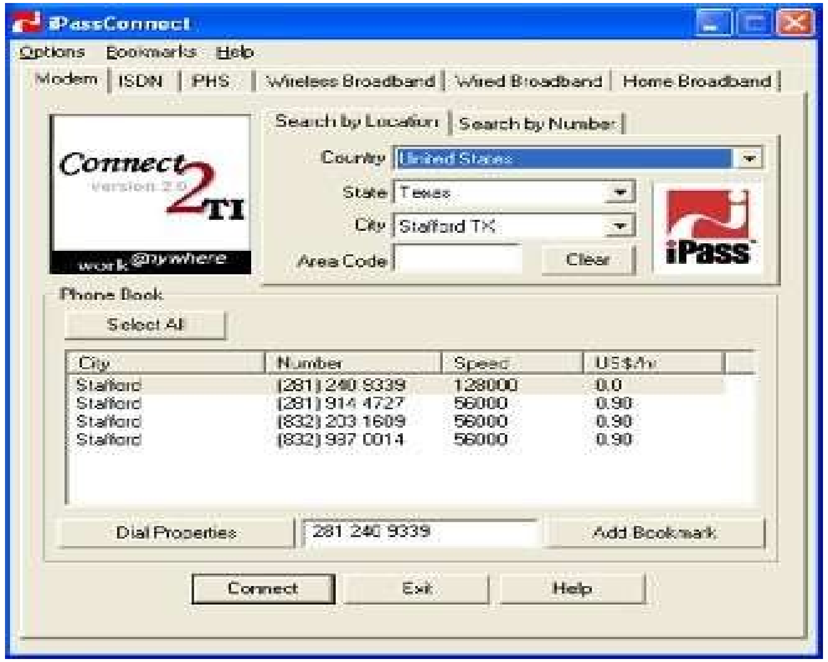
- Single menus conceptually require choices No other menus will follow necessitating additional user choices

- A single menu may be iterative if it requires data to be entered into it and that data is not valid. The menu will then be represented to the user with a message requesting reentry of valid data.

Structures of Menus

- Sequential Linear Menus





Structures of Menus

2) Sequential Linear Menus

- Sequential linear menus are presented on a series of screens possessing only one path.
- The menu screens are presented in a preset order, and, generally, their objective is for specifying parameters or for entering data.
- The length of the path may be short, or long, depending upon the nature of the information being collected.

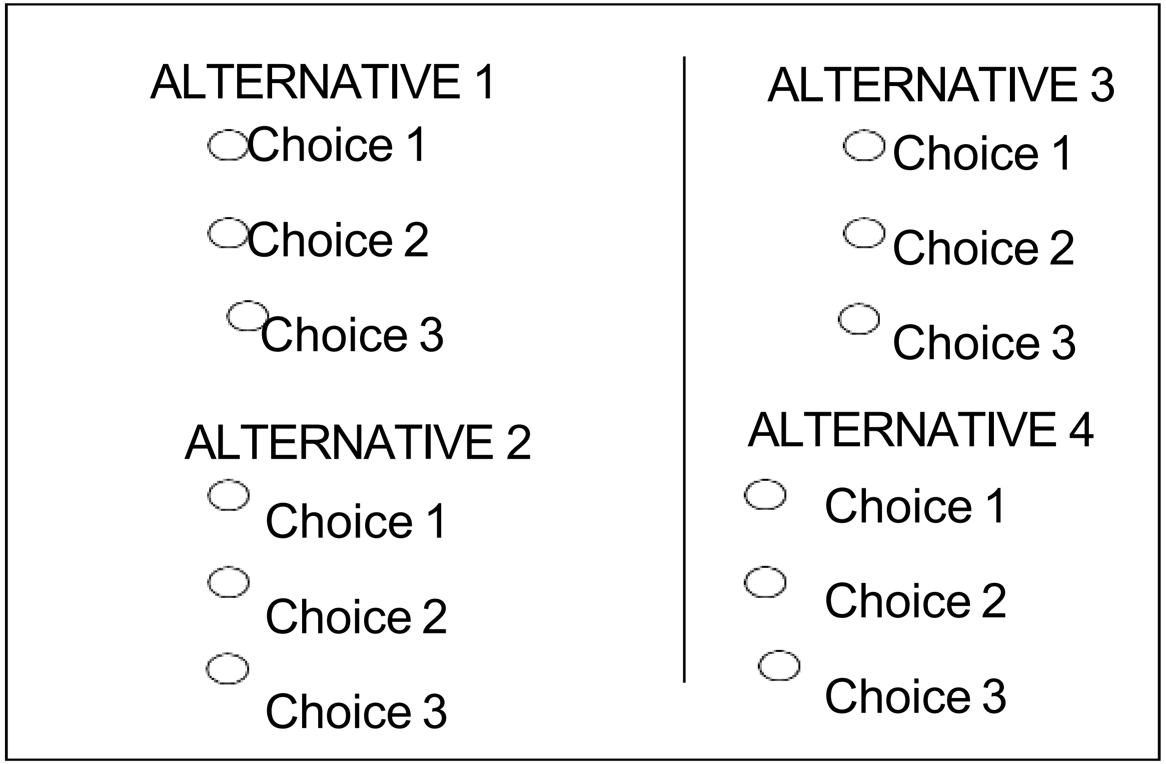
Structures of Menus

2) Sequential Linear Menus

- Sequential path menus have several **disadvantages.**
- A long sequence may become tiresome as menu after menu is presented.
- The user may not remember an answer to a previous question, a question important to the currently presented choices.
- The user may also want to return to a previous menu to change an answer or look at an answer.
- Finally, the user may, conceptually, want to complete the menus in a different order than which they are being presented.

Structures of Menus

3) Simultaneous Menus

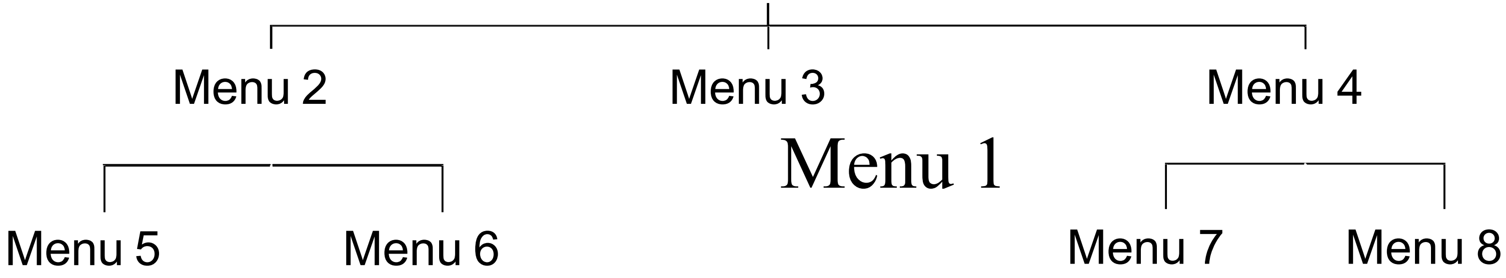


- Instead of being presented on separate screens, all menu options are available simultaneously
- The menu may be completed in the **order desired by the user**, choices being skipped and returned to later.
- All alternatives are visible for reminding of choices, **comparing choices, and changing answers.**
- The dullness associated with a long series of sequential menus is greatly reduced.
- **Problems with simultaneous menus** are that for large collections of menu alternatives screen clutter can easily occur, and screen paging or scrolling may still be necessary to view all the choices.

Structures of Menus

4) Hierarchical Menus

- When many relationships exist between menu alternatives, and some menu options are only appropriate depending upon a previous menu selection, a hierarchical structure is the best solution



Structures of Menus

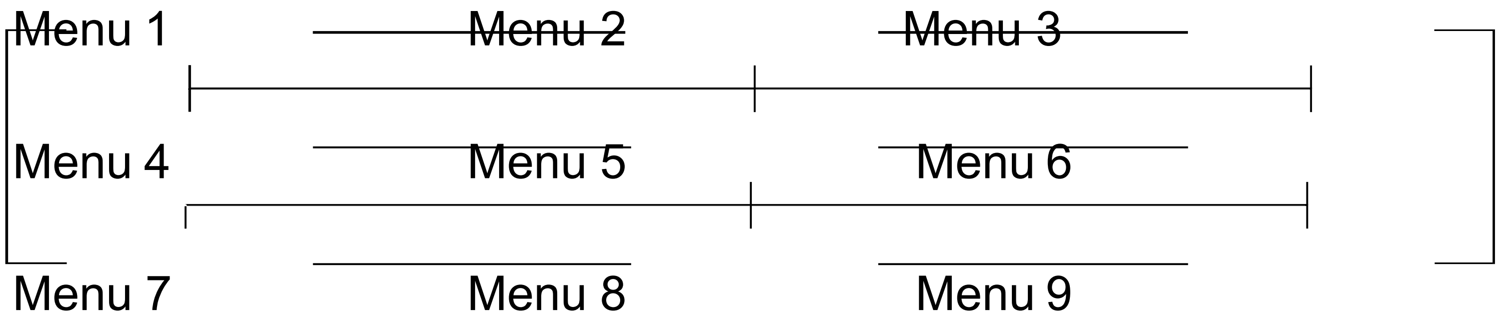
4) Hierarchical Menus

- A disadvantage of a hierarchical scheme is that the defined branching order may not fit the users conception of the task flow. If users are not familiar with the hierarchical menu, or are unable to predict what sub options lie below a particular choice, they may go down wrong paths
- It is important that hierarchies be consistent with user expectations, and that choice uncertainties be reduced as much as possible.

Structures of Menus

5) Connected Menus

– This menu gives you a full control over the navigation flow



- Connected menus are networks of menus all interconnected in some manner.
- Movement through a structure of menus is not restricted to a hierarchical tree, but is permitted between most or all menus in the network.

Structures of Menus

5) Connected Menus

- A connected menu system may be cyclical, with movement permitted in either direction between menus, or acyclical, with movement permitted in only one direction.
- The biggest advantage of a connected menu network is that it gives the user full control over the navigation flow.
- Its disadvantage is its complexity, and its navigation may be difficult for an inexperienced user.

Structures of Menus

6) **Event-Trapping Menus**

- Provide ever-present background of control over the system's state and parameters while the user is working on a foreground task
- Serve three functions
  - Immediately change some parameter in the current environment (bold text)
  - Take user out of current environment to perform function (spell check)
  - Exit and allow user to go to new environment (exit)

Functions of Menus

A menu can be used to perform several functions to navigate to a new menu, to execute an action or procedure, to display information or to input data or parameters

1) Navigation to a New Menu

selection of a menu leads to another menu in a hierarchical order, the purpose of each selection is to lead the user to ultimate goal. Selection errors may lead the user down wrong paths, cost and time.

Functions of Menus

2) Execute an Action or Procedure

User selection directs the computer to implement an action. The action may be some thing like opening or closing a file, copying text or sending a message

3) Displaying Information

the main purpose of selecting a menu is to simply display information. The user searching for information in a database or browsing web their primary focus is on information desired.

4) Data or Parameter Input

Each selection specifies a piece of input data for the system or provides a parameter value. These data values may be input on single menu or hierarchy of menus.

Content of Menus

a menu consists of four elements context, title, choice description and completion instruction

- **Menu Context**
  - Provides **user oriented Information**. This kind of information is critical in complex or hierarchical system, feedback is necessary that tells users where they are in a process.
  - Verbal linkage, spatial linkage, or both may be used to provide navigation feedback.
  - **Verbal linkage** involves providing, on the current menu screen, a listing of choices made on previous menus that have led to this position. It also involves assuring the user that the displayed menu is the menu desired.
  - ***Spatial linkage*** can be accomplished by graphic methods

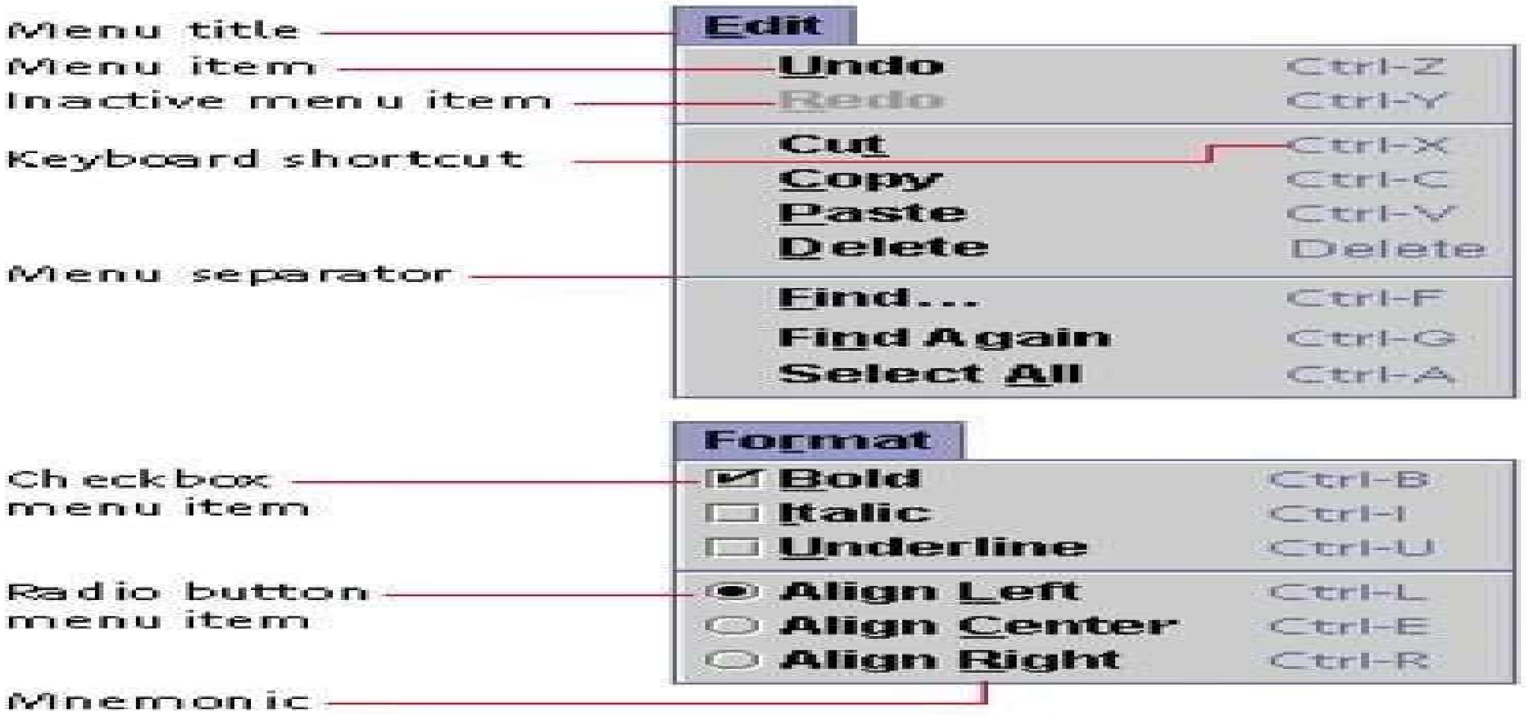
Content of Menus

- **Menu Title**
  - Provides the context for the current set of choices

- **Choice Descriptions:**
  - Choice descriptions are the alternatives available to the user. Descriptions can range from a mnemonic, numeric or alphabetized listing of choices to single words or phrases to full sentences or more.
  - The style chosen will reflect the experience of the user (novice or expert), the nature of the choices (well-learned alternatives or not), the nature of the selection mechanism (keyboard or mouse), and the nature of the system (business system application or Web page).

Content of Menus

- **Completion Instructions**
  - Tell users how to indicate their choices



Formatting of Menus

For formatting menus we have to follow some series of guidelines which include:

- **Consistency**
  - Provide consistency with user expectations
  - Provide consistency in menu
    - Formatting, including Organization, presentation, and choice ordering
    - Phrasing, including titles, choice descriptions and instructions.
    - Choice selection methods
    - Navigation schemes
- **Display**
  - If continual or Frequent references to menu options are necessary
    - Permanently display the menu in an area of the screen that will not hide other screen data
  - If Occasional references to menu options are necessary, the menu may be presented on demand, however critical options should be continuously displayed

- **Presentation**
  - Ensure that a menu and its choices are obvious to the user by presenting them with a unique and consistent structure, location, and display technique.
  - Ensure that other system components do not possess the same visual qualities as menu choices.
- **Organization**
  - Provide a main menu
  - Display
    - All relevant alternatives
    - Only relevant alternatives (delete or gray-out inactive choices)
  - Match the menu structure to the structure of the task. Organization should reflect the most efficient sequence of steps to accomplish a persons most frequent or most likely goals

Formatting of Menus

- **Organization(cont)**

-- Minimize number of menu levels, for website restrict it to two levels for fastest performance

– Be conservative in the Number of menu choices presented on a screen
  - 4-8 choices without logical grouping of elements
  - 18-24 choices with logical groupings of elements with no more than 10 items within a group

– provide users with an easy way to restructure a menu according to how work is accomplished

– Never require menus to be scrolled

Formatting of Menus

- **Complexity**
  - Provide both simple and complex menus
  - **Simple:** a minimal set of actions and menus.
  - **Complex:** a complete set of actions and menus
- **Item Arrangement**
  - Align alternatives or choices into single columns whenever possible
  - Orient for top-to-bottom reading
  - Left justify descriptions
  - If a horizontal of orientation of description must be maintained, Organize for left to right reading

Formatting of Menus

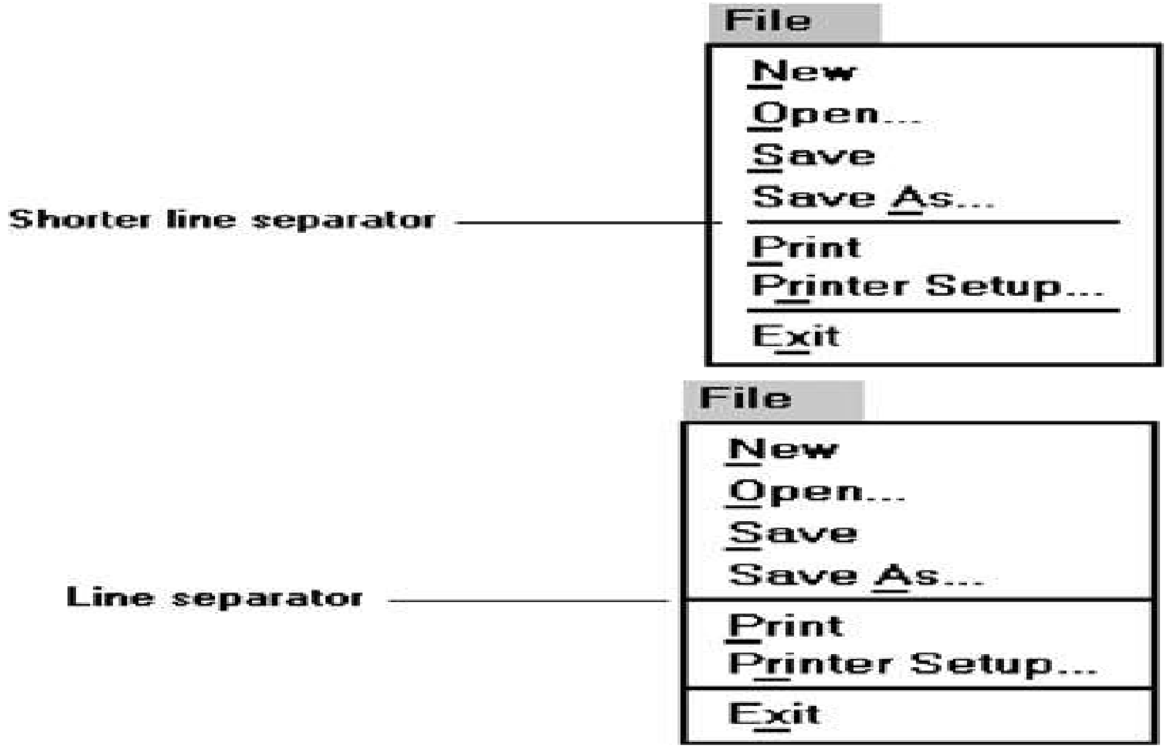
- **Ordering**
  - Order lists of choices by their natural order like chapters in a book etc
  - For lists associated with numbers, use numeric order.
  - For textual lists with a small number of options (seven or less), order by: Sequence of occurrence, Frequency of occurrence, Importance, Semantic similarity.
  - Use alphabetic order for Long lists (eight or more options), Short lists with no obvious pattern or frequency.
  - Separate potentially destructive(delete and clear) actions as far away from frequently chosen items.
  - If option usage changes, do not reorder menus.

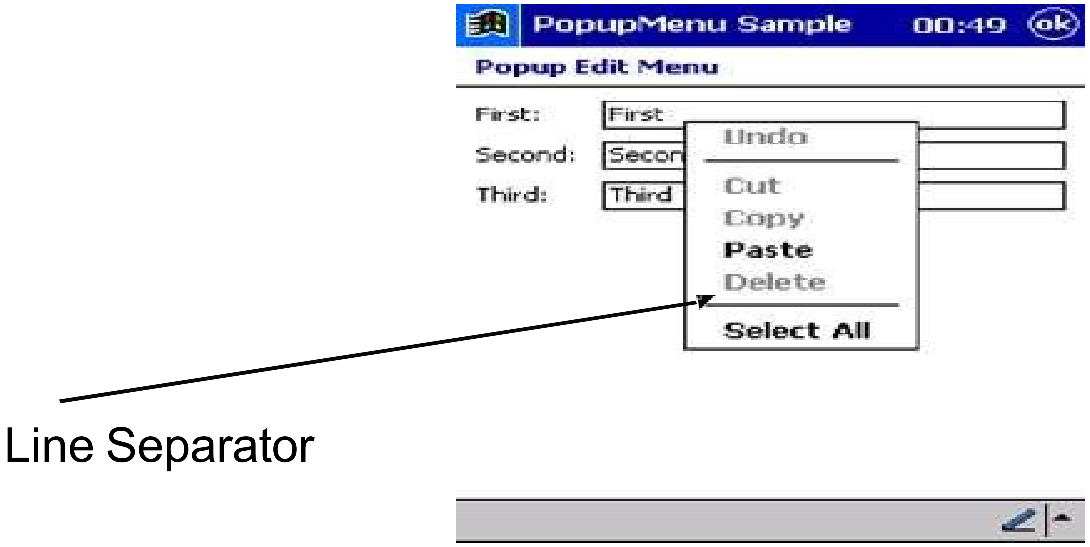
Groupings

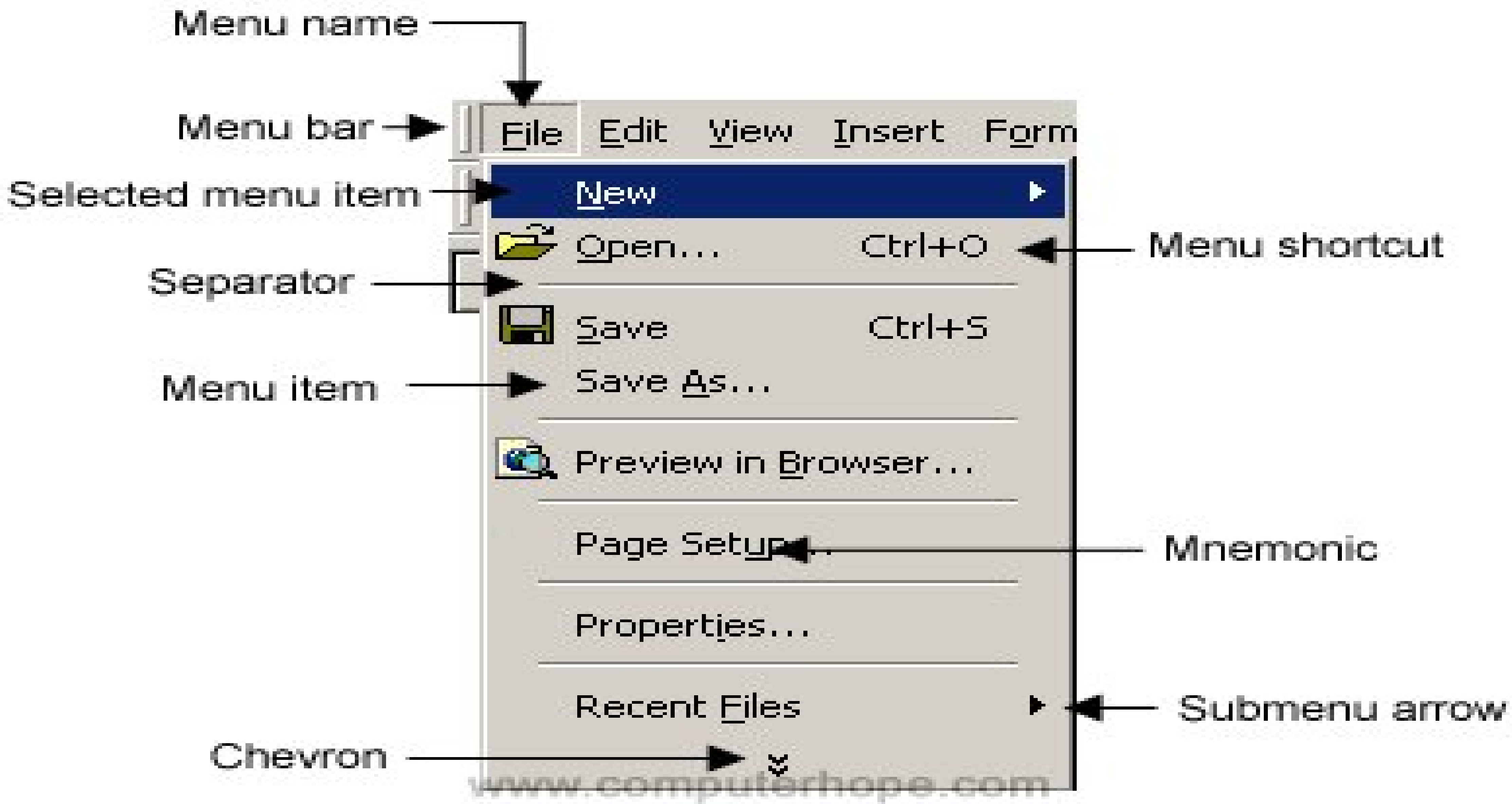
- Create grouping of items that are logical, unique, meaningful and mutually exclusive
- Categorize them in such a way to maximize similarities of items within a category and minimize the similarity of items across the category
- Present no more than six or seven groupings on screen
- Order categorized grouping in a meaningful way
- Separate grouping created through either
  - Wider spacing, or a thin ruled line
- Provide immediate access to critical or frequently chosen items

Line Separator

- Separate vertically arrayed grouping with minute solid lines
- Separate vertically arrayed subgroupings with minute dotted or dashed lines
- For sub groupings within a category left justify the lines under the first letter of the column choice descriptions, right justify lines under the last character of the longest choice description
- For independent groupings
  - Extend the line to the left and right menu borders







Menu name
Menu bar
Selected menu item
Separator
Menu item
Chevron
File
Edit
View
Insert
Form
New
Open...
Ctrl+O
Save
Ctrl+S
Save As...
Preview in Browser...
Page Setup...
Properties...
Recent Files
Menu shortcut
Mnemonic
Submenu arrow
www.computerhope.com

Phrasing the Menu

1) Menu Titles:

- **Main menus**- create Short, Simple, Distinctive title describing the purpose of the entire series of choices
- **Sub Menus-** Submenu titles must be worded exactly the same as the menu choice previously selected to display them.
- **General:**

  >>Locate the title at the top of the listing of choices.

  >>Spell out the title fully using either an:

  Uppercase font.

  Mixed-case font in the headline style.

  >>Unnecessary titles may be omitted.

Phrasing the Menu

2) Menu Choice Description:

- Create **meaningful** choice descriptions that are familiar, fully spelled out, concise, and distinctive. Eg: print instead of list
- **Size** of Descriptions may be single words, compound words, or multiple words or phrases.
  - **Exception:** Menu bar items should be a single word (if possible).
- Place the **keyword first**, usually a verb.
- **Capitalization:** Use the headline style, capitalizing the first letter of each significant word in the choice description.

Phrasing the Menu

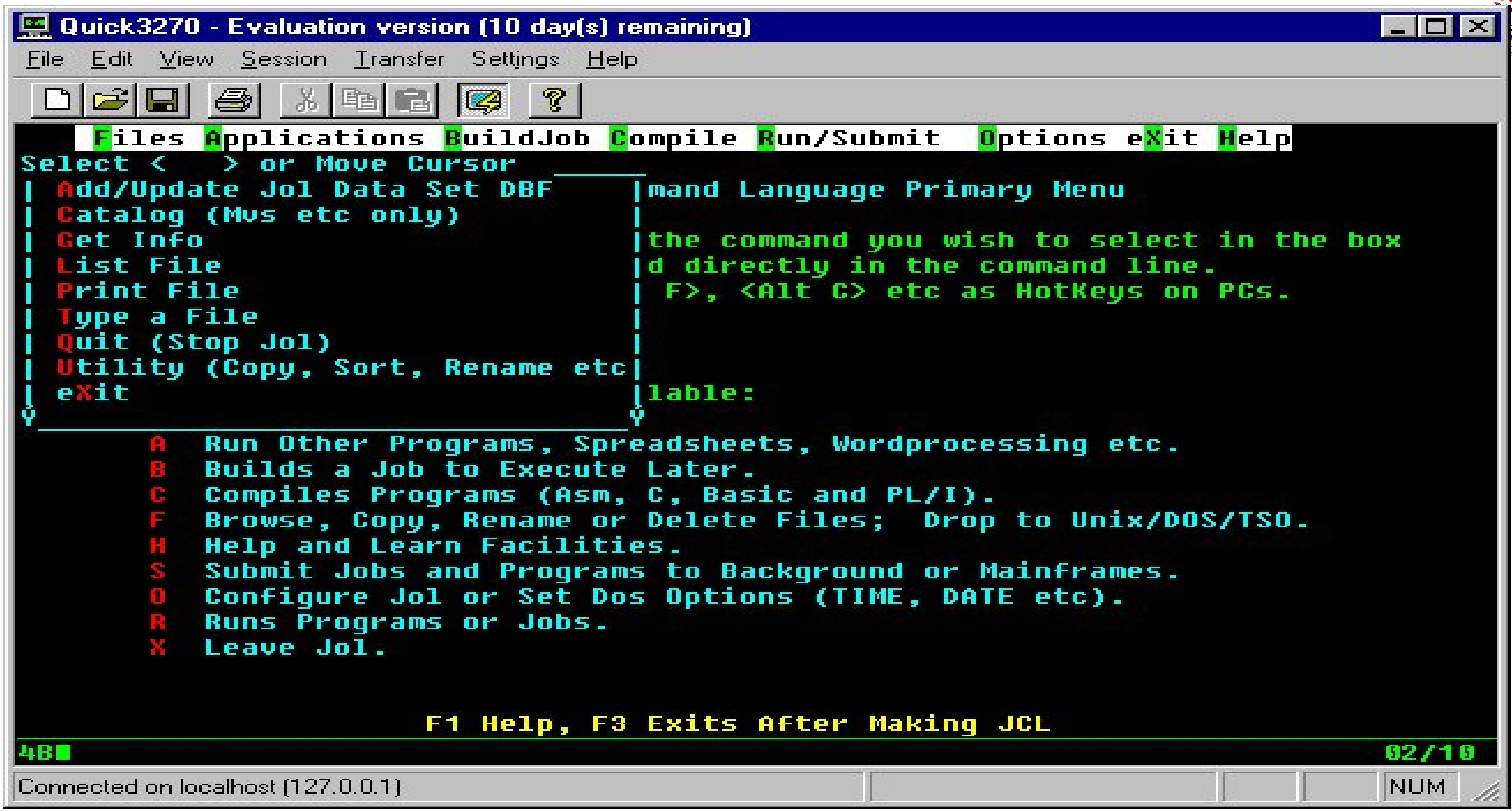
2) Menu Choice Description:

- **Task oriented wording:** Use task-oriented not data-oriented wording. Task-oriented wording usually positions a verb first, such as Manage Customer Information. An example of data-oriented wording would be to simply say Customers. What is being done with or to customers is unclear in the latter.
- **Use parallel construction:** When choices are composed of phrases, use a parallel word construction in creating descriptions for related choices. Parallel construction would be: *Print* a File, *Execute* a Program, and *Eject* a Disk. An example of non-parallel construction is: Print; Execute a Program, and Disk Eject.

Phrasing the Menu

2) Menu Choice Description:

- **Relationship to title:** A menu choice must never have the same wording as its menu title.
- **Consistency across menus:** Identical choices on different menus should be worded identically.
- **Numbering:** Choices should not be numbered unless the listing is numeric in nature, or a graphic
- **Command language:** If menu options will be used in conjunction with a command language, the capitalization and syntax of the choices should be consistent with the command language.


Quick3270 - Evaluation version (10 day(s) remaining)
File Edit View Session Transfer Settings Help
Files Applications BuildJob Compile Run/Submit Options eXit Help
Select < > or Move Cursor
Add/Update Jol Data Set DBF
Catalog (Mvs etc only)
Get Info
List File
Print File
Type a File
Quit (Stop Jol)
Utility (Copy, Sort, Rename etc
eXit
mand Language Primary Menu
the command you wish to select in the box
d directly in the command line.
F>, <Alt C> etc as HotKeys on PCs.
lable:
A Run Other Programs, Spreadsheets, Wordprocessing etc.
B Builds a Job to Execute Later.
C Compiles Programs (Asm, C, Basic and PL/I).
F Browse, Copy, Rename or Delete Files; Drop to Unix/DOS/TSO.
H Help and Learn Facilities.
S Submit Jobs and Programs to Background or Mainframes.
O Configure Jol or Set Dos Options (TIME, DATE etc).
R Runs Programs or Jobs.
X Leave Jol.
F1 Help, F3 Exits After Making JCL
4B
02/10
Connected on localhost (127.0.0.1)
NUM

Phrasing the Menu

2) Menu Choice Description:

- **Word as a command to computer:** phrase all menu choices as commands to the computer.
- Example: Choose one:

  Save and exit

  Exit without saving

  rather than:

  Do you want to save and exit?

  Yes

  No

Phrasing the Menu

3) Menu Instructions

- For novice or inexperienced users, provide menu completion instructions explicitly.

  ☾ Place the instructions in a position just preceding the part, or parts, of the menu to which they apply.

  >>Left-justify the instruction and start the related menu choice descriptions a minimum of three spaces to the right.

  >>Leave a space line, if possible, between the instructions and the related menu choice descriptions.

  ☾ Present instructions in a mixed-case font in sentence style.

Phrasing the Menu

3) Menu Instructions

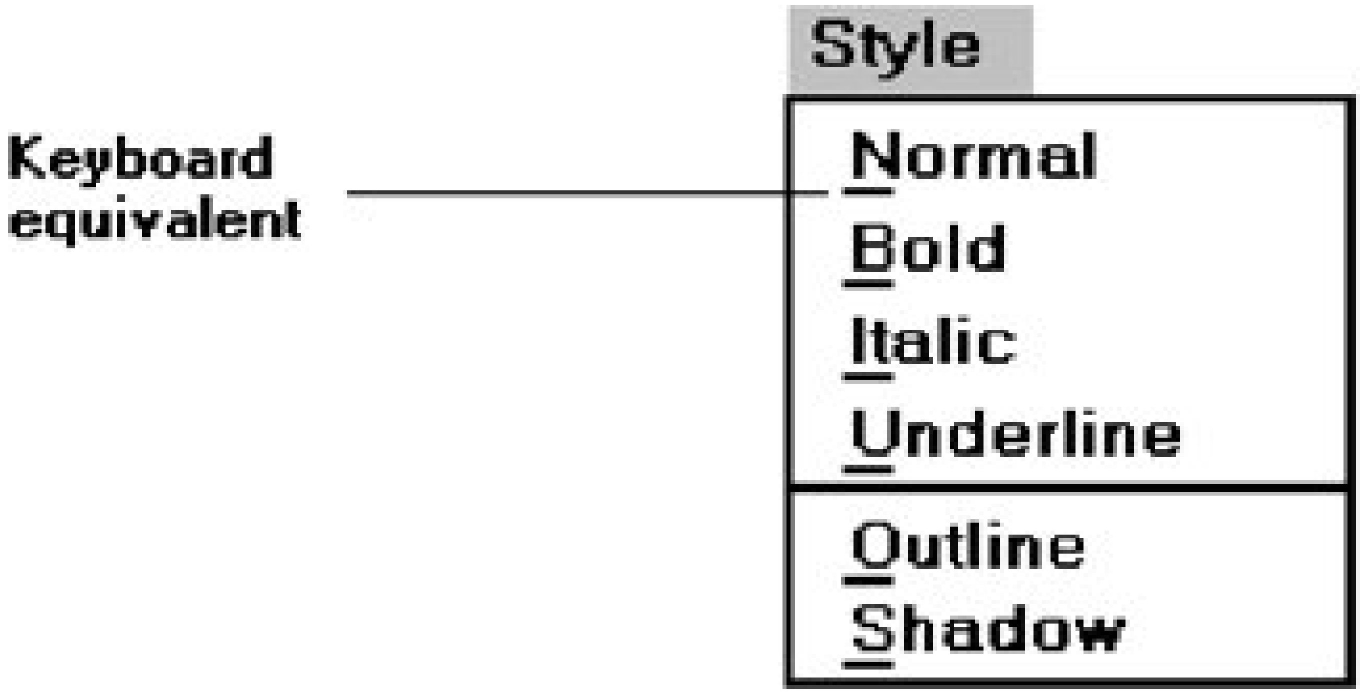
- For expert users, make these instructions easy to ignore by:
  - Presenting them in a consistent location.
  - Displaying them in a unique type style and/or colour.

Phrasing the Menu

4) Keyboard Equivalents

- To facilitate **keyboard selection** of a menu choice, each menu item should be assigned a keyboard equivalent mnemonic.
- The **mnemonic** should be the first character of the menu item's description.
  - If duplication exists in first characters, use another character in the duplicated item's description.
  - Preferably choose the first succeeding consonant.
- **Designate** the mnemonic character by underlining it.
- Use **industry-standard keyboard access equivalents** when they exist.

Phrasing the Menu



Keyboard equivalents

Phrasing the Menu

5) Keyboard Accelerators

- *Accelerators* are keys, or combinations of keys, that invoke an action regardless of cursor position. They are most commonly used to activate a menu item without opening the menu.
- They may also be called *hot keys*.
- For frequently used items, provide a keyboard accelerator to ease keyboard selection.
- The accelerator may be one function key or a combination of keys.

Computer Science and Engineering

Phrasing the Menu

5) Keyboard Accelerators

- Pressing no more than two keys simultaneously is preferred. Do not exceed three simultaneous keystrokes.
- Use a plus (+) sign to indicate that two or more keys must be pressed at the same time.
- Identify the keys by their actual key top engraving(name printed on key).
- If keyboard terminology differences exist, use The most common keyboard terminology and Terminology contained on the newest PCs.
- Separate the accelerator from the item description by three spaces.

Computer Science and Engineering

Phrasing the Menu

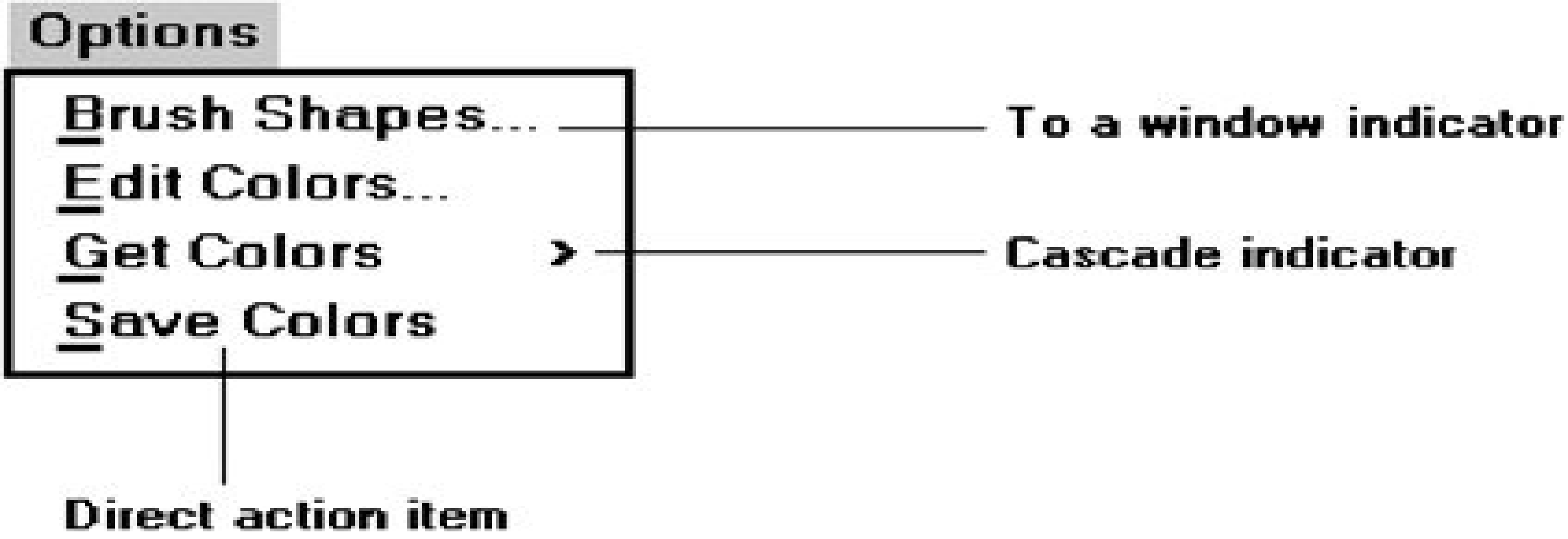
5) Keyboard Accelerators

- Right-align the key descriptions.
- Do not use accelerators for:
  - Menu items that have cascaded menus.
  - Pop-up menus.
- Use industry-standard keyboard accelerators when they exist.

Phrasing the Menu

6) Intent Indicators

- **To a cascade indicator:** place a triangle or right- pointing solid arrow following the choice
- **To a window indicator:** place ellipsis (...) immediately follow the choice



Phrasing the Menu

6) Intent Indicators

- **Cascade indicator:**

  ☾ To indicate that selection of an item will lead to a submenu, place a triangle or right-pointing solid arrow following the choice.

  ☾ A cascade indicator must designate every cascaded menu.

- To a **window indicator:**

  ☾ For choices that result in displaying a window to collect more information, place an ellipsis (. . .) immediately following the choice.

  ☾ **Exceptions**—do not use when an action:

  >>Causes a warning window to be displayed.

  >>May or may not lead to a window.

Phrasing the Menu

6) Intent Indicators

- **Direct action items:**

☾ For choices that directly perform an action, no special indicator should be placed on the menu.

Selecting Menu Choices

- Menu items can be selected by pointing at the choice with a mechanical pointer, by pointing at the choice through the keyboard

1) Initial Cursor Positioning

- When a menu is first displayed, position the cursor at the option most likely to be chosen, or at the first option in the list if no option has a significantly higher probability of selection.
- If repeating the previously selected option has the highest probability of occurrence, position the cursor at this option.

Selecting Menu Choices

2) Choice Selection

- **Pointers**
  - Select the choice by directly pointing at it with a mechanical device such as a mouse or trackball pointer, or light pen, or pointing with one's finger.
  - **Visually indicate:** Which options can be selected, When the option is directly under the pointer and can be selected.
  - Visually distinguish single and multiple-choice menu alternatives.

Selecting Menu Choices

2) Choice Selection

- **Pointers**

- **If pointing with a mechanical device is the selection method used:** The selectable target area should be at least twice the size of the active area of the pointing device or displayed pointer. In no case should it be less than 6 millimetres square.
- Adequate separation must be provided between adjacent target areas.

Selecting Menu Choices

2) Choice Selection

– **Pointers**

- **If finger pointing is the selection method used:** The touch area must be a minimum of 20 to 30 millimetres square, The touch area must encompass the entire caption plus one character around it.

Selecting Menu Choices

2) Choice Selection

– **Keyboards**

- **If moving the cursor to a menu choice:** The up and down arrow keys should move the cursor up or down vertically oriented menu options, The left and right cursor keys should move the cursor left or right between horizontally oriented menu options.
- **If keying a choice identifier value within an entry field:** Locate the entry field at the bottom of the last choice in the array of choices, Uppercase, lowercase, and mixed -case typed entries should all be acceptable.

Selecting Menu Choices

2) Choice Selection

– **Selection/Execution**

- Provide separate actions for selecting and executing menu options.
- **Indicate the selected choice through either:** Highlighting it with a distinctive display technique, Modifying the shape of the cursor.
- **Permit unselecting choice before execution.** If a menu is multiple choice, permit all options to be selected before execution.

Selecting Menu Choices

2) Choice Selection

- **Combining techniques**
  - Permit alternative selection techniques, to provide flexibility.

3) Defaults

- Provide a default whenever possible and display as Bold Text

4) Unavailable Choices

- Should be dimmed or “greyed out”
- Do not add or remove items from a menu unless the user takes explicit action to add or remove them through the application.

Selecting Menu Choices

5) Mark Toggles or Setting

- **Purpose**
  - Use to designate that an item or feature is active over a relatively long period of time
  - Use to provide a reminder that an item or feature is active or inactive
- **Guidelines**
  - Position the indicator to the left of the option
  - For situations where several non exclusive choices may be selected, consider including one alternative that de selects all items and reverts the state to the normal condition

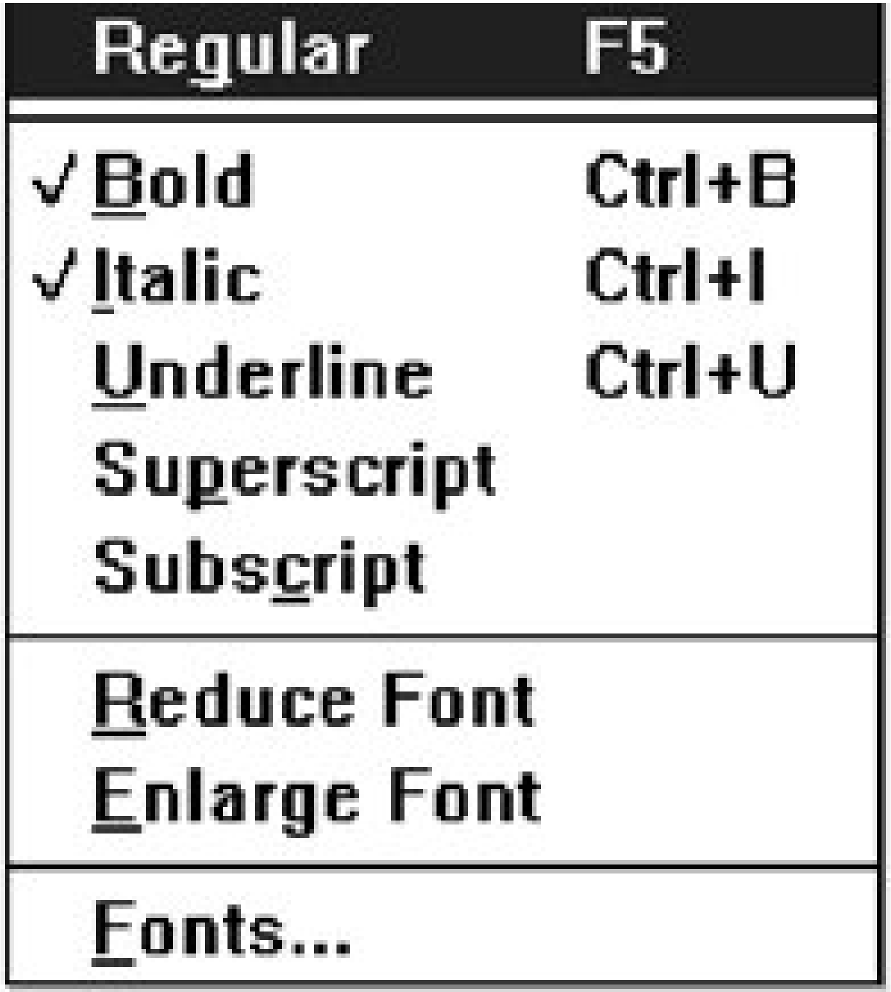


FIG for Mark toggles

6) Toggled Menu Items

A toggled menu item is a one menu item command that toggles back and forth between the current state and its alternative state.

- **Purpose**
  - Use to designate two opposite commands that are accessed frequently
  - Use when the menu item displayed will clearly indicate that the opposite condition currently exists
- **Guidelines**
  - Provide a meaningful, fully spelled-out description of action
  - Begin with a clear verb
  - Use mixed-case letter

6) Toggled Menu Items

if a background grid is currently being displayed, the menu item reads *Hide Grid.* When Hide Grid is selected, the grid is removed from the window, and the menu item dynamically changes to reflect the opposite action. It will now read *Show Grid*.

Kinds of Graphical Menus

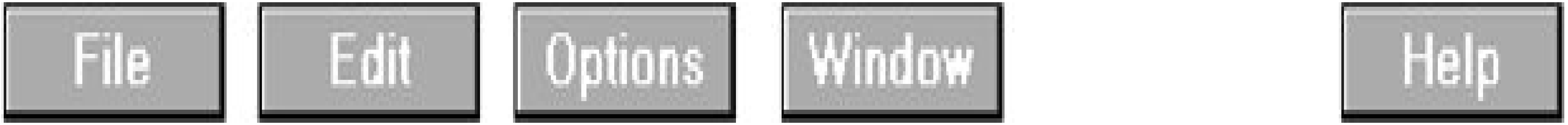
- Menu Bar
- Pull-Down Bar
- Cascading Menu Bar
- Pop-Up Menu
- Iconic Menu

Menu Bar

- Advantage
  - Always visible
  - Easy to browse
  - Do not obscure the screen working area
  - Allow for use of keyboard equivalents
- Disadvantage
  - Consume a full row of screen space
  - Require looking away from the main working area to find
  - Require moving pointer from the main working area to select
  - Horizontal orientation is less efficient for scanning

Menu Bar

- To identify and provide access to common and frequently used application actions that take place in a wide variety of different windows.
- A menu bar choice by itself should not initiate an action.
- Menu bars often consist of a series of textual words, as represented in Figure
- Some Menu bars also consists of buttons in place of text



Menu Bar

Display

- All primary windows must have a menu bar
- All menu bars must have an associated pull down menu containing at least two choices
- Do not allow the user to turn off the display of the menu bar
- If all the items in its associated pull-down menu are disabled, then disable the menu bar item but continue to display it in a visually muted manner.
- The disabled pull-down menu must always be capable of being pulled down so that the choices may be seen.

Menu Bar

Location

- Position choices horizontally over the entire row at the top of the screen, just below the screen title.
- A typical bar is composed of no more than about seven or eight choices. Due to screen space constraints, and limitations in human information-processing capabilities, a maximum of seven or eight is reasonable.
- In the event that more are needed, a second line of choices may be added.
- **Title** – the window title will be menu bar title

Menu Bar

Item Descriptions:

- The menu item descriptions must clearly reflect the kinds of choices available in the associated pull-down menus.
- Menu item descriptions will be the "titles" for pull-down menus associated with them.
- Use mixed-case letters to describe choices.
- Use single-word choices whenever possible.
- Do not display choices that are never available to the user.

Menu Bar

Organization

- Follow standard platform ordering schemes where they exist. Place application- specific choices where they fit best.
- Order all choices left-to-right, with the most frequently elected choices to the left and related information grouped together.
- Choices found on more than one menu bar should be consistently positioned.
- Left-justify all choices within the line
- When choices can be logically grouped, provide visual logical groupings, if possible.
- Help, when included, should be located at the right side of the bar.

Menu Bar

File   Edit   Options   Window   Help

Layout

- Indent the first choice one space from the left margin.
- Leave at least three spaces between each of the succeeding choices (except for Help which will be right-justified).
- Leave one space between the final choice and the right margin.

xFilexxxEdit   Options   Window   Helpx

Menu Bar

- **Separate** the bar from remainder of the screen by using different background or by using solid lines above or below
- Keyboard equivalent mnemonics should be included on menu bars.
- Keyboard accelerators, to a window indicators, and cascade indicators need not be included.

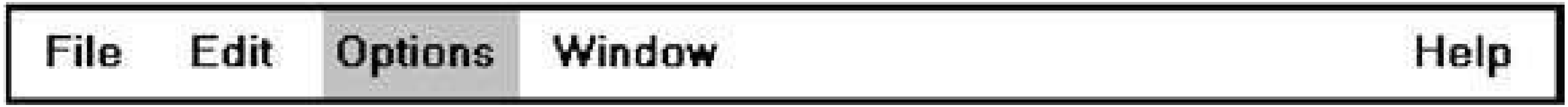
Selection Indication

- **Keyboard cursor:** Use a reverse video, or reverse colour, selection cursor to surround the choice.
- Cover the entire choice, including one blank space before and after the choice word.

Menu Bar

Selection Indication

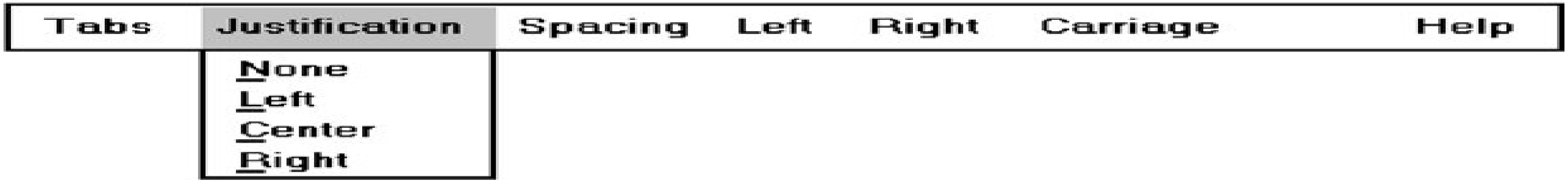
- **Pointer:** Use reverse video, or reverse colour, to highlight the selected choice.



Pull-Down Menu

- Proper Usage
  - To initiate frequently used application actions that take place on a wide variety of different windows.
  - A small number of items
  - Items best represented textually
  - Items whose content rarely changes
- Advantages
  - No window space is consumed when they r not used
  - Allow for display of both keyboard equivalents and accelerators
  - Vertical orientation permits more choices to be displayed
- Disadvantage
  - Require searching and selecting
  - Require moving the pointer out of working area to select
  - May obscure the screen working area

Pull-Down Menu



Display

- Display all possible alternatives
- Gray-out or dim items that can not be chosen

Location:

- Position the pull-down directly below the selected menu bar choice

Size

- Restrict to no more than 5-10 choices and must contain a minimum of 2 choices

Pull-Down Menu

- **The title** will be the name of the menu bar item chosen.

Organization

- Place frequent or critical items at the top
- Separate destructive choices from other choices
- Align choices into columns, with: Most frequent choices toward the top, Related choices grouped together, Choices found on more than one pull-down consistently positioned.
- Left align choice descriptions
- Multicolumn menus are not desirable

Pull-Down Menu

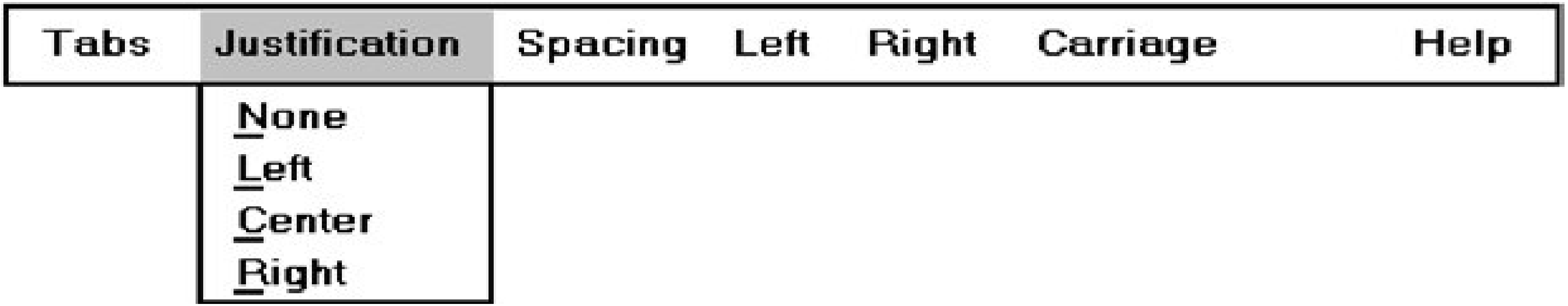
Layout

- Leave the menu bar choice leading to the pull-down highlighted in the selected manner (reverse video or reverse colour).
- Physically, the pull-down menu must be wide enough to accommodate the longest menu item description and its cascade or accelerator indicator.
- Align the first character of the pull-down descriptions under the second character of the applicable menu bar choice.

Pull-Down Menu

Layout

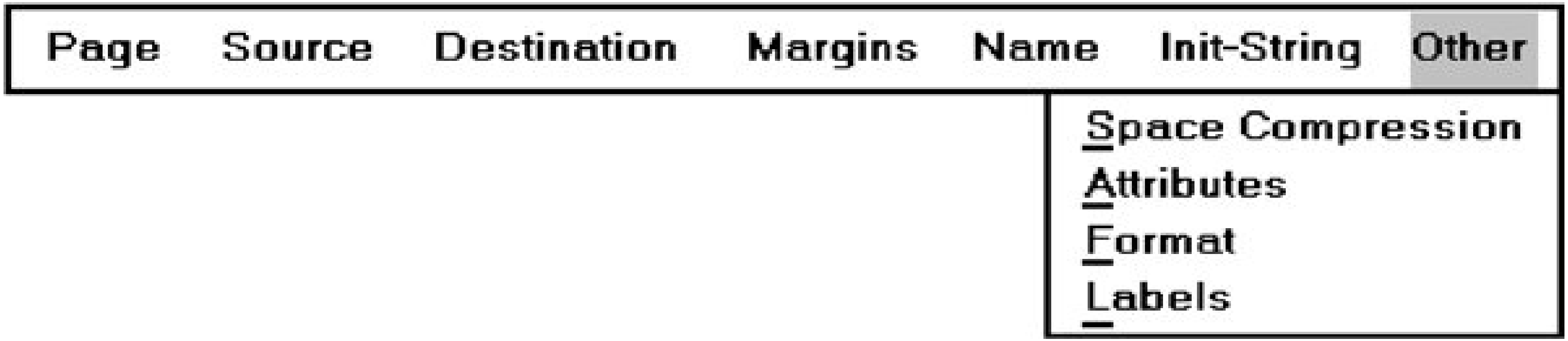
- Horizontally, separate the pull-down choice descriptions from the pull-down borders by two spaces on the left side and at least two spaces on the right side.
  - The left-side border will align with the left side of the highlighted menu bar choice.
  - The right-side border should extend, at minimum, to the right side of its high- lighted menu bar choice.



Pull-Down Menu

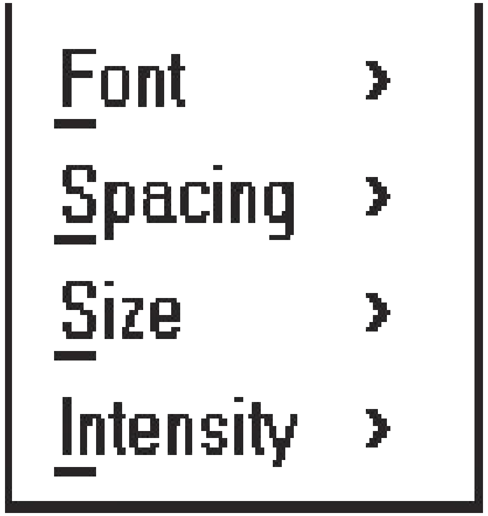
Layout

- Pull-downs for choices on the far right side of the menu bar, or long pull-down descriptions, may require alignment to the left of their menu bar choice to maintain visibility and clarity.



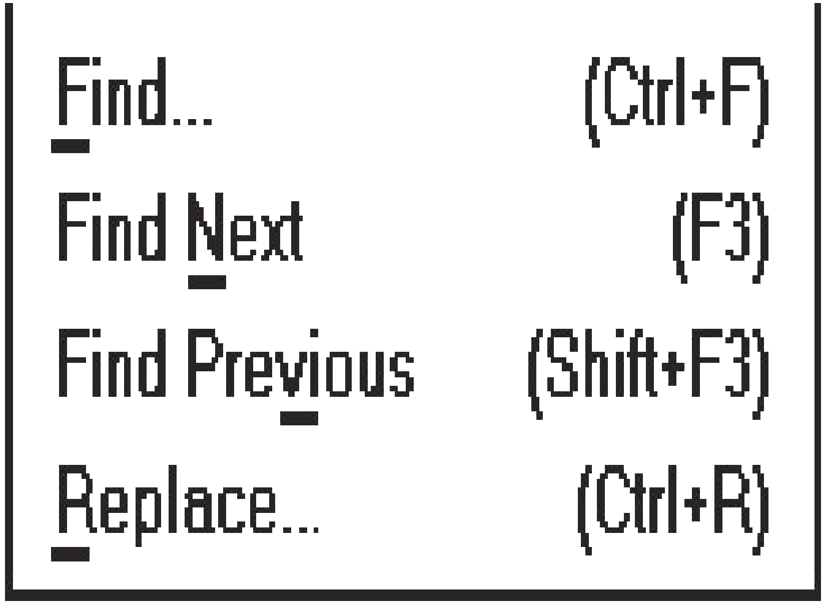
Pull-Down Menu

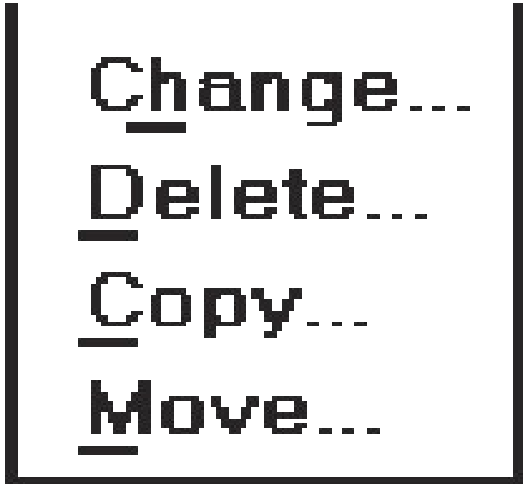
- **Mark Toggles or Setting:** If a menu item establishes or changes the attributes of data or properties of the interface, mark the pull down choice or choices whose state is current or active "On"
- **If a pull down leading to another pull down provide a Cascade indicator(>)** , align these arrows to the right side of pull down and display it in same color as the choice description



Pull-Down Menu

- **If a pull down leading to a window place ellipsis(...)** immediately after choice description, do not separate it from description by using space, display ellipsis in same colour as the choice description
- **Keyboard Equivalents and Accelerators**





Keyboard Equivalents and Accelerators

- Provide unique mnemonic codes by which choices may be selected through the typewriter keyboard. Indicate the mnemonic code by underlining the proper character.
- Provide key accelerators for choice selection.
- Identify the keys by their actual key-top engravings.
- Use a plus (+) sign to indicate that two or more keys must be pressed at the same time.
- Enclose the key names within parentheses ( ).
- Right-align the key names, beginning at least three spaces to the right of the longest choice description.
- Display the key alternatives in the same colour as the choice descriptions.

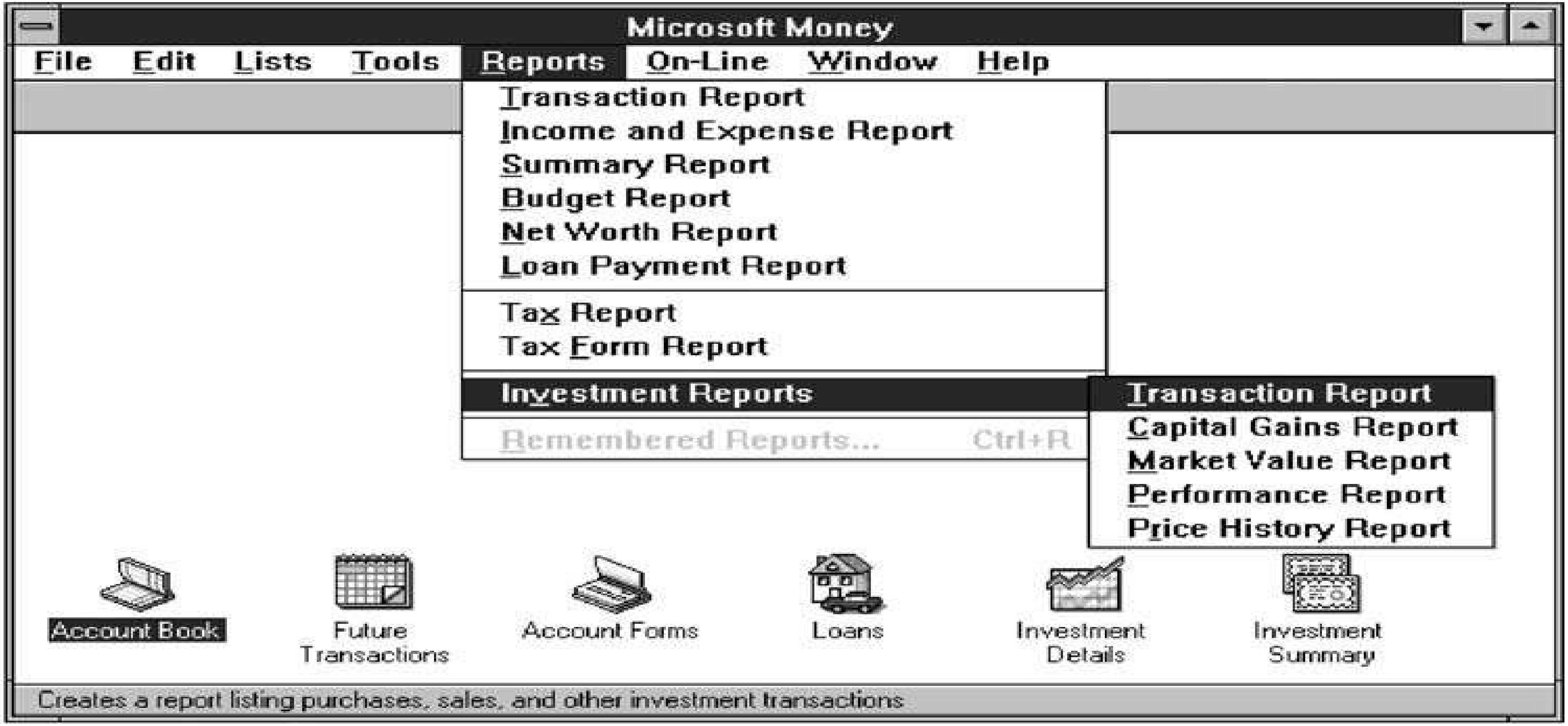
Cascading Menus

- A cascading menu is a submenu derived from a higher-level menu

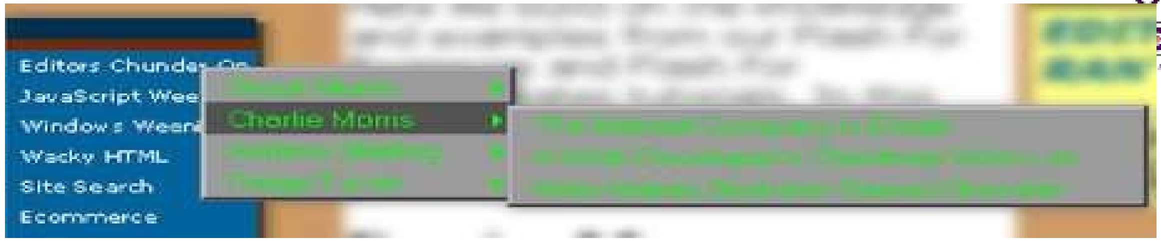
Proper usage:

- To reduce the number of choices presented together for selection (reduce menu breadth).
- When a menu specifies many alternatives and the alternatives can be grouped in meaningful related sets on a lower-level menu.
- When a choice leads to a short, fixed list of single-choice properties.
- When there are several fixed sets of related options.
- To simplify a menu.
- Avoid using for frequent, repetitive commands.

Cascading Menus



Cascading Menus



- Advantage:
  - Top-level menus are simplified because some choices are hidden
  - More first-letter mnemonics are available because menus possess fewer alternatives
  - High-level command browsing is easier because subtopics are hidden
- Disadvantage
  - Access to submenu items requires more steps
  - Access to submenu items require a change in pointer movement

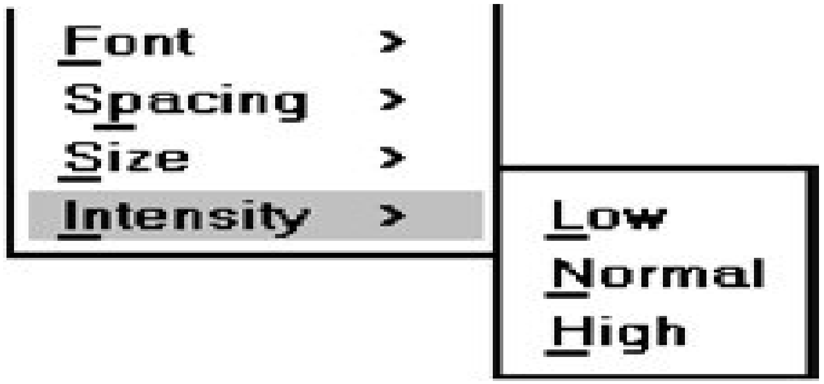
Cascading Menus

Cascade Indicator

- Place an arrow or right-pointing triangle to the right of each menu, separate the indicator from choice description by one space, display the indicator in the same color as choice description

Location

- Position the first choice in the cascading menu immediately to the right of the selected choice.
- Leave the choice leading to the cascading menu highlighted.

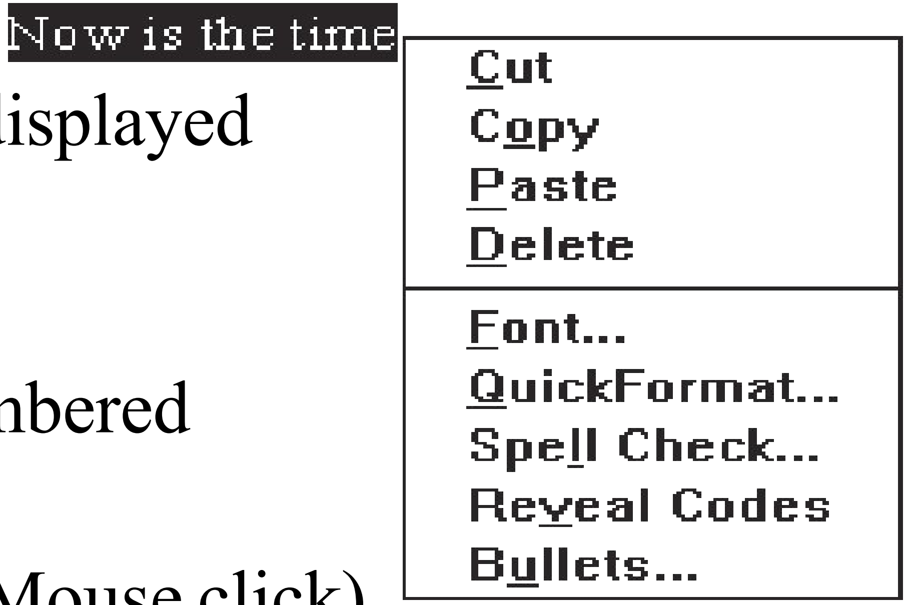


Cascading Menus

- **Levels :** Do not exceed three menu levels (two cascades), Only one cascading menu is preferred.
- **Title:** Not necessary on the cascading menu. The title will be the name of the higher-level menu item chosen.

Pop Up Menu

- Choices may be also presents alternatives or choices within the context of the task
- Pop-up menus may be requested when the mouse pointer is positioned over a designated or hot area of screen (a window border or a text) or over a designed icon
- Advantage
  - They do not use window space when not displayed
  - They appear in the working area
- Disadvantage
  - They existence must be learned and remembered
  - May obscure the screen working area
  - Require a special action to see the menu (Mouse click)



Pop Up Menu

Pop Up Menu

Display

- **Provide a pop-up menu for common, frequent, contextual actions-** Items that cannot be chosen due to the current state of an application should not be displayed.
- **Continue to display a pop-up until:** A choice is selected, An action outside the pop-up is initiated, The user removes the pop-up.

Location

- **Position the pop-up:** Centred and to the right of the object from which it was requested, Close enough to the pointer so that the pointer can be easily moved onto the menu, But not so close that the pointer is positioned on an item, possibly leading to accidental selection.

Pop Up Menu

Location

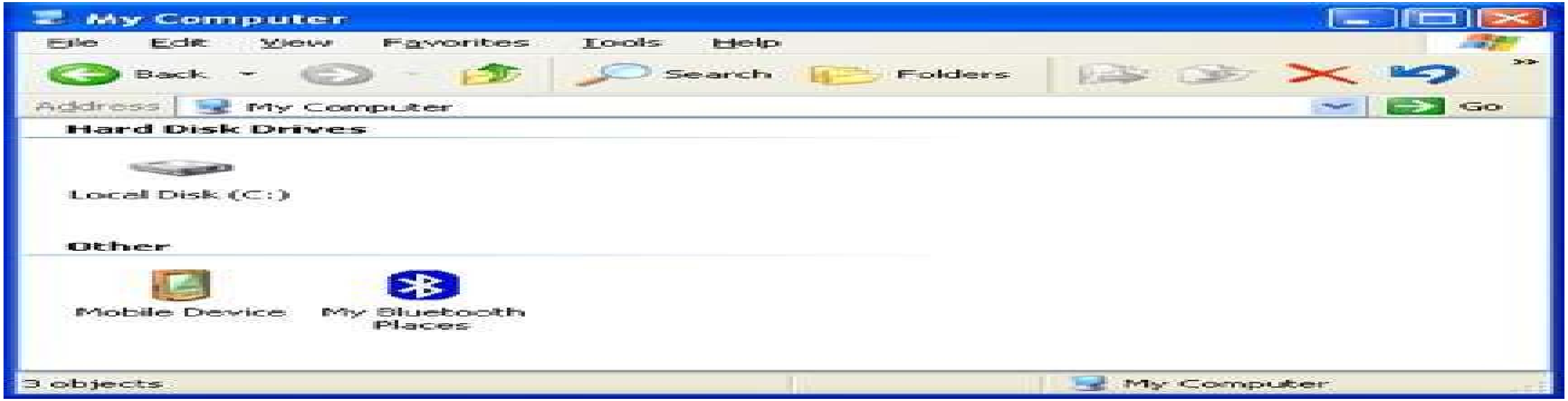
•If the pointer is positioned in such a manner that a right-centered position would force the pop-up partially or fully off the screen, locate the pop-up fully on the screen

• **size:** Restrict the pop-up to no more than 5 to 10 choices, preferably 8 or less.

•**Title:** Not necessary on a pop-up menu. If included, clearly describe the menu’s purpose. Locate in a centred position at the top. Display in uppercase or mixed-case letters.

Iconic Menu

- An iconic menu is the portrayal of menu items or objects in a graphic or pictorial form
- Use to remind user of the functions, commands, application choices
- Create icons that
  - Help enhance recognition and hasten option selection
  - Meaningful and clearly represent choices

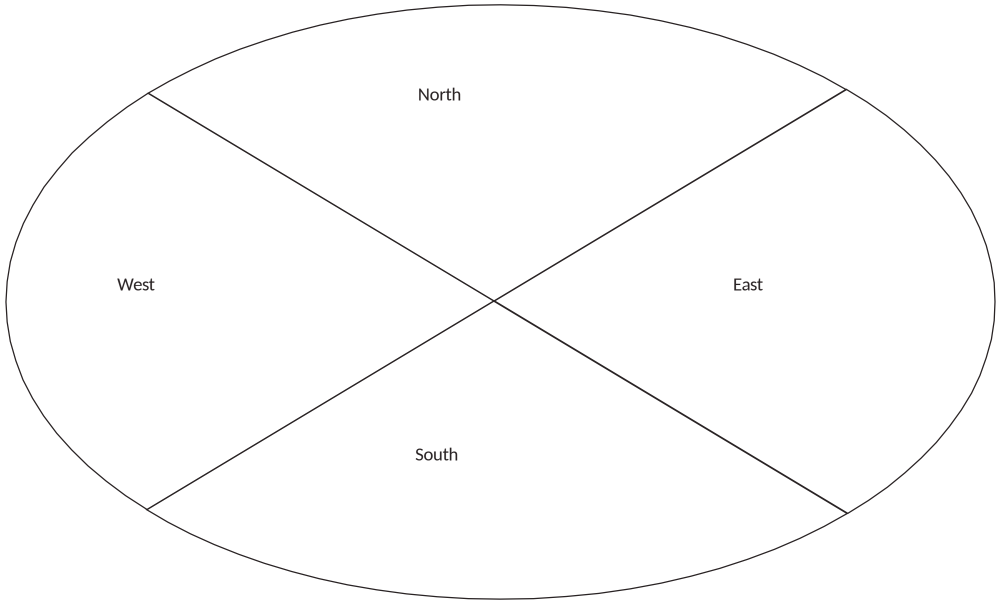


Tear off Menu

A tear-off menu is a pull-down menu that can be positioned anywhere on the screen for constant referral. A tear-off menu is a pull-down menu that can be positioned anywhere on the screen for constant referral.

PIE Menus

A pie menu is a circular representation of menu items used as an alternative to a pull-down/pop up



Navigating Menus

- Navigation, and an efficient navigational structure, is the most important element in system usability.

Web Site Navigation Problems

1) Technical issues: a graphical system application, whose screens tend to flow in an orderly and predictable manner, a Web application is composed of pages, each of which can, be linked to any other page in the application

- The graphical system user deal with only one operating system whose navigational characteristics are standard and fairly consistent. The Web user must deal with two navigational systems, one is browser being used and other is the Web site being viewed.

Navigating Menus

Web Site Navigation Problems

1) **Technical issues: Another problem:** Because of the rapidly evolving and expanding nature of the Web, Web sites also have a tendency to grow more. Due to this more data, what is initially a reasonable structure and menu scheme slowly dissolves into a confusing mass of listings and linked pages. **The result is unrelated information that is presented in no particular order.**
2) **Usage problems:** The two most serious user problems in Web navigation are the heavy mental loads imposed to use the Web and the feeling of spatial disorientation that often occurs.

Navigating Menus

Web Site Navigation Problems

2) Usage problems: The **cognitive or mental overload** the user must expend in making decisions concerning which links to follow, or to abandon. Another problem is that not all links on a page are always obvious. This often leads to much trial-and-error behavior, the user aimlessly clicking to see what happens.

- Feelings of ***disorientation or confusion*** are easily experienced when one becomes **"lost in Web space."**

Navigating Menus

Navigation Goals

- A well-designed navigation system facilitates quick and easy navigation between components whose structure and relationship are easily comprehendible. For that user, answers to the following questions must be obvious at all times during an interaction:
  - Where am I now?
  - Where did I come from?
  - Where can I go from here?
  - How can I get there quickly?

Sometimes referred to as **“way finding,”**

Navigating Menus

Navigation Goals

- a good navigational scheme, and the proper navigational tools, will minimize, the problems associated with mental overload and feelings of disorientation. General system navigation guidelines include the following.

1) **Control:** For multilevel menus, provide one simple action to:
   - Return to the next higher-level menu.
   - Return to the main menu.
   - Provide multiple pathways through a menu hierarchy whenever possible.

Navigating Menus

Navigation Goals

2) Menu Navigation aids:

- To aid menu navigation and learning, provide an easily accessible:
  - **Menu map** or overview of the menu hierarchy.
  - **"look ahead" :** Menu navigation and learning will be assisted if a person is able to browse the next level of choices before the currently displayed choice is selected.
  - **Navigation history**: Provide a navigation history that summarizes the menu choices made leading to the currently displayed menu or screen.

Navigating Menus

Website Navigation

- In designing a Web site navigation scheme there are two things to always remember. Never assume that users know as much about a site as the site designers do and, any page can be an entry point into the Web site.

1) **Web Site Organization:** It is easier to develop a clear and comprehendible navigation scheme if the Web site is organized and structured in a meaningful way. **The design goal is a proper balance of menus and pages** that can be easily and efficiently moved between.

Website Navigation

1) Web Site Organization:

- **Logical fragments, units, or chunks**: Because of limitations in short-term human memory, smaller discrete fragments or chunks of information are often easier to navigate than long ones.
- **Hierarchy of generality or importance**: A document organizational tree structure, (table of contents, chapters, sections, and subsections) is a good scheme, since people are very familiar with, and have an excellent mental model of this organization. Such a structure provides clarity about information sequence, information quantity, and the relationships existing between components.

Website Navigation

1) Web Site Organization:

- **Structure the relationships:** Structure the relationships among content fragments, units, or chunks. Establish global or site wide navigation requirements.
- **Hierarchical tree:** Create a well-balanced hierarchical tree. Restrict to two levels requiring no more than two clicks to reach deepest content, whenever possible.

Website Navigation

2) Components of a Web Navigation System: To move between Web site information fragments requires the creation of navigation ***links.*** They are contained within a framework of tools or controls, including the browser's command buttons, textual phrases, Web site navigation bars, and Web site command buttons. Collectively, these are all referred to as links.

- To design these links we have to follow some guidelines

All navigation controls must:

- Make sense in the absence of site context.
- Be continually available.

Website Navigation

2) Components of a Web Navigation System: All navigation controls must(cont)

- Be obvious and distinctive.
- Be consistent in appearance, function, and ordering.
- Possess a textual label or description.
- Offer multiple navigation paths.

- **Browser Command Buttons:** The browser being used in interacting with the Web provides its own command buttons.
- pressing the browser *Back* and *Forward* buttons can create confusion because they can transport a user in and out of a Web site.

Website Navigation

2) Components of a Web Navigation System: All navigation controls must(cont)

Browser Command Buttons: (cont) Novice users often do not recognize where browser control ends and application control starts, and vice versa.

- Rather then relying on the browser's buttons, provide navigation controls within the application for movement within the application. They can take the form of links or command buttons such as *Next* and *Previous*.

Website Navigation

2) Components of a Web Navigation System: All navigation controls must(cont)

Web Site Navigation Bars: A Web site navigation bar is a menu, an array of textual phrases, graphical images or icons, or command buttons.

Textual explicit listing navigation bar

Graphical or iconic navigation bars

Command button navigation bar.

Website Navigation

2) Components of a Web Navigation System: All navigation controls must(cont)

Web Site Navigation Bars: A Web site contains at least three levels of navigation links,

- ***global*, or site-wide**, links indicating the site's total scope or categories of available information. These should be placed at the top of the page.
- ***local or topical* specific navigation links** within the category or topical area being displayed should be placed on left side of the page.
- ***minor*** illustrative, parenthetical, or footnote links, placed at the end of the page

Website Navigation

2) Components of a Web Navigation System: All navigation controls must(cont)

Web Site Navigation Bars: For long pages, provide a navigation bar repeating important global or local links at the page bottom.

Textual Phrases: Textual phrases are words, or short pieces of highlighted text, serving as links. Textual phrase links possess two distinct structures, **explicit and embedded.**

- An ***explicit*** menu is a listing of textual phrase links set apart from the main page content, often in a toolbar. These listings usually include links to various Web site topics, links to site global features such as the site map or search facility, and perhaps links to other related sites.

Website Navigation

2) Components of a Web Navigation System: All navigation controls must(cont)

Web Site Navigation Bars: For long pages, provide a navigation bar repeating important global or local links at the page bottom.

Textual Phrases: Textual phrases are words, or short pieces of highlighted text, serving as links. Textual phrase links possess two distinct structures, **explicit and embedded.**

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Website Navigation

2) Components of a Web Navigation System: All navigation controls must(cont)

Textual Phrases: An *embedded* menu is a link contained within the textual content of a page. Certain words or phrases are designated as links, highlighted, and whe n

the lists of usability problems found by heuristic evaluation will tend to be dominated by minor problems, which is one reason severity ratings form a useful supplement to the method. Even though major usability problems are by definition the most important ones to find and to fix, minor usability problems are still

Website Navigation

2) **Components of a Web Navigation System: All navigation controls must(cont)**

Graphical Images or Icons: appear in an array in the form of a navigation bar, or be individually located at relevant points in a page.

Command Buttons: Command buttons may appear in an array in the form of a navigation bar, or be individually located at relevant points in a page.

Website Navigation

2) Components of a Web Navigation System: All navigation controls must(cont)

Other web site navigational elements: Other elements are historical trails and search engines.

Overview Provide:

- An executive summary that provides a preview of the site and contains links to all major concepts.
- A site map illustrating the site's hierarchical structure and the relationships of components.
- Both global and local maps.
- An alphabetized site index.
- A table of contents.

Website Navigation

2) Components of a Web Navigation System: All navigation controls must(cont)

Other web site navigational elements:

Overview Provide:

- Allow accessibility from any point in the Web site.

Historical Trails: Historical navigation aids try to show the user's position in an information space by showing where they have come from, or where they have been.

- Provide A ***bread- crumb trail*** in a hierarchical Web site

Website Navigation

2) Components of a Web Navigation System: All navigation c

Breadcrumb trails

Website Navigation

2) **Components of a Web Navigation System: All navigation controls must(cont)**

Historical Trails: provide A ***history list*** is a sequential textual listing of sites or pages visited over a specific time period, a session, a day, or some other time period.

- provide A ***history tree*** is an overview map of a site's structure with pages already visited marked by an indicator such as a plus sign, check mark, or asterisk.
- Provide The markings serve as ***footprints***, guiding the user back to pages of interest, and/or signaling which have already been seen and may no longer be of interest.

Website Navigation

2) Components of a Web Navigation System: All navigation controls must(cont)

Historical Trails: provide A ***bookmark*** is similar to a history list except that it is designated by the user to mark locations of continuing interest

Search Facility: Another form of navigation support is provided by a site search facility.

Website Navigation Guidelines:

- How many links should exist on a page?
- How should textual links be presented to make them obvious?
- What kinds of links should be included on a page?

1) **Scrolling:**

- Do not require scrolling of navigation-only pages.
- Minimize the need for scrolling to view all links on pages containing content.
- Never require horizontal scrolling.

Website Navigation Guidelines:

2) Number of Links:

- Every page should contain at least one link.
- Be conservative in the total number of links presented on a screen:

  >>Without logical groupings of elements, limit links to 4 to 8.

  >>With logical groupings of elements, limit links to 18 to 24.

- Restrict embedded links to those most important,

Website Navigation Guidelines:

3) Presenting Links:

- **Link text.** To identify a link, the well-established convention is to ***underline*** the link text. All link text must be underlined, including that
  - embedded in page content
  - that presented in explicit listings
  - that contained in headings
  - that taking the form of labels in graphical images.
- Distinguish between unselected/unvisited links and selected/visited links.
  - Make unselected/unvisited links blue.

Website Navigation Guidelines:

3) Presenting Links:

- **Kinds of links:** Distinguish links leading to different Web destinations through a differentiating symbol, A link's destination should be as predictable as the content at the other end.

  ☾ Precede links to content within the same page with a pound sign (#).

  >>**For links moving downward in the page use: #** The principles of design.

  >>**For links moving upward in the page use: #** ^

Website Navigation Guidelines:

3) Presenting Links:

- **Kinds of links:**

  ☾ Precede links to external or foreign sites with another unique symbol such as an asterisk (*): * Additional information.

  ☾ Do not precede links to other site pages with any symbol

  ☾ Also distinguish links leading to different Web destinations by presenting them in consistent locations.

•

Website Navigation Guidelines:

3) Presenting Links:

- **Links in toolbars:**
  - Distinguish links contained in toolbars through:
    >>Presenting in consistent locations.
    >>Using different colored backgrounds.

4) Other Link Guidelines:

- **Writing:**
  - Provide links to satisfy a range of user needs.
  - Create descriptive links clearly indicating their destination or resulting action

Website Navigation Guidelines:

4) Other Link Guidelines:

- **Grouping:**

  ☾ Group links by the most relevant menu-grouping scheme.

  ☾ Separate visually the following types of navigation:

  >>Upward to the immediate parent page.

  >>Upward to the beginning of the section or category of information.

  >>Across to main sections or categories of information.

  >>To basic utilities.

Website Navigation Guidelines:

4) Other Link Guidelines:

- **Ordering:**

  ☾ Order links by the most relevant menu choice-ordering scheme.

- **Heading:**

  ☾ Where appropriate, provide a listing heading describing the organizing category, principle, or theme.

- **Size:**

  ☾ Provide graphical images and command buttons of sufficient and equal size.

Website Navigation Guidelines:

4) Other Link Guidelines:

- **Spacing:**

  ☾ Create equal spacing between choices graphical image and textual listing tool- bars.

- **Inapplicability:**

  ☾ Disable and display dimmed links conditionally not applicable.

Website Navigation Guidelines:

5) Kinds of Links

- **Within a page.** For long pages, include links to for important content within the page. Place these links at the top of the page and identify them, by a heading or symbol as a internal link.
- **Within a website on all pages include links to:**

  ☾ **Home page.** A home link will transport the user directly to the site's home page. Easy access is also achieved when the user is ready to start over, or ready to commence a new navigation. A home link eliminates the

Website Navigation Guidelines:

5) Kinds of Links

- **Within a website on all pages include links to:**

  Global features. Provides links to a site's global features, including the highest level of information categories and utilities such as the Search facility.

  Other main pages, navigation points, sections, or categories. Do not link to all sections of the site from all pages. To provide easy navigation throughout a site, provide links to a site's major navigation points, sections, or categories of information.

Website Navigation Guidelines:

5) Kinds of Links

- **Within a website on all pages include links to:**

  ☾ **The likely Web site starting point.** Provide links to the site's likely starting point, the home page, a site map, or an index.

  ☾ **Main pages with links to page.** Provide links back to the main pages that have links to the displayed page. A return link describing the page one is going back to provide better predictability and much clearer context. It also provides escape ability.

Website Navigation Guidelines:

5) Kinds of Links

- **For *sequential* pages, provide easily accessible links to adjacent pages:**

  ☾ **Next Page:** To allow sequential movement downward through pages, place a Next link at the end of each page. Explain, whenever possible, what will happen or where one

  ☾ **Previous.** Also include Previous link returning the user to the prior page in the Web site structure, thereby reversing direction in screen navigation. Locate this link at the end of the page. For long pages, also include

Website Navigation Guidelines:

5) Kinds of Links

- **Also consider including links to:**
  - **Places of related interest.** Provide links to other pages with related content. Wherever the user's attention is likely to be captured, provide a direct link to related places.
  - **Important pages.** Provide links to important or high-priority areas or pages you want to make sure the user sees.
  - **Background or explanatory information.** Provide links to

Website Navigation Guidelines:

5) Kinds of Links

- **Also consider including links to:**

  ☾ **Supplemental information.** Use links to provide supplemental information like definitions of terms and abbreviations

  ☾ **New or changed content.** Draw attention to new or changed content by making it easy to notice and go directly to. A prominently placed ***What's New?*** link can be used for this purpose.

Website Navigation Guidelines:

5) Kinds of Links

- **Also consider including links to:**

  - **Quit or Exit.** The Web has no way to stop running an application without closing the browser or leaving by a link. Provide this command so the users can confirm that an application is finished and any entered data should be saved. This command may be included on a special exit page showing external links and other useful information.

Website Navigation Guidelines:

5) Kinds of Links

- **Provide external links to other relevant Web sites and information sources**

  ☾ **Informational sites.** Links to external or foreign sites are most appropriate for informational sites, where browsing is a primary usage purpose.

  ☾ **Related content.** Provide links to relevant information on other Web sites, including sites with similar content to that mentioned in your Web site. Also provide links to other resources, repositories, reference information, and

Website Navigation Guidelines:

5) Kinds of Links

- **Provide external links to other relevant Web sites and information sources**

  ☾ **Separate page.** Whenever possible, locate links that go outside of the Web site on a separate page. To accomplish this, use a

  See Also link to this additional page.

  ☾ **Outside indication.** Identify links leading away from the site by a heading or a unique symbol. Also inform users that they are leaving the displayed site for another Web

Website Navigation Guidelines:

6) Link Maintenance

- Maintain correct internal links.
- Frequently check and correct external links.

Select the Proper Kinds of Windows

A window is

- an area of the screen that contains a particular view of some area of the computer.
- A window may be small, containing a short message or a single field, or it may be large, consuming most or all of the available display space. A display may contain one, two, or more windows within its boundaries.

Content

- A window’s characteristics
- A window’s components
- A window’s presentation styles
- The types of windows available
- Organizing window system functions
- A window’s operations
- Web system frames and pop-up windows

Window Characteristics

A window is seen to possess the following characteristics:

- A name or title, allowing it to be identified
- A size in height and width (which can vary)
- A state, accessible or active, or not accessible(Only active windows can have their contents altered)
- Visibility—the portion that can be seen (A window may be partially or fully hidden behind another window or Information with in a window may extend beyond window's display area)
- A location, relative to the display boundary.

Window Characteristics

A window is seen to possess the following characteristics: (cont..)

- Presentation is arranged in relation to other windows (it may be tiled, overlapping, or cascading)
- Management capabilities, Methods for manipulation of the window on the screen
- Its highlight, that is, the part that is selected
- The function, task, or application to which it is dedicated.

Windows are useful in the following

- **Presentation of Different Levels of Information:**

  Information can be in increasing levels of detail. A document table of contents can be presented in a window. A chapter or topic selected from this window can be simultaneously displayed in more detail in an adjoining window.

- **Presentation of Multiple Kinds of Information:**

  Variable information needed to complete a task can be displayed simultaneously in adjacent windows.

  ☾ An order-processing system window could collect a customer account number in one window and retrieve the customer's name and shipping address in another window. A third window could collect details of the order, after which another window could present factory availability of and shipping dates for the desired items.

- **Sequential Presentation of Levels or Kinds of Information:**

  Steps to accomplish a task can be sequentially presented through windows. Successive windows are presented until all the required details are collected. Key windows may remain displayed, but others appear and disappear as necessary.

  ☾ This sequential preparation is especially useful if the information-collection process leads down various paths. An insurance application, for example, will include different types of coverage.

- **Access to Different Sources of Information**

  Independent sources of information may have to be accessed at the same time. This information may reside in different host computers, operating systems, applications, files, or areas of the same file.

- **Combining Multiple Sources of Information:**

  Text from several documents may have to be reviewed and combined into one. Relevant information is selected from one window and copied into another.

- **Perform More Than One Task:**

  More than one task can be performed at one time. While waiting for a long, complex procedure to finish, another can be performed. Tasks of higher priority can interrupt less important ones. The interrupted task can then be resumed without the necessity to “close down” and “restart.”

- **Reminding:**

  Windows can be used to remind the viewer of things likely to be of use in the near future. Examples might be menus of choices available, a history of the path followed, the time of an important meeting.

- **Monitoring:**

  Changes, both internal and external, can be monitored. Data in one window can be modified and its effect on data in another window can be studied.

- **Multiple Representations of the Same Task:**

  The same thing can be looked at in several ways—for example, alternate drafts of a speech, different versions of a screen, or different graphical representations of the same data.

Constraints in Window System Design

- The problems with windowing systems can be attributed to three factors: historical considerations, hardware limitations, and human limitations.

1) **Historical Considerations:**

   - Historically, system developers have been much more interested in solving hardware problems than in user considerations.
   - there are few concrete window design guidelines to aid designers. This lack of guidelines makes it difficult to develop acceptable and agreeable window standards.
   - Standardization is also made more difficult by the complexity and range of alternatives available to the designer.

Constraints in Window System Design

2) Hardware Limitations:

- The slower processing speeds and smaller memory sizes of some computers may inhibit the use of windows.
- A drain on the computer's resources may limit feedback and animation capabilities, thereby reducing the system's usability.
- Poor screen resolution and graphics capability may also deter effective use of windows by not permitting sharp and realistic drawings and shapes.

Constraints in Window System Design

3) Human Limitations:

- A windowing system, because it is more complex, requires the learning and using of more operations. Much practice is needed to master them.

4) Other Limitations:

- Other possible window problems include the necessity for window borders to consume valuable screen space, and that small windows providing access to large amounts of information can lead to excessive scrolling.

Components of a Window

- Frame (Border)
- Title Bar
- Title Bar Icon
- Window Sizing Buttons
- What’s This Button
- Menu Bar
- Status Bar
- Scroll Bars
- Split Box(Split Bar)
- Toolbar
- Command Area
- Size Grip
- Work Area

Components of a Window

- **Frame (Border):**

☾ A window will have a frame or border, usually rectangular in shape, to define its boundaries and distinguish it from other windows.

☾ textual materials, which are usually read from left to right, fit most efficiently within this structure.

☾ Windows filling an entire screen may use the screen edge as the border. If a window is resizable, it may contain control points for sizing it. If the window cannot be resized, the border coincides with the edge of the window.

Components of a Window

- **Title Bar:**

  ☾ The title bar is the top edge of the window, inside its border and extending its entire width. This title bar is also referred to by some platforms as the **caption, caption bar, or title area.**

  ☾ The title bar contains a descriptive title identifying the purpose or content of the window.

- **Title Bar Icon:**

  ☾ Located at the left corner of the title bar in a primary window, this button is used in Windows to retrieve a pull-down menu of commands that apply to the object in the window.

Components of a Window

- **Window Sizing Buttons:**

  ☾ Located at the right corner of the title bar, these buttons are used to manipulate the size of a window.

  ☾ The leftmost button, the **minimize button**— inscribed with a short horizontal line toward the bottom of the button is used to reduce a window to its minimum size.

  ☾ The **maximize button**—typically inscribed with a large box enlarges a window to its maximum size, usually the entire screen.

  ☾ the **restore button** replaces the maximize button, since the window can no longer be increased in size. The restore button typically inscribed with a pair overlapping boxes returns a window to the size it had before a minimize or maximize action was performed.

- ## Window Sizing Buttons:

  - A **close button**—typically inscribed with an X—closes the window.
  - Sizing buttons are included on primary windows only.
  - When these buttons are displayed, use the following guidelines:

1) When a window does not support a command, do not display its command button.

2) The Close button always appears as the rightmost button. Leave a gap between it and any other buttons.

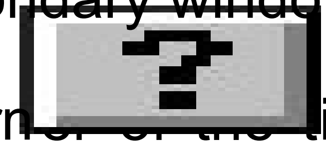
3) The Minimize button always precedes the Maximize button.

4) The Restore button always replaces the Maximize button or the Minimize button when that command is carried out.

Components of a Window

- **What's This Button:**

  ☾ The **What's This?** Button, which appears on secondary windows and dialog boxes, is used to invoke the What's This? Windows command to provide contextual Help about objects displayed within a secondary window.



  ☾ it is located in the upper-right corner of the title bar, just to the left of the close button.

Components of a Window

- **Menu Bar:**

  ☾ A menu bar is used to organize and provide access to actions. It is located horizontally at the top of the window, just below the title bar. A menu bar contains a list of topics

- **Status Bar:**

  ☾ Information being used by the user can be displayed in a designated screen area or areas. They may be located at the top of the screen in some platforms and called a status area, or at the screen’s bottom. Microsoft recommends the bottom location and refers to this area as the status bar. It is also referred to by other platforms as a **message area or message bar.**

Components of a Window

- **Scroll Bars :**

  ☾ When all display information cannot be presented in a window, the additional information must be found and made visible.

  ☾ This is accomplished by scrolling the display's contents through use of a scroll bar. A scroll bar is an extended rectangular container consisting of a scroll area or shaft, a slider box or elevator, and arrows or anchors at each end.

  ☾ For vertical scrolling, the scroll bar is positioned at the far right side of the work area, extending its entire length. Horizontal scrolling is accomplished through a scroll bar located at the bottom of the work area.

Components of a Window

- **Split Box(Split Bar) :**

☾ A window can be split into two or more pieces or panes by manipulating a split box located above a vertical scroll bar or to the left of a horizontal scroll bar.

☾ A split box is sometimes referred to as a **split bar.**

☾ A window can be split into two or more separate viewing areas that are called **panes.**

☾ A split window allows the user to:

>>Examine two parts of a document at the same time.

>> Display different, yet simultaneous, views of the same information.

Components of a Window

- **Toolbar :**

☾ Toolbars are permanently displayed panels or arrays of choices or commands that must be accessed quickly. They are sometimes called **command bars**.

☾ Toolbars are designed to provide quick access to specific commands or options. Specialized toolbars are sometimes referred to as ribbons, toolboxes, rulers, or palettes.

Components of a Window

- **Command Area :**

☾ In situations where it is useful for a command to be typed into a screen, a command area can be provided.

☾ The desired location of the command area is at the bottom of the window.

☾ If a horizontal scroll bar is included in the window, position the command area just below it.

☾ If a message area is included on the screen, locate the command area just above it.

Components of a Window

- **Size Grip:**

  ☾ A size grip is a Microsoft Windows special handle included in a window to permit it to be resized. When the grip is dragged the window resizes

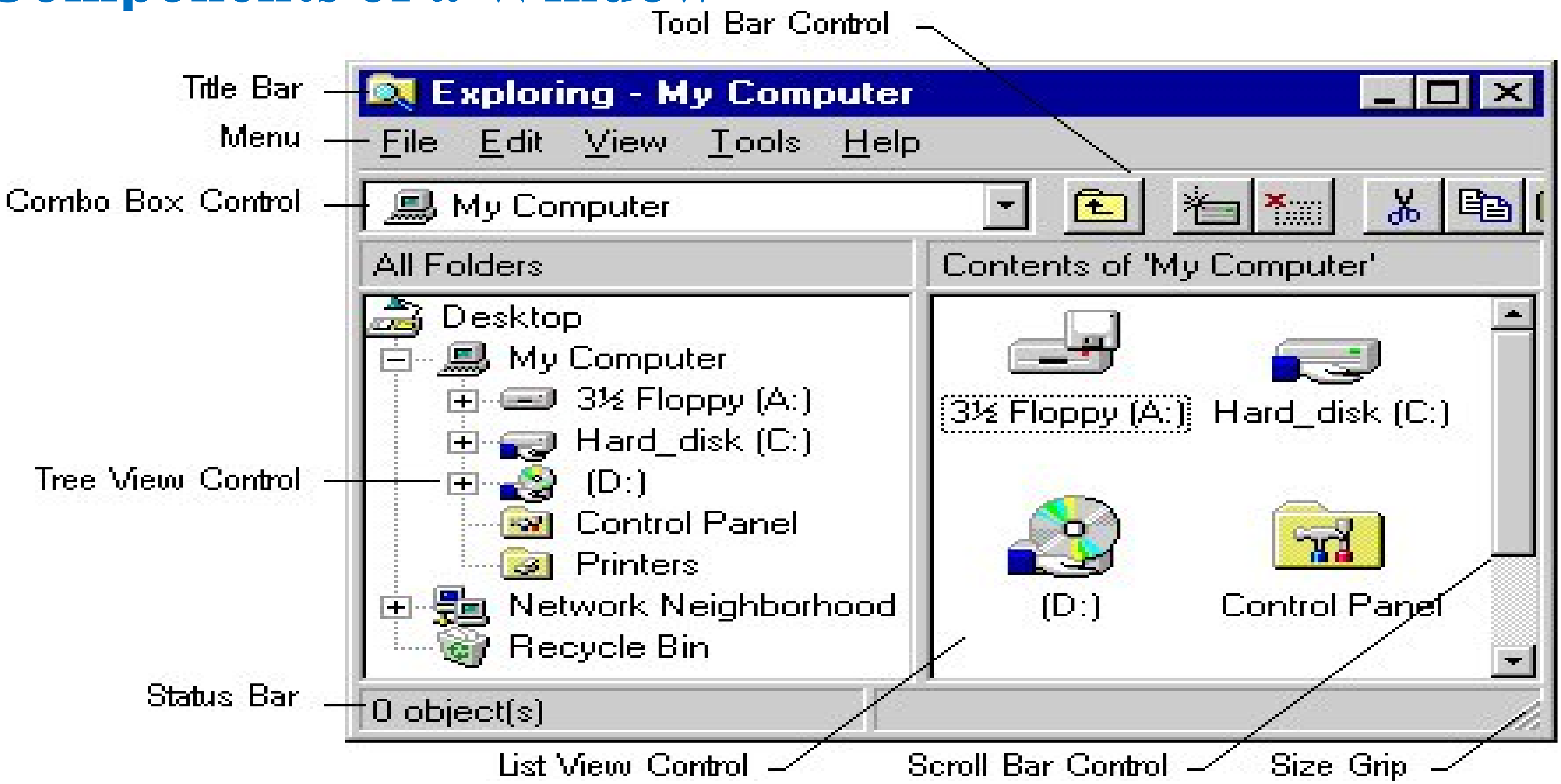
  ☾ Three angled parallel lines in the lower-right corner of a window designate the size grip.

Components of a Window

- **Work Area:**

  - The work area is the portion of the screen where the user performs tasks.
  - It is the open area inside the window's border and contains relevant peripheral screen components such as the menu bar, scroll bars, or message bars.
  - The work area may consist of an open area for typing, or it may contain controls (such as text boxes and list boxes) or customized forms (such as spreadsheets).
  - The work area may also be referred to as the **client area.**

Components of a Window



Window Presentation Styles

- The presentation style of a window refers to its spatial relationship to other windows. There are two basic styles, commonly called tiled or overlapping.

Tiled Windows:

- Tiled windows derive their name from common floor or wall tile.
- Tiled windows appear in one plane on the screen and expand or contract to fill up the display surface, as needed.
- Most systems provide two-dimensional tiled windows, adjustable in both height and width.
- Some less-powerful systems, however, are only one-dimensional, the windows being adjustable in only one manner (typically the height).

Window Presentation Styles

Advantages of Tiled Windows:

- The system usually allocates and positions windows for the user, eliminating the necessity to make positioning decisions.
- Open windows are always visible, eliminating the possibility of them being lost and forgotten.
- Every window is always completely visible, eliminating the possibility of information being hidden.
- They are perceived as less complex than overlapping windows, possibly because there are fewer management operations or they seem less “magical.”

Window Presentation Styles

Advantages of Tiled Windows:

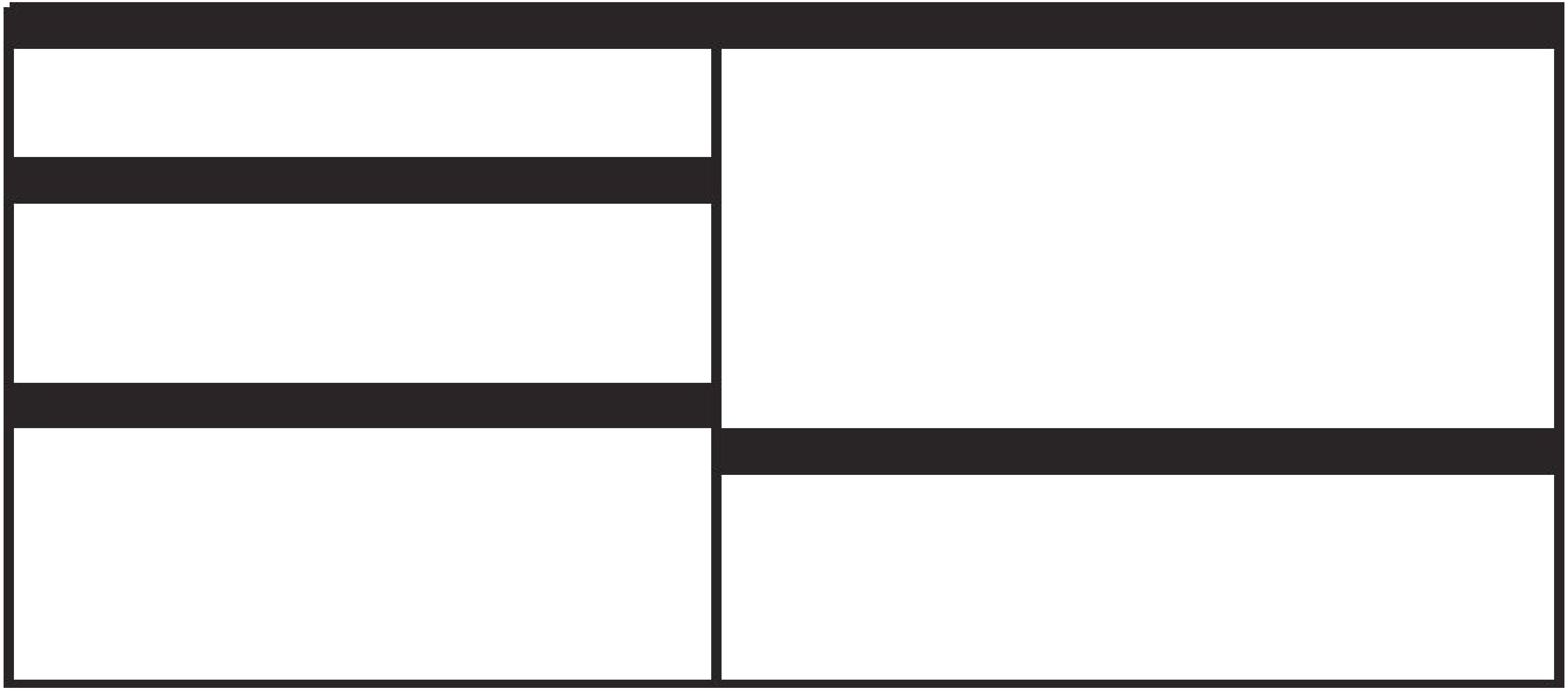
- They are easier, according to studies, for novice or inexperienced people to learn
- Yield better user performance for tasks where the data requires little window manipulation to complete the task

Disadvantages:

- Only a limited number can be displayed in the screen area available
- As windows are opened or closed, existing windows change in size . This can be annoying
- As the number of displayed windows increases, each window can get very tiny

Disadvantages:

- The changes in sizes and locations made by the system are difficult to predict.
- The configuration of windows provided by the system may not meet the user's needs.
- They permit less user control because the system actively manages the windows.



Tiled windows.

Window Presentation Styles

- Overlapped Windows

Overlapping windows may be placed on top of one another like papers on a desk. They possess a three-dimensional quality, appearing to lie on different planes. Users can control the location of these windows, as well as the plane in which they appear. The sizes of some types of windows may also be changed.

Advantages

- Visually, their look is 3-D, resembling the desktop that is familiar to the user
- Windows can maintain larger sizes
- Windows can maintain consistent sizes, position.
- Greater control allows the user to organize the windows to meet his or her needs.

Window Presentation Styles

- Overlapped Windows

–Screen space conservation is not a problem, because windows can be placed on top of one another.

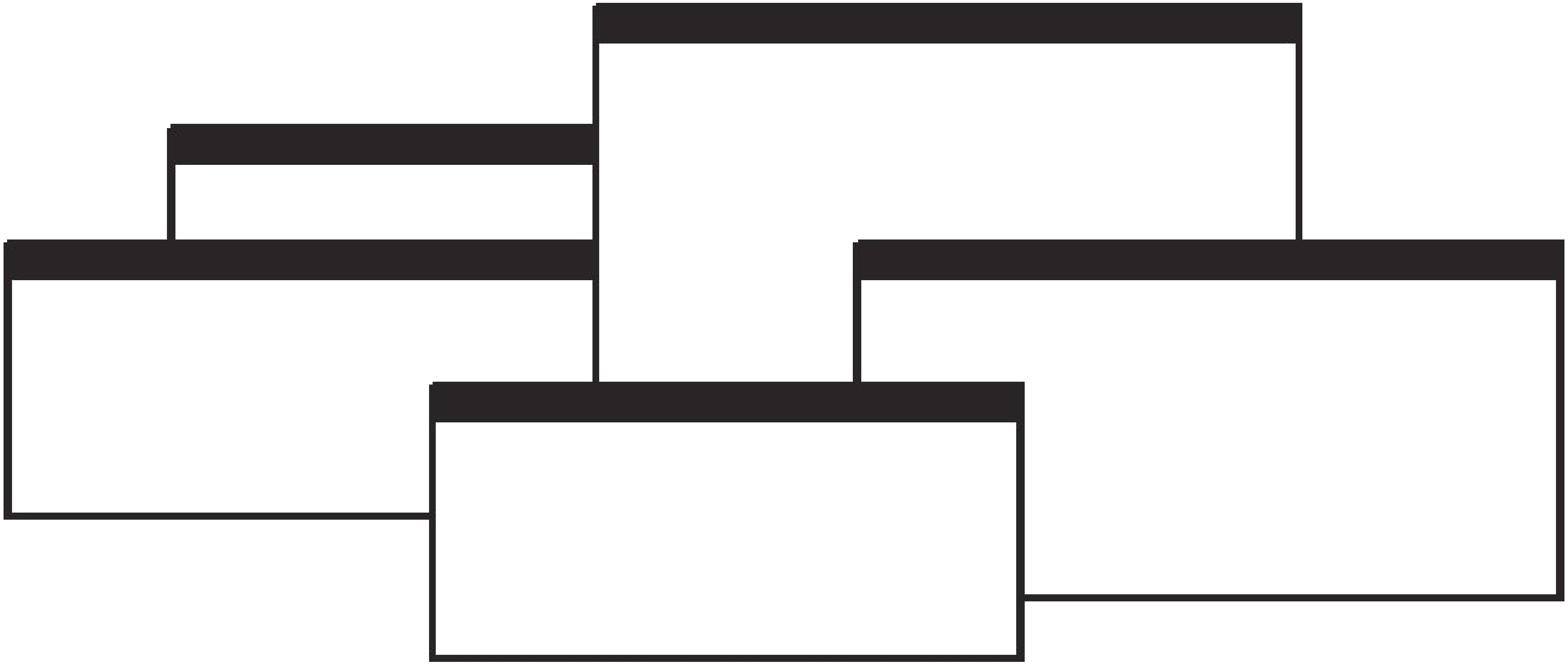
–There is less pressure to close or delete windows no longer needed.

Disadvantages:

- They are operationally much more complex than tiled windows. More control functions require greater user attention and manipulation
- Information in windows can be obscured behind other windows.
- Windows themselves can be lost behind other windows and be resumed not to exist.

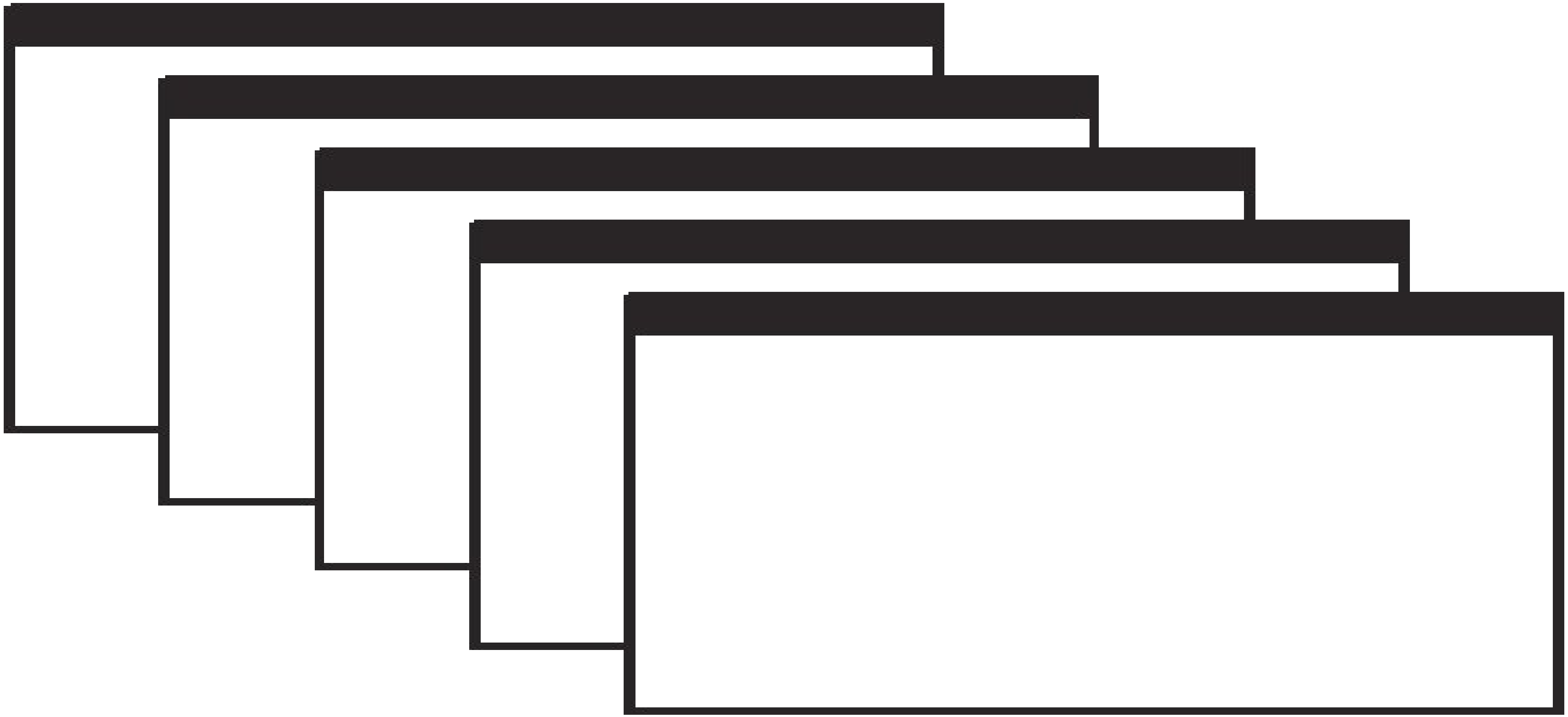
Window Presentation Styles

- Overlapped Windows



Window Presentation Styles

- Cascading Windows (Special type of overlapping window)



Window Presentation Styles

- **Cascading Windows (Special type of overlapping window)**
  - No window is ever completely hidden
  - Bringing any window to the front is easier
  - It provides simplicity in visual presentation and cleanness

Picking a Presentation Style

- **Use tiled window for:**
  - Single task activities
  - Data that needs to be seen simultaneously
  - Tasks requiring little window manipulation
  - Novice or inexperienced users
- **Use overlapping windows for:**
  - Switching between tasks
  - Tasks necessitating a greater amount of window manipulation
  - Expert or experienced users
  - Unpredictable display contents

Type of Windows

- **Primary Window** : The *primary* window is the first one that appears on a screen when an activity or action is started
  - Should represent an independent function or application
  - Use to present constantly used window components and controls

    >> Menu bar items that are:

    - Used frequently.
    - Used by most, or all, primary or secondary windows.

    >>Controls used by dependent windows.
  - Use for presenting information that is continually updated (Date and time)
  - Use for providing context for dependent windows to be created.

Type of Windows

- Do not divide independent function into two or more primary windows
- Do not divide Present unrelated functions in one primary window.

Type of Windows

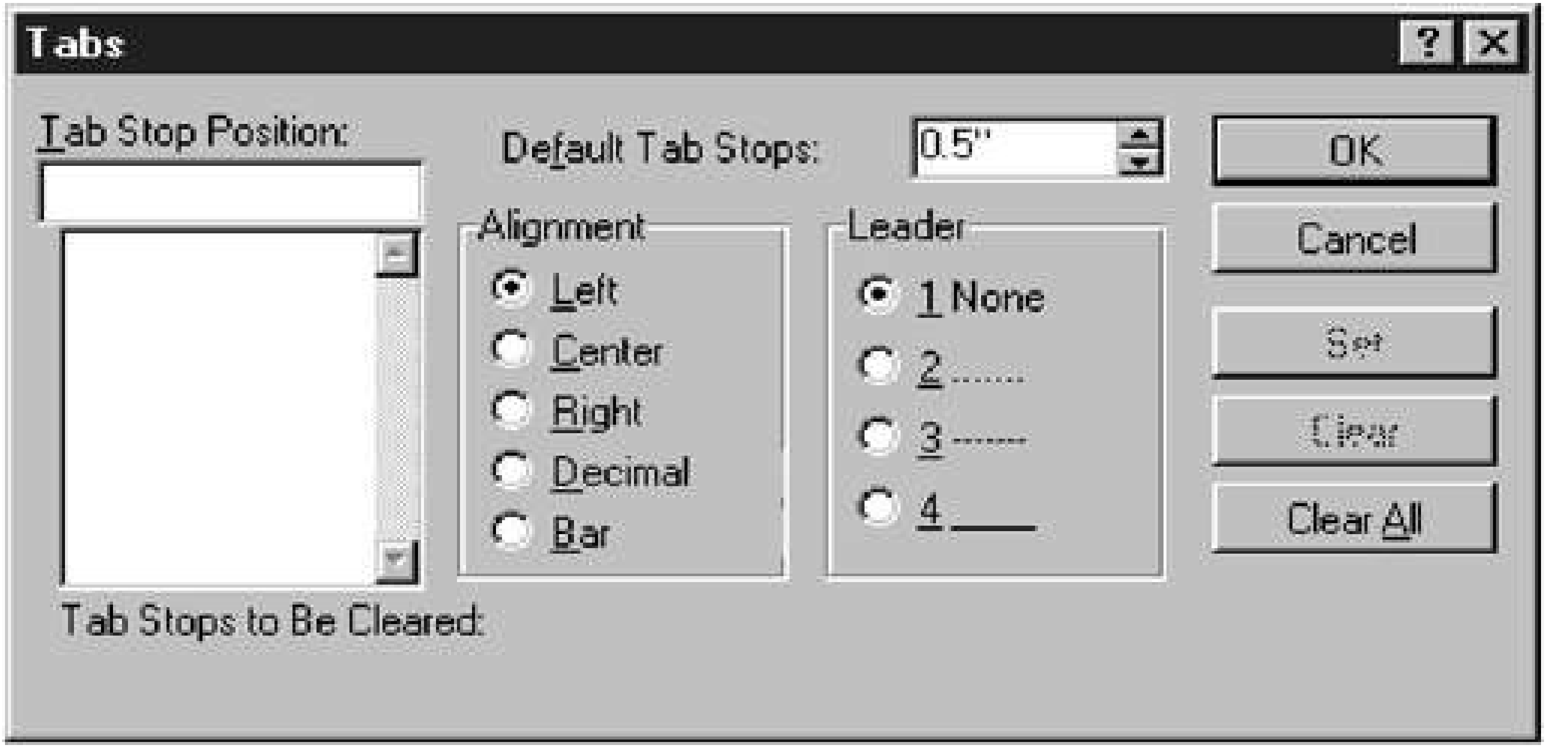
- **Secondary Windows** : Secondary windows are supplemental windows. Secondary windows may be dependent upon a primary window or displayed independently of the primary window.
  - **A dependent secondary**
    - It can only be displayed from a command on the interface of its primary window
  - **A independent secondary**
    - Can be opened independently of a primary window . For example a property sheet displayed when the user clicks the Properties command on the menu of a desktop icon.

Type of Windows

- **Secondary Windows :**
- **Proper usage:** Although secondary windows share many characteristics with primary windows, they also differ from primary windows in behaviour and use.
- Secondary windows are used to perform supplemental or subordinate tasks, or tasks that are extended in nature.
- Frequently and occasionally used window components should also be presented in secondary windows.

Type of Windows

- **Secondary Windows**
- Microsoft Windows possesses several types of secondary type of secondary windows called
  - Dialog boxes
  - Property sheet
  - Property inspectors
  - Message boxes
  - Palette windows
  - Pop-up windows

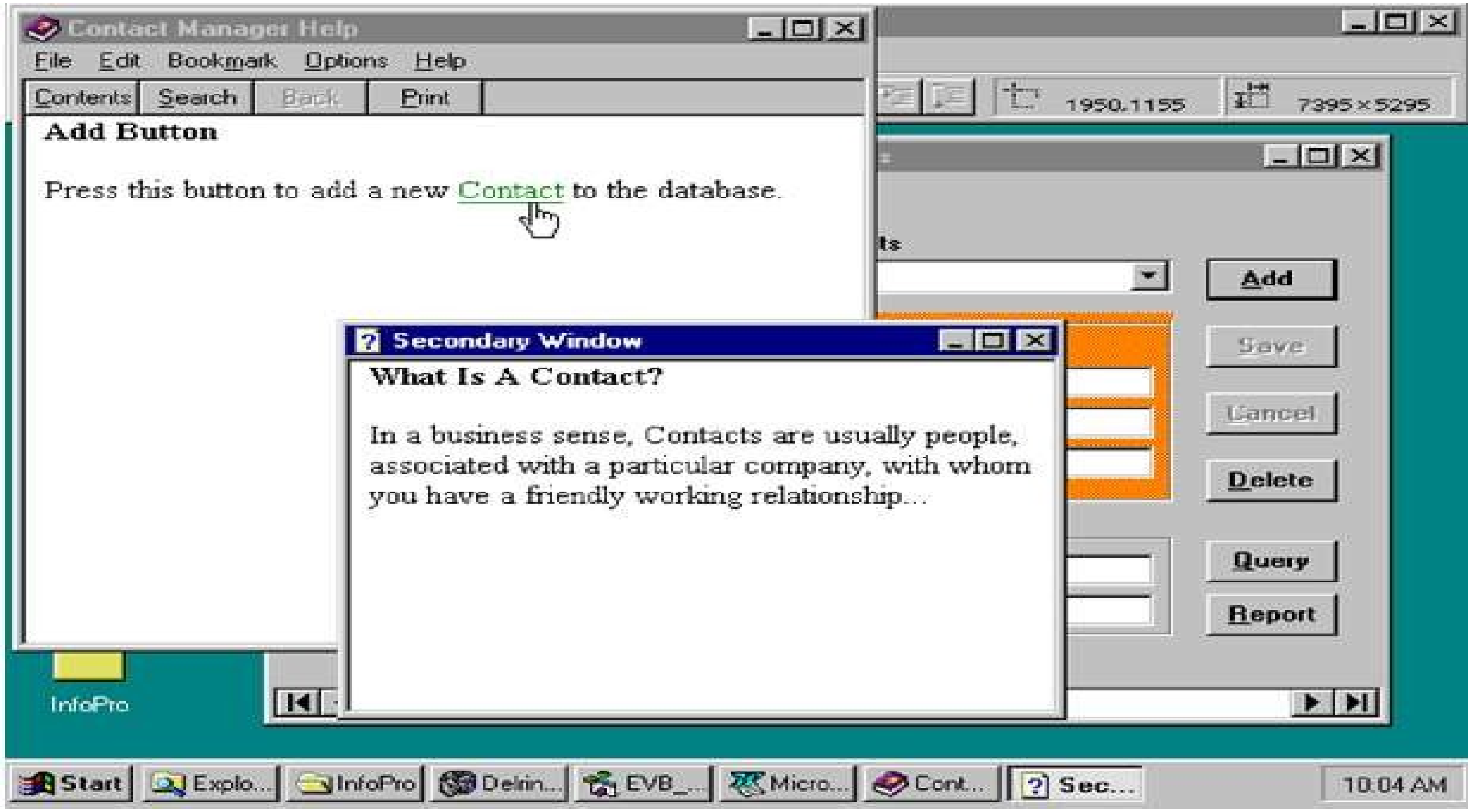


Type of Windows

- **Secondary Windows**
- **Guidelines.** A secondary window should typically not appear as an entry on the taskbar.
- Secondary windows obtain or display supplemental information that is usually related to the objects that appear in a primary window.
- A secondary window is typically smaller than its associated primary window and smaller than the minimum display resolution.

Type of Windows

- Secondary Windows



Modal and Modeless

- **Modal window:** Most secondary windows will be **modal**.
  - Will not permit interaction with another window until the current dialog is completed
  - Use for:

    >>Presenting information.

    ☾ For example, messages (sometimes called a message box).

  - Receiving user input.

    >>For example, data or information (sometimes called a prompt box).

  -Asking questions.

    >>For example, data, information, or directions (sometimes called a question box).

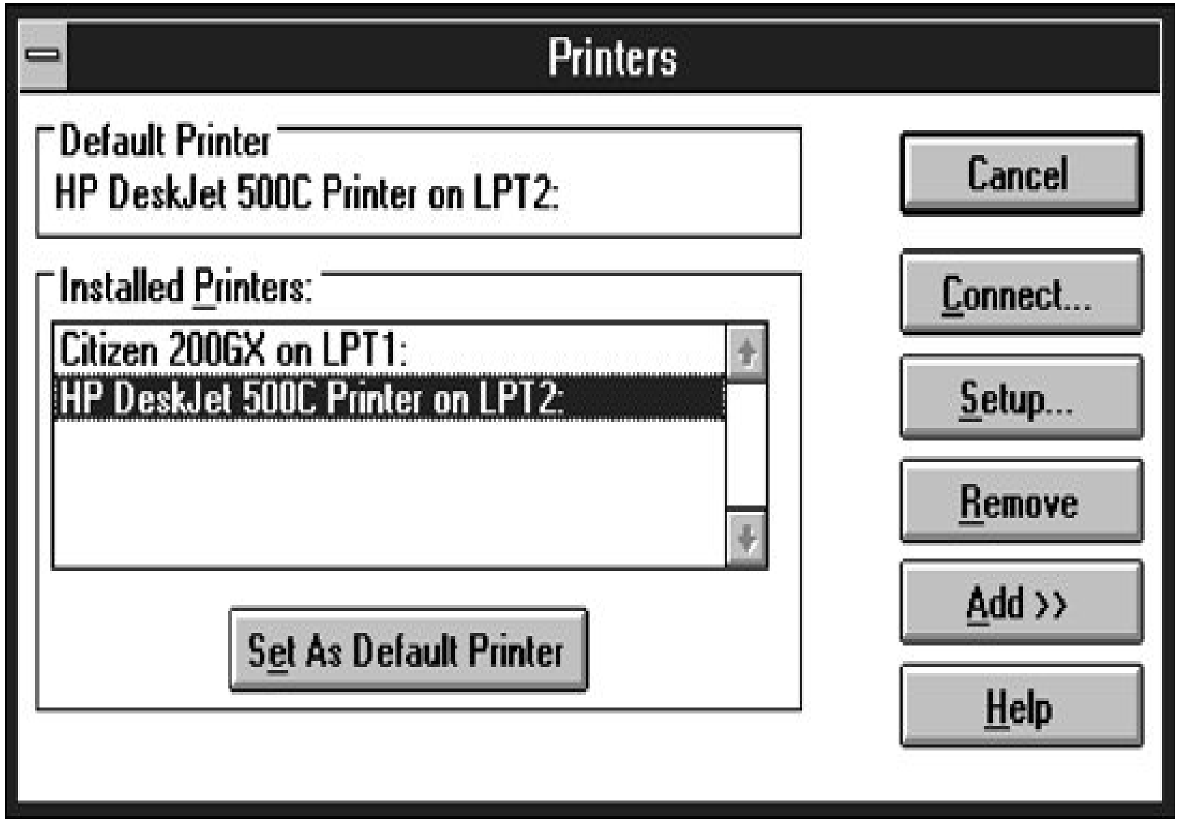
  — Use carefully because it constrains what the user can do.
  - Remain displayed until the appropriate action is taken after which it is removed
  - Modal dialog boxes typically request critical information or actions

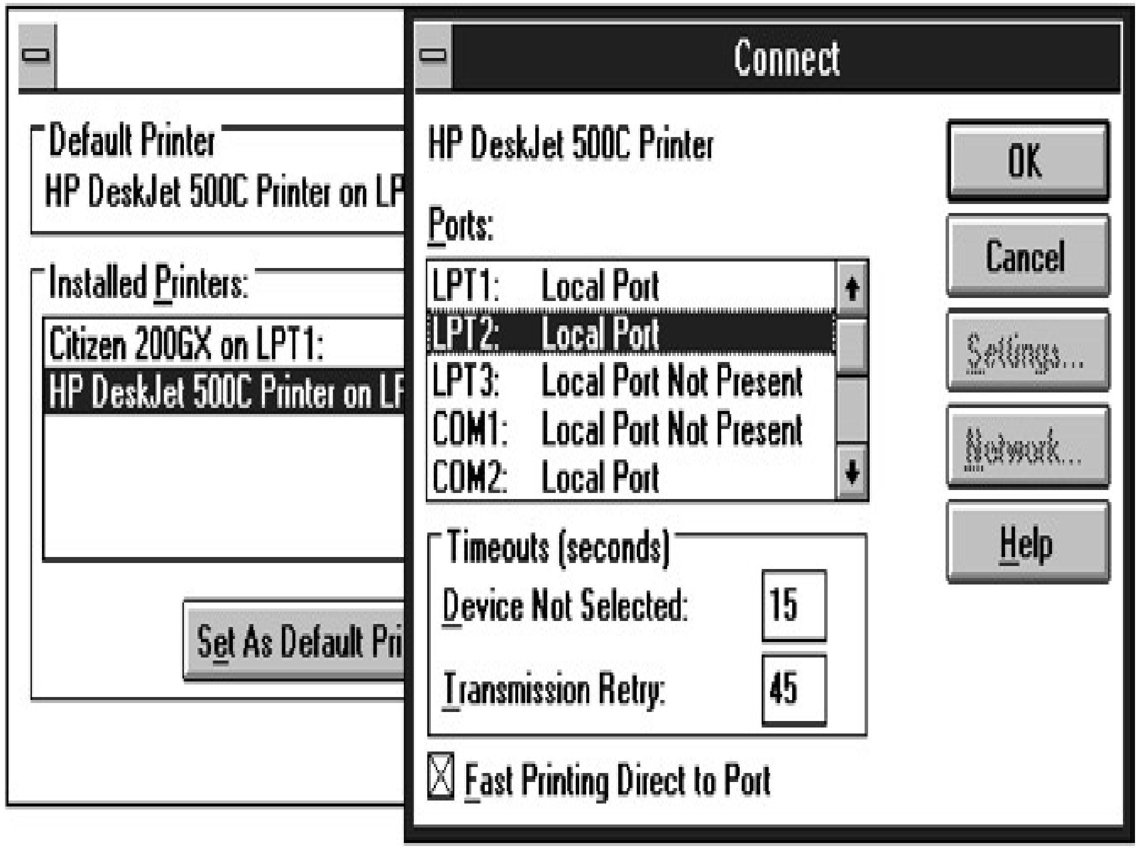
Modal and Modeless

- Modeless window
- - A modeless dialog box permits the user to engage in parallel dialogs.
  - Switching between the box and its associated is permitted
  - Use a modeless dialog box when interaction with a primary window or another secondary window must be permitted, for example, during the accessing of the Help function.
  - Also, use a modeless dialog box when interaction with other windows must be repeated; for example, in a word search operation.

Cascading and Unfolding

- A cascading window keeps the original window displayed, with the dependent window displayed on top, offset slightly to the right and below the original secondary window.





Cascading and Unfolding

- Cascading
  - Purpose is to provide advanced options at a lower level in a complex dialog

  Guidelines

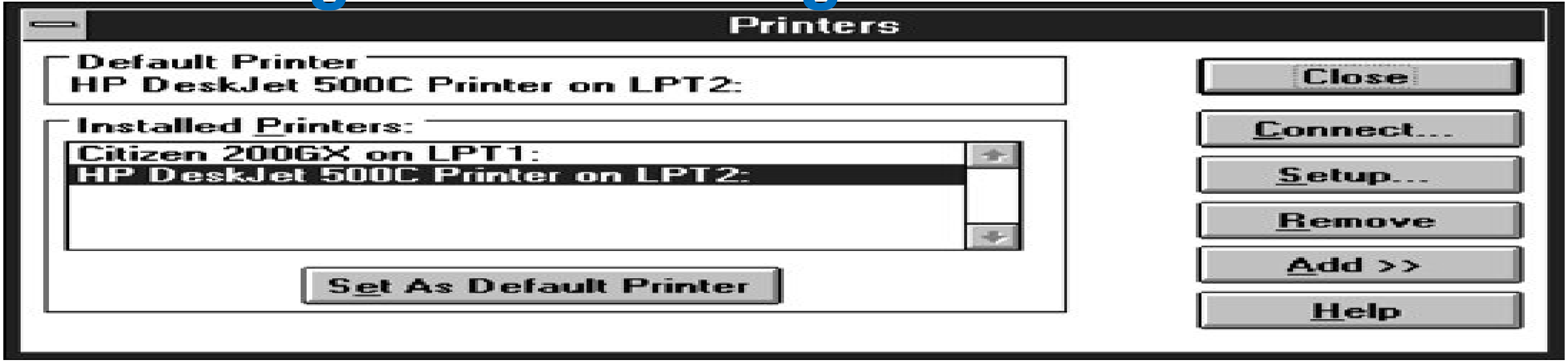
  - Provide a command button leading to the next dialog box with (…)
  - Provide no more than two cascades in a given path
  - Don not cover previous critical information
    - Relevant information
    - Title Bar

    If independent, close the secondary window from which it was opened.
- Unfolding(sometimes called as expanding windows)
  - Purpose is to provide advanced options at the same level in a complex dialog

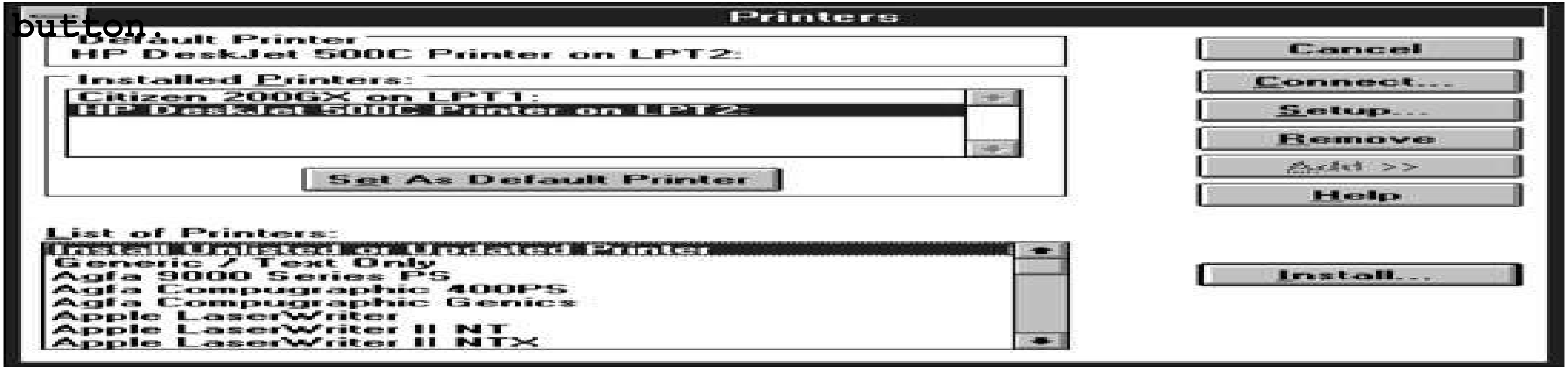
  Guidelines

  - Provide a command button with an expanding dialog symbol >>
  - Expand to right or downward

Cascading and Unfolding



Printers secondary window with *Add* >> unfolding button.



Unfolded Printers secondary window.

Dialog Boxes

- Dialog boxes are used to extend and complete an interaction within a limited context.
- Dialog boxes are always displayed from another window, either primary or secondary, or another dialog box.

Microsoft Windows dialog box.

Dialog Boxes

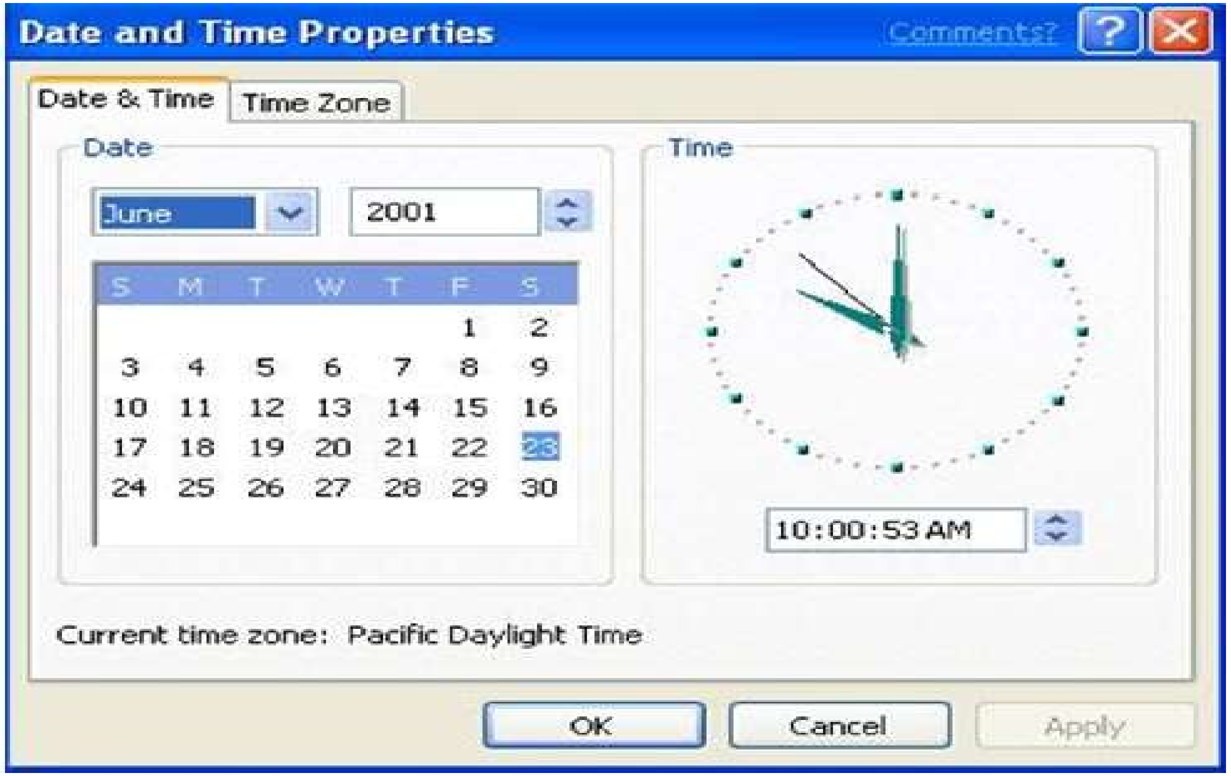
- Use for presenting brief messages
- Use for requesting specific, temporary actions
- Use for performing actions that
  - Take a short time to complete
  - Are not frequently changed
- Usually be those that do not occur frequently
- Command button to include
  - OK
  - Cancel
  - Others as necessary

Property Sheets and Property Inspectors

- Property sheets
  - Use for presenting the complete set of properties for an object
  - Categorize and group within property pages, as necessary
  - Command buttons to include
    - Ok
    - Cancel
    - Apply
    - Reset
    - Others as necessary
  - For single property sheets, place the command on the sheet
  - For tabbed property pages, place the commands outside the tabbed pages

Property Sheets and Property Inspectors

- Property sheets

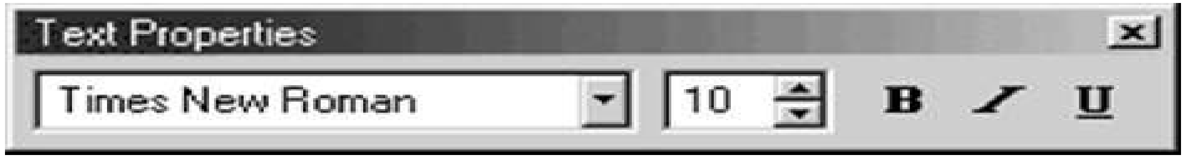


Property Sheets and Property Inspectors

- **Property Inspectors**
  - Use for displaying only the most common or frequently accessed object properties
  - Properties of an object are displayed by using a dynamic viewer or browser that reflects the properties of the current selection

Dynamic changes

- Property value in the selected object should be changed as soon as the user makes the change in the related property control



Message Boxes

•A message box is a secondary window that displays a message about a particular situation or condition.

Microsoft Windows message box.

Command Buttons:

• If a message requires no choices to be made but only acknowledgement, include an **ok button** and optionally a help menu

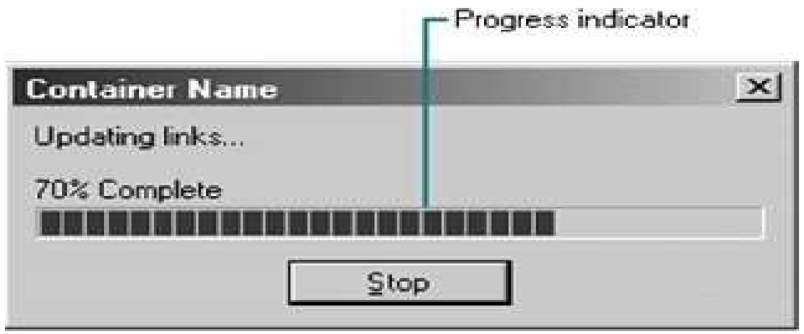
Message Boxes

- If the message requires the user to make a choice, include a **command button** for each option
- Include **OK and Cancel** buttons only when the user has the option of continuing or stopping the action
- Use **Yes and No** buttons when the user must decide how to continue
- If the choices are too ambiguous, label the command buttons with the names of specific actions**, for example, Save and Delete**

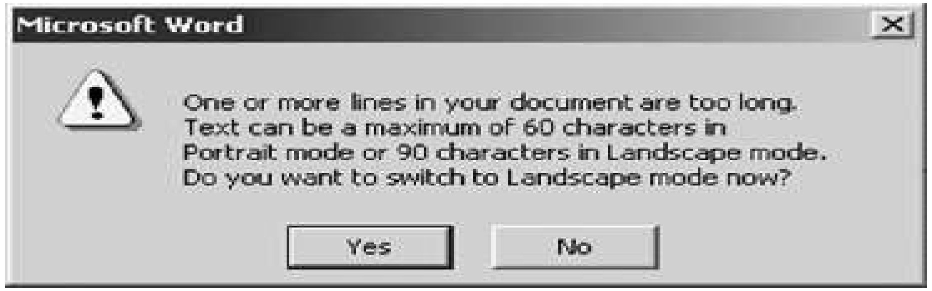
Message Boxes

- **Stop:** To terminate the process without restoring it use **stop** message instead of **cancel**
- **Help:** A Help button can be included in a message box for messages needing more detail.
- **Close Box:** Enable the title bar Close box only if the message includes a Cancel button.
- **Default:** Designate the most frequent or least destructive option as the default command button.

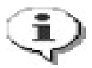
Message Boxes

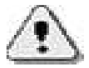


Progress message box

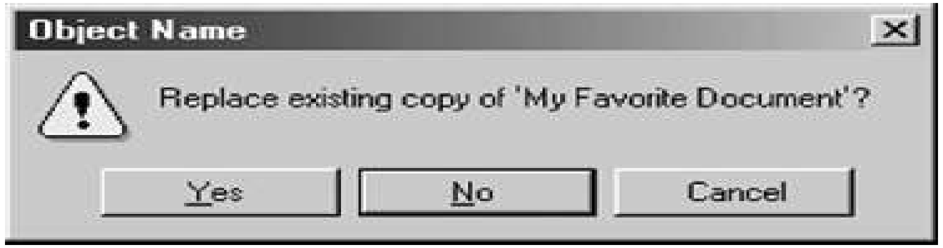


Yes No message box


Information


Warning

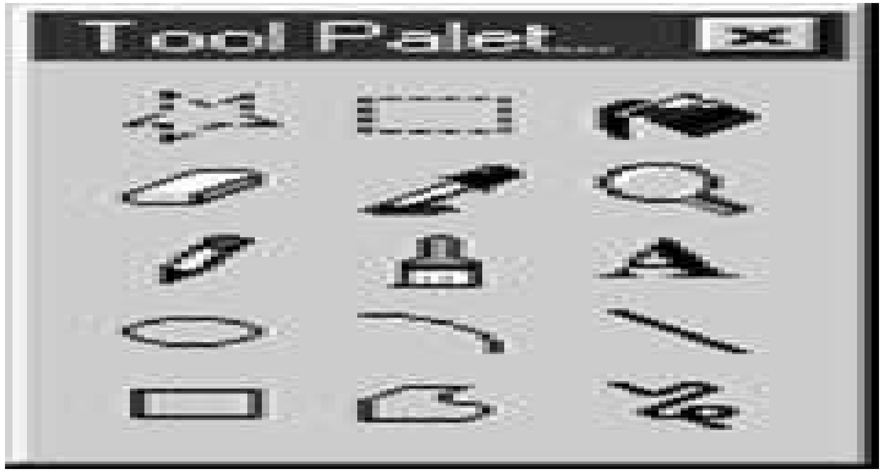

Critical



Message box choices

Palette and Pop-Up Windows

- Palette windows are modeless secondary windows that present a set of controls.
- Palette windows are distinguished by their visual appearance, a collection of images, colors or patterns
- The title bar for a palette window is shorter and includes only a close button
- **Sizing:** A palette window can be defined as fixed in size, or, more typically, resizable by the user.



Microsoft Windows palette window

Palette and Pop-Up Windows

- Use pop-up windows to display
  - Additional information when an abbreviated form of the information is the main presentation
  - Textual labels for graphical controls
  - Context-sensitive Help information
  - Pop-up windows do not contain standard secondary widow components

Microsoft Windows pop-up window.

Window Management

- Microsoft Windows also provides several window management schemes, a single document interface, a multiple-document interface, workbooks, and projects.
- To choose the right scheme, consider a number of design factors, including:

  >>the intended users and their skill level,

  >>the application and its objects or tasks, and

  >>the most effective use of display space.

Window Management

- **Single document interface:**

Description:

A single primary window with a set of secondary windows.

Proper usage:

>>Where object and window have a simple, one-to-one relationship.

>>Where the object’s primary presentation or use is as a single unit.

>>To support alternate views with a control that allows the view to be changed.

>>To support simultaneous views by splitting the window into panes.

Window Management

- **Single document interface:**

Advantages:

>>Most common usage.

>>Window manipulation is easier and less confusing.

>>Data centred approach.

Disadvantage:

>>Information is displayed or edited in separate windows.

Window Management

Multiple document interface:

- **Description:**

  — A technique for managing a set of windows where documents are opened into windows.

- **Contains:**

  >>A single primary window, called the parent.

  >>A set of related document or child windows, each also essentially a primary window.

- Each child window is constrained to appear only within the parent window.
- The child windows share the parent window's operational elements.
- The parent window's elements can be dynamically changed to reflect the requirements of the active child window.

Multiple document interface:

- **Proper usage:**

— To present multiple occurrences of an object.

— To compare data within two or more windows.

— To present multiple parts of an application.

— To clearly segregate the objects and their windows used in a task.

- **Advantages:**

— The child windows share the parent window’s interface components (menus, toolbars, and status bars), making it a very space-efficient interface.

— Useful for managing a set of objects.

— Provides a grouping and focus for a set of activities within the

Multiple document interface:

Disadvantages:

— Reinforces an application as the primary focus.

— Because the parent window does not actually contain objects, context cannot always be maintained on closing and opening.

— The relationship between files and their windows is abstract, making an MDI application more challenging for beginning users to learn.

— Confining child windows to the parent window can be inconvenient or inappropriate for some tasks.

— The nested nature of child windows may make it difficult for the user to distinguish a child window in a parent window from a primary window that is a peer with the parent window but is

Workbooks:

Description:

– A window or task management technique that consists of a set of views organized like a tabbed notebook.

– It is based upon the metaphor of a book or notebook.

– Views of objects are presented as sections within the workbook's primary windows; child windows do not exist.

– Each section represents a view of data.

– Tabs can be included and used to navigate between sections.

– Otherwise, its characteristics and behavior are similar to those of the multiple- document interface with all child windows maximized.

Workbooks:

Proper usage:

— To manage a set of views of an object.

— To optimize quick navigation of multiple views.

— For content where the order of the sections is significant.

Advantages:

— Provides a grouping and focus for a set of activities within the larger environment of the desktop.

— Provides the greater simplicity of the single-document window interface.

— Provides greater simplicity by eliminating child window management.

Workbooks:

Disadvantage:

– Cannot present simultaneous views.

Projects:

Description:

– **A technique that consists of a container:** a project window holding a set of objects.

– The objects being held within the project window can be opened in primary windows that are peers with the project window.

– Each opened peer window must possess its own menu bar and other interface elements.

Projects:

— Each opened peer window can have its own entry on the task bar.

— When a project window is closed, all the peer windows of objects also close.

— When the project window is opened, the peer windows of the contained objects are restored to their former positions.

— Peer windows of a project may be restored without the project window itself being restored.

Proper usage:

— To manage a set of objects that do not necessarily need to be contained.

— When child windows are not to be constrained.

Projects:

Advantages:

--Provides a grouping and focus for a set of activities within the larger environment of the desktop.

— Preserves some management capabilities of the multiple document interface.

— Provides the greatest flexibility in the placement and arrangement of windows.

Disadvantage:

— Increased complexity due to difficulty in differentiating peer primary windows of the project from windows of other applications.

Organizing Window Functions

Proper organization and support of tasks by windows will only be derived through a thorough and clear analysis of user tasks.

1) Window Organization

Organize windows to support user tasks.

■ Support the most common tasks in the most efficient sequence of steps.

■ **Use primary windows to:**

— Begin an interaction and provide a top-level context for dependent windows.

Organizing Window Functions

Window Organization

•Use secondary windows to:

– Extend the interaction.

– Obtain or display supplemental information related to the primary window.

•Use dialog boxes for:

– Infrequently used or needed information.

– "Nice-to-know" information.

Organizing Window Functions

2) Number of Windows

- Minimize the number of windows needed to accomplish an objective.

Window Operations

1) Active Window

- A window should be made active with as few steps as possible.
- Visually differentiate the active window from other windows.

2) General Guidelines

- Design **easy to use** and learn windowing operations.
  - Direct manipulation seems to be a faster and more intuitive interaction style than indirect manipulation for many windowing operations.

Window Operations

2) General Guidelines

- **Minimize the number** of window operations necessary to achieve a desired effect.
- Make **navigating** between windows particularly **easy and efficient** to do.
- Make the **setting up** of windows particularly easy to remember.
- In overlapping systems, provide powerful commands for arranging windows on the screen in **user tailor able configurations.**

Window Operations

3) Opening a Window

- Provide an iconic representation or textual list of available windows.
  – If opening with an expansion of an icon, animate the icon expansion.
- **When opening a window:**

– Position the opening window in the most forward plane of the screen.

– Adapt the window to the size and shape of the monitor on which it will be presented.

– Designate it as the active window.

Window Operations

3) Opening a Window

- When a primary window is opened or restored, position it on top.

— Restore all secondary windows to the states that existed when the primary window was closed.

- When a dependent secondary window is opened, position it on top of its associated primary window.

— Position a secondary window with peer windows on top of its peers.

— Present layered or cascaded windows with any related peer secondary windows.

Window Operations

3) Opening a Window

- If more than one object is selected and opened, display each object in a separate window. Designate the last window selected as the active window.
- Display a window in the same state as when it was last accessed.
- With tiled windows, provide an easy way to resize and move newly opened windows.

Window Operations

4) Sizing Windows

- Provide large-enough windows to:
  - >>Present all relevant and expected information for the task.
  - >>Avoid hiding important information.
  - >>Avoid crowding or visual confusion.
  - >>Minimize the need for scrolling.
    - But use less than the full size of the entire screen.
- If a window is too large, determine:
  - >>Is all the information needed?
  - >>Is all the information related?
- Otherwise, make the window as small as possible.
  - >>Optimum window sizes: For text, about 12 lines, For alphanumeric information, about seven lines.

Window Operations

5) Window Placement:

•**Considerations:**

In placing a window on the display, consider:

- The use of the window.
- The overall display dimensions.
- The reason for the window’s appearance.

General: Position the window so it is entirely visible.

• If the window is being restored, place the window where it last appeared.

Window Operations

5) Window Placement:

- If the window is new, and a location has not yet been established, place it:
  - At the point of the viewer’s attention, usually the location of the pointer or cursor.
  - In a position convenient to navigate to.
  - So that it is not obscuring important or related underlying window information.
- For multiple windows, give each additional window its own unique and discernible location.
  - A cascading presentation is recommended.
- In a multiple-monitor configuration, display the secondary window on the same monitor as its primary window.

Window Operations

5) Window Placement:

- If none of the above location considerations apply, then:
  - ☾ Horizontally centre a secondary window within its primary window just below the title bar, menu bar, and any docked toolbars.
- If the user then moves the window, display it at this new location the next time the user opens the window.
  - ☾ Adjust it as necessary to the current display configuration.
- Do not let the user move a window to a position where it cannot be easily repositioned.

Dialog boxes: If the dialog box relates to the entire system,

Window Operations

6) Window Separation

Crisply, clearly, and pleasingly demarcate a window from the background of the screen on which it appears.

— Provide a surrounding solid line border for the window.

— Provide a window background that sets the window off well against the overall screen background.

— Consider incorporating a drop shadow beneath the window.

7) Moving a Window:

- Permit the user to change the position of all windows.
- Change the pointer shape to indicate that the move selection is successful.

Window Operations

7) Moving a Window:

- Move the entire window as the pointer moves.

  >> If it is impossible to move the entire window, move the window outline while leaving the window displayed in its original position.

- Permit the moving of a window without its being active.

Window Operations

8) Resizing a Window:

- Permit the user to change the size of primary windows.
  - Unless the information displayed in the window is fixed or cannot be scaled to provide more information.
- Change the pointer shape to indicate that the resizing selection is successful.
- The simplest operation is to anchor the upper-left corner and resize from the lower- right corner.
  - Also permit resizing from any point on the window.

Window Operations

8) Resizing a Window:

- Show the changing window as the pointer moves.
  - ☾ If it is impossible to show the entire window being resized, show the window's outline while leaving the window displayed in its original position.
- When window size changes and content remains the same: Change image size proportionally as window size changes.
- If resizing creates a window or image too small for easy use, do one of the following:
  - >>Clip (truncate) information arranged in some logical structure or layout when minimum size is attained, or

Window Operations

8) Resizing a Window:

>>When no layout considerations exist, format (restructure) information as size is reduced, or

>>Remove less useful information (if it can be determined), or

>>When minimum size is attained, replace information with a message that indicates that the minimum size has been reached and that the window must be enlarged to continue working.

- Permit resizing a window without its being active.

9) Other Operations

Window Operations

10) Window Shuffling: Window shuffling must be easy to accomplish.

11) Keyboard Control/Mouse less Operation:

- Window actions should be capable of being performed through the keyboard as well as with a mouse.
- Keyboard alternatives should be designated through use of mnemonic codes as much as possible.
- Keyboard designations should be capable of being modified by the user.

12) Closing a window:

- Close a window when:
  - The user requests that it be closed.
  - The user performs the action required in the window.
  - The window has no further relevance.

Window Operations

12) Closing a window:

- If a primary window is closed, also close all of its secondary windows.
- When a window is closed, save its current state, including size and position, for use when the window is opened again.

Web Systems

Web systems have limited windowing capabilities. The ***frame*** concept does provide window like ability, and **JavaScript** does provide ***pop-up*** **windows.**

1) Frames

Description:

• Multiple Web screen panes that permit the displaying of multiple documents on a page.

• These documents can be independently viewed, scrolled, and updated.

• The documents are presented in a tiled format.

Web Systems

1) Frames

Description:

Proper usage:

- For content expected to change frequently.
- To allow users to change partial screen content.
- To permit users to compare multiple pieces of information.

Guidelines:

— Use only a few frames (three or less) at a given time.
- Choose sizes based upon the type of information to be presented.
- Never force viewers to resize frames to see information.
- Never use more than one scrolling region on a page.

2) Pop-Up Windows

- JavaScript pop-up windows began appearing on the Web in 1996.
- They are most frequently used in advertising, they have become a source of great aggravation to almost every user.
- pop-up window is used, it may never be completely seen or read by the user. **Use them with extreme caution.**

Select the Proper Device-Based Controls

Device-based controls, often called input devices, are the mechanisms through which people communicate their desires to the system.

Identify the characteristics and capabilities of device-based control

- Trackball
- Joystick
- Graphic tablet
- Light pen
- Touch screen
- Voice
- Mouse
- Keyboard

Characteristics of device based controls

- To point at an object on the screen.
- To select the object or identify it as the focus of attention. To drag an object across the screen.
- To draw something free form on the screen. To track or follow a moving object.
- To orient or position an object.
- To enter or manipulate data or information.

Trackball

- **Description**
  - A spherical object(ball) that rotates freely in all directions in its socket
  - Direction and speed is tracked and translated into cursor movement.
- **Advantages**
  - Direct relationship between hand and pointer movement in terms of direction and speed
  - Does not hide vision of screen
  - Does not require additional desk space
- **Disadvantage**
  - Movement is indirect, in plane different from screen
  - Requires hand to be removed from keyboard keys
  - Requires different hand movements
  - May be difficult to control

Joystick

- Description:

  — A stick or bat-shaped device anchored at the bottom.

  — Variable in size, smaller ones being operated by fingers, larger ones requiring the whole hand.

  — Variable in cursor direction movement method, force joysticks respond to pressure, movable ones respond to movement.

  — Variable in degree of movement allowed, from horizontal-vertical only to continuous.

Joystick

- Advantages
  - Direct relationship between hand and pointer movement in terms of direction and speed
  - Does not obscure vision of screen
  - Does not require additional desk space
- Disadvantage
  - Movement indirect, in plane different from screen
  - Requires hand to be removed from keyboard keys
  - Requires different hand movements
  - May be difficult to control
  - May be slow and inaccurate

Graphic (*Touch*) Tablet

- Description
  - Pressure ,heat ,light , or light blockage sensitive horizontal surfaces that lie on the desktop or keyboard
  - May be operated with fingers, light pen, or objects like pencil
- Advantages
  - Direct relationship between hand and pointer movement in terms of direction and speed
  - Does not obscure vision of screen
  - More comfortable horizontal operating plane
- Disadvantage
  - Movement is indirect, in a plane different from screen
  - Requires hand to be removed from keyboard
  - Requires different hand movements to use
  - Finger may be too large for accuracy with small objects

Touch Screen

- Description:

  — A special surface on the screen sensitive to finger

- Advantages
  - Direct relationship between hand and pointer movement in terms of direction and speed
  - Movement is direct, in the same plane as screen
  - Requires no additional desk space
- Disadvantage
  - Finger may hide part of screen
  - Finger may be too large for accuracy with small objects
  - Requires moving the hand far from the keyboard to use
  - May Damage the screen

Light Pen

- Description
  - A special surface on a screen sensitive to the touch of a special pen
- Advantage
  - Direct relationship between hand and pointer movement in terms of direction, distance, and speed
  - Movement is direct, in the same plane as screen
  - Requires minimal additional desk space
  - Stands up well in high-use environments
  - More accurate than finger touching
- Disadvantage
  - Hand may hide part of screen
  - Requires picking it to use
  - Requires moving the hand far from the keyboard to use

Voice

- Description: Automatic speech recognition by the computer
- Advantage
  - Simple and direct
  - Useful for people who cannot use a keyboard
  - Useful when the user's hands are occupied
- Disadvantage
  - High error rates due to difficulties in
    - Recognizing boundaries between spoken words
    - Blurred word boundaries due to normal speech patterns
  - Slower throughput than with typing
  - Difficult to use in noisy environment
  - Impractical to use in quite environment

Mouse

- Description:

  —— A rectangular or dome-shaped, movable, desktop control containing from one to three buttons used to manipulate objects and information on the screen.

  —— Movement of screen pointer imitate the mouse movement.

- Advantage

  – Direct relationship between hand and pointer movement in terms of direction, distance, and speed.

  – Permit a comfortable hand resting position

  – Selection mechanisms are included on mouse

  – Does not hide vision of the screen

Mouse

- Disadvantage
  - Movement is indirect, in a plane different from screen
  - Requires hand to be removed from keyboard
  - Requires additional desk space
  - May require long movement distances
  - Requires a degree of eye-hand co ordination

Mouse Usage Guidelines

- Provide a “hot zone” around small or thin objects that might require extremely fine mouse positioning
- Never use double-clicks or double-drags as the only means of carrying out essential operations
- Do not use mouse plus keystroke combinations
- Do not require a person to point at a moving target

Keyboard

- Description:

  -- Standard typewriter keyboard and cursor movement keys.

- Advantage
  - Familiar
  - Accurate
  - Does not take up additional desk space
  - Very useful for
    - Entering text and alphanumeric data
    - Inserting in text and alphanumeric data
    - Keyed shortcuts accelerators
    - Keyboard mnemonics equivalents

Keyboard

- Advantageous for:
  - Performing actions when less than three mouse buttons exist.
  - Use with very large screens.
  - Touch typists.
- Disadvantage
  - Slow for non-touch-typists
  - Slower than other devices in pointing
  - Requires discrete actions to operate

Keyboard Guidelines

- Provide keyboard accelerators
  - Assign single keys for frequently performed, small-scale tasks
  - Use standard platform accelerators
  - Assign Shift-key combinations for actions that extend or are complementary to the actions of key or key combination used with out the Shit-key
  - Assign Ctrl-key combinations for
    - Infrequent actions
    - Tasks that represent larger-scale versions of the task assigned to the unmodified key
- Provide keyboard equivalents
  - Use standard platform equivalents
  - Use the first letter of the item description
  - If first letter conflicts exist, use:
  - Another distinctive consonant in the item description.
  - A vowel in the item description.
  - Provide window navigation through use of keyboard keys.

Selecting the Proper Device-Based Controls

- Consider characteristics if the task
- Provide keyboards for tasks involving
  - Heavy text entry and manipulation
- Provide an alternative pointing device for graphical or drawing tasks
  - **Mouse:** pointing, selecting, drawing, and dragging
  - **Joystick:** selecting and tracking
  - **Trackball:** pointing, selecting and tracking
  - **Touch screen:** pointing and selecting
  - **Graphic tablet:** pointing selecting, drawing, and dragging

Selecting the Proper Device-Based Controls

- Provide touch screens under the following conditions
  - The opportunity for training is minimal
  - Targets are large, discrete and spread out
  - Frequency of use is low
  - Desk space is at a premium
  - Little or no text input requirement exists
- Consider user characteristics and preferences
  - Provide keyboards for touch typists
- Minimize eye and hand movements between devices
- Consider the characteristics of the environment, hardware, device in relation to application
- Provide flexibility

Pointer Guidelines

- The pointer
  - Should be visible at all times
  - Should contrast well its background
  - Should maintain its size across all screen locations and during movement
- The user should always position the pointer
- Shape of pointer
  - Should clearly indicate its purpose and meaning
  - Should be constructed of already defined shapes
  - Should not be used for any other purpose other than its already defined meaning
- Use only as many shapes as necessary to inform the user about current location and status
- Animation should not distract and restrict ones ability to interact

Choose the Proper Screen Based Controls

- Screen Based controls, often simply called controls and sometimes called widgets. By definitions, they are graphic objects that represent the properties or operations of other objects
- A control may
  - Permit the entry or selection of a particular value.
  - Permit the changing or editing of a particular value.
  - Display only a particular piece of text, value, or graphic.
  - Cause a command to be performed.
  - Possess a contextual pop-up window.

Choose the Proper Screen Based Controls

- Buttons.
- Text entry/read-only controls.
- Selection controls.
- Combination entry/selection controls.
- Specialized operable controls.
- Custom controls.
- Presentation controls. Web controls.
- Select the proper controls for the user and tasks.

Operable Controls

- Operable controls are those that permit the entry, selection, changing, or editing of a particular value, or cause a command to be performed.
  - Buttons
  - Text entry/read-only,
  - selection,
  - combination entry/selection
  - Specialized controls

Buttons

- Description
  - A square or rectangular-shaped control with a label inside that indicates action to be accomplished
  - The label may consist of text, graphics, or both
- Purpose

– To start actions.

– To change properties.

– To display a pop-up menu.

- **Advantages:**

-- Always visible, reminding one of the choices available.

-- Convenient.

-- Can provide meaningful descriptions of the actions that will be performed.

Buttons

- **Advantages:**

-- Can possess 3-D appearance:

  - Adds an aesthetically pleasing style to the screen.
  - Provides visual feedback through button movement when activated.

- **Disadvantages:**

  - Consumes screen space.
  - Requires looking away from main working area to activate.
  - Requires moving the pointer to select.

- Proper usage:

  - Use for frequently used actions that are specific to a window.

  >>To cause something to happen immediately.

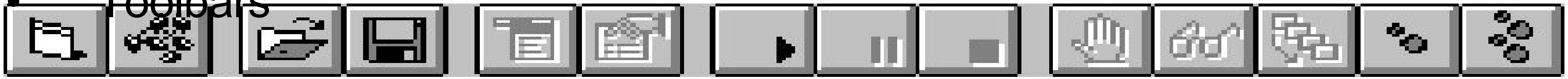
  >>To display another window.

  >>To display a menu of options

Buttons

- Command Buttons

- Toolbars



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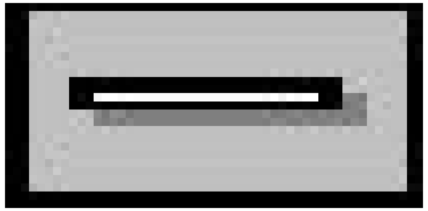


Buttons

- Command Buttons

Advantage of a command button

>>always visible, providing a reminder of its existence.

>>Command buttons are conveniently and logically located in the work area and can be inscribed with meaningful descriptions of what they do.

>>provide meaningful visual feedback through the movement of the button when activated.

>>Their activation is much easier and faster

Buttons

- Command Buttons

☾ Disadvantage

>>their larger size, which consumes considerable screen space

>>limits the number that can be displayed.

- Toolbars

☾ Advantages

>>continuous visibility

>>ease and speed of use.

>> consume a relatively small amount of space.

Buttons

- Toolbars

☾ Disadvantage

>>location being away from the main work area

>> small size, which slows down selection.

>>when a large number of buttons are grouped in a bar, they consume a great deal of screen space, and they can easily create screen clutter

Command Buttons

USAGE:

- Use to provide fast access to frequently used or critical commands (**for windows with a menu bar**)
- Use to provide access to all necessary commands (**for windows without a menu bar**)

STRUCTURE

- Provide a rectangular shape with the label inscribed within it.
- Give the button a raised appearance.
- Maintain consistency in style throughout an application.

Command Buttons

LABELS

- Use standard button labels when available.
- Provide meaningful descriptions of the actions that will be performed.
- Use single-word labels whenever possible (Use two –three words for clarity, if necessary)
- Use mixed-case letters with the first letter of each significant label word capitalized
- **Display labels:** In the regular system font, In the same size font.
- Do not number labels.
- Centre the label within the button borders, leaving at least two pixels between the text and the button border.
- Provide consistency in button labelling across all screens.

Command Buttons

LABELS

- Common button functions should have standard names and uses. Microsoft windows, for example, provides these standard names and definitions:
- **OK**—Any changed information in the window is accepted and the window is closed.
- **Cancel**—Closes window without implementing uncommitted changes.
- **Reset**—Resets defaults and cancels any changed information that has not been submitted.
- **Apply**—Any changed information in the window is accepted and again displayed in the window that remains open.
- **Close**—Closes the window.
- **Help**—Opens online Help.

Command Buttons

SIZE

- Provide as large a button as feasible.
- Maintain consistent button heights and widths.

Exception: Buttons containing excessively long labels may be wider.

NUMBER Restrict the number of buttons on a window to six or fewer.

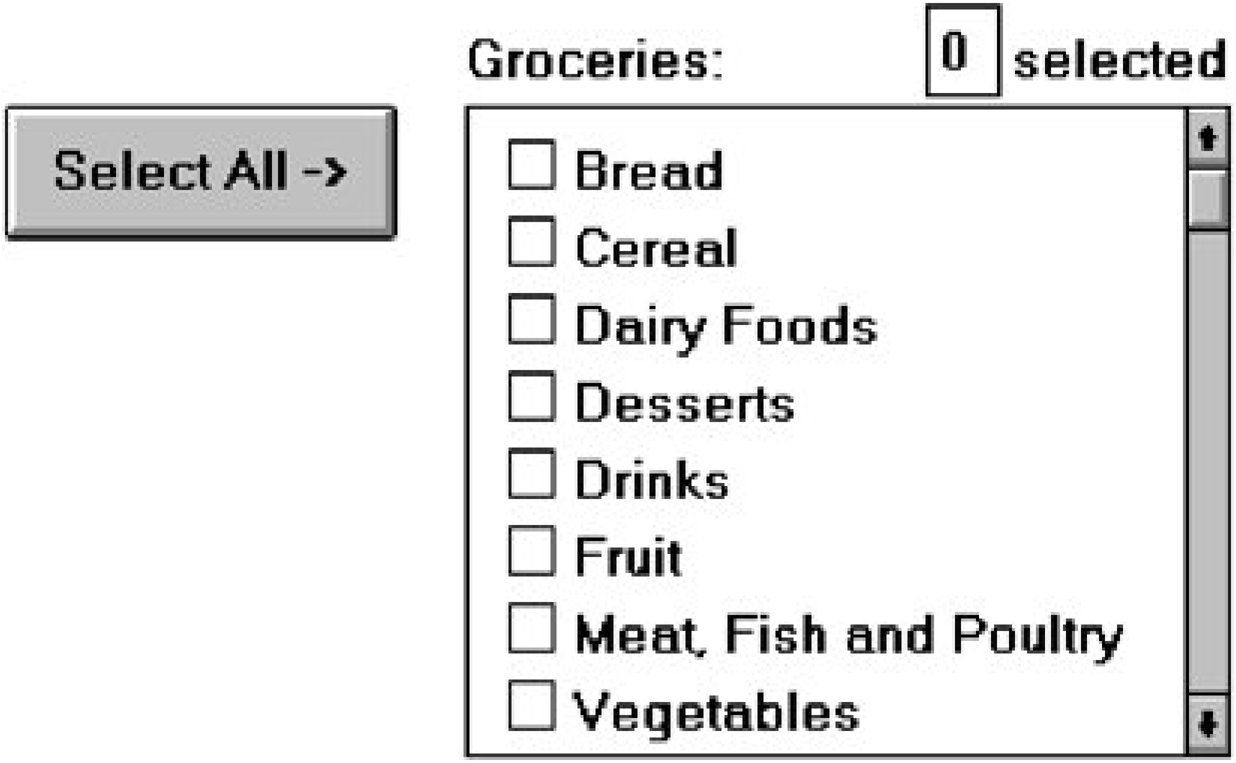
A much too large Color Palette button.

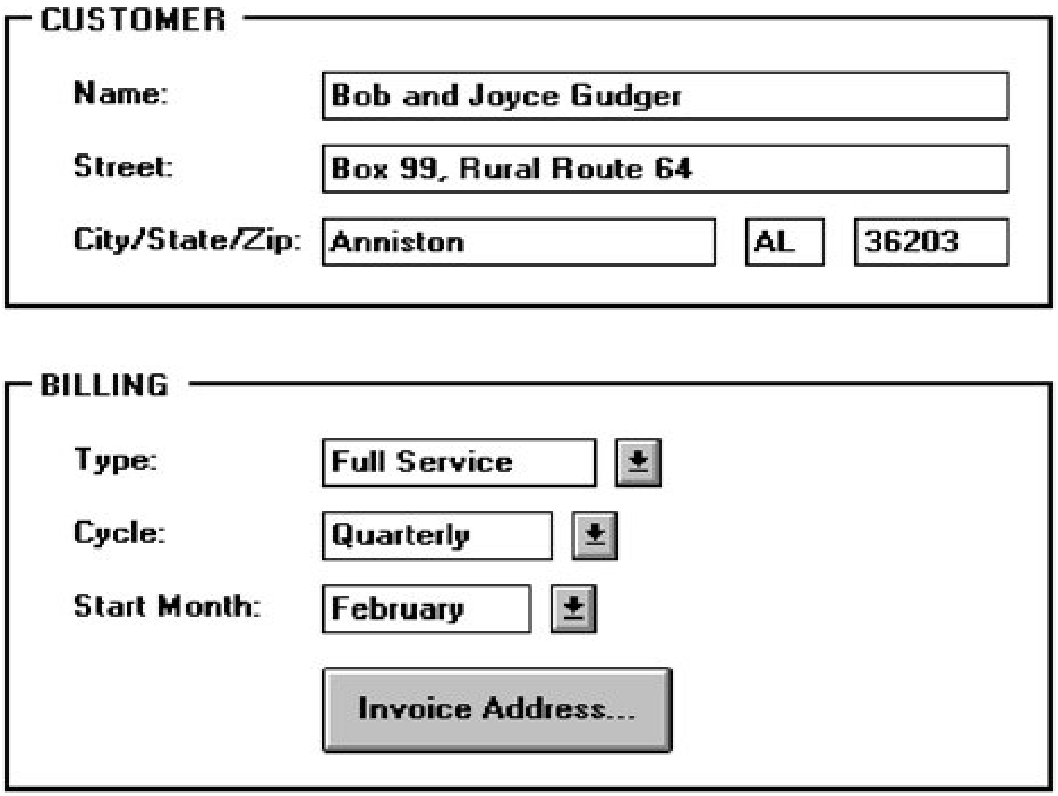
A properly sized Color Palette button.

Command Buttons (Location and Layout)

- Maintain consistency in button location between windows.
- Never simply “fit” buttons in available space.
- **Buttons exiting a dialog, and usually closing the window,** should be positioned horizontally and centered across the lower part of the window
- **For a button invokes a dialog or expands the dialog,** position it centered and aligned vertically along the right side of the window
- **If a button has a dependent relationship to another control:** Position it adjacent to the related control.
- **If a button has a dependent relationship to a group of controls:** Position it at the bottom or to right of related controls.

Command Buttons (Location and Layout)



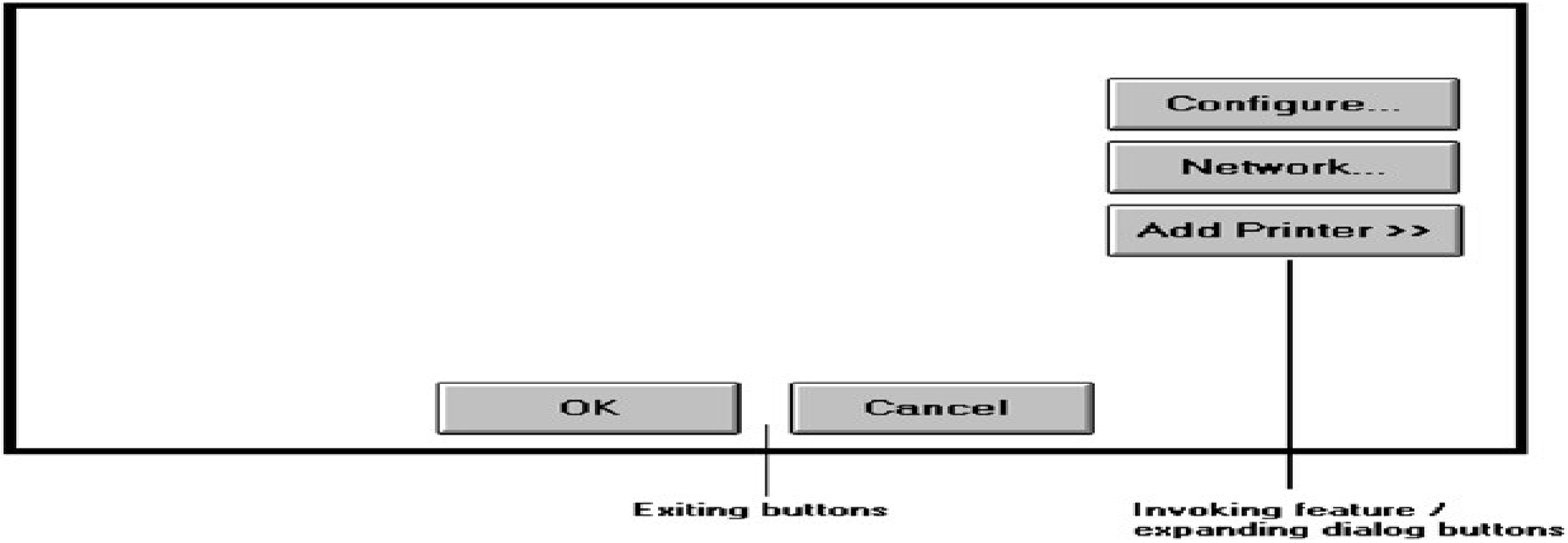


button has a dependent relationship to another control

button has a contingent relationship to a group of controls

Command Buttons (Location and Layout)

- **For exiting and expanding/invoking feature buttons, do not:** provide alignment with other screen controls.
- Maintain alignment and spacing only within the buttons themselves



Command Buttons (Location and Layout)

- Provide equal and adequate spacing between adjacent buttons.
- Provide adequate spacing between buttons and the screen body controls.

Command Buttons (Organization)

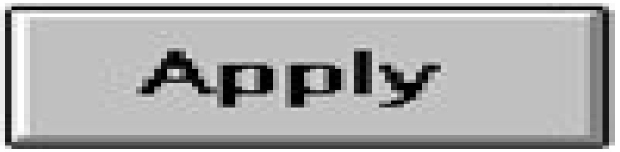
- Organize standard buttons in the manner recommended by the platform being used.
- For other buttons, organize them in common and customary grouping schemes.
- — For **buttons ordered left to right**, place those for most frequent actions to the left.
- — **For buttons ordered top to bottom**, place those for most frequent actions at the top.
- Keep related buttons grouped together
- Exception: Buttons containing excessively long labels may be wider

Command Buttons (Organization)

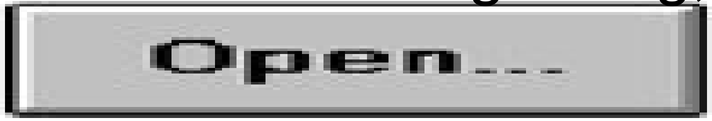
- Separate potentially destructive buttons from frequently chosen selections.
- Buttons found on more than one window should be consistently positioned.
- The order should never change.
- Windows Recommends
  - An affirmative action the left or above
  - The default first
  - OK and Cancel next to each other
  - Help last

Command Buttons (Intent Indicators)

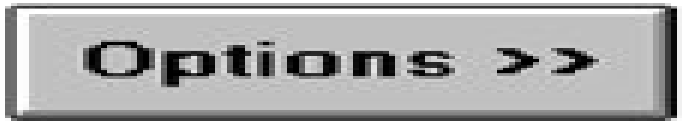
- No intent indicator is necessary, when a button causes an action to be immediately performed

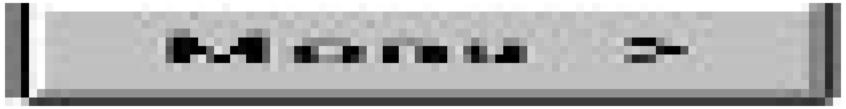


- When a button leads to a cascading dialog, include and ellipsis (…)



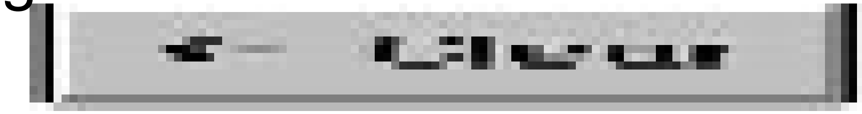
- When a button leads to a menu, include a triangle pointing in the direction the menu will appear after the label





- When a button leads to and expanding dialog, include a double arrow (>>)

- When a button has a dependent relationship to another control, include a single arrow (☾) pointing at the control



Command Buttons (Expansion Buttons)

- Gray buttons after Expansion or when not applicable
- Provide a contraction button, if necessary, Locate it beneath, or to right of, the expansion button. Gray it out when not applicable.

DEFAULTS

- When a window is first displayed, provide a default action, if practical
- **Presentation:**

  — Indicate the default action by displaying the button with a bold or double border.

DEFAULTS

- **Selection:**

  A default should be the most likely action:

  – A confirmation

  – An application of the activity being performed

  – A positive action such as OK

  – If a destructive action is performed (such as a deletion) the default should be Cancel

- **Procedures:**

  — The default can be changed as the user interacts with the window.

  — When the user navigates to a button, it can temporarily become the default.

DEFAULTS

- **Procedures:**
  - Use the Enter key to activate a default button.
  - If another control requires use of the Enter key, temporarily disable the default while the focus is on the other control.
  - Permit double-clicking on a single selection control in a window to also carry out the default command.

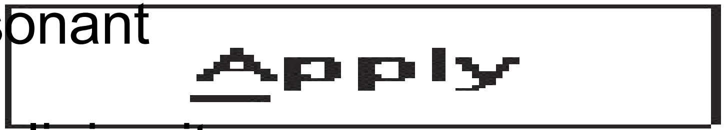
UNAVAILABLE CHOICES

- Temporarily unavailable choices should be dimmed or grayed out.

Command Buttons (Keyboard Equivalents, Accelerators)

Equivalents:

- Assign a keyboard equivalent mnemonic to each button to facilitate keyboard selection.
- The mnemonic should be the first character of the button's label
  - If duplication exists in first characters, use another character in the label, preferable choose the first succeeding consonant



- Designate the mnemonic character by underlining it
- Maintain the same mnemonic on all identical buttons on other screens.

Command Buttons (Keyboard Equivalents, Accelerators)

ACCELERATORS:

- Assign a keyboard accelerator to each button to facilitate keyboard selection

Command Buttons (Scrolling and Button Activation)

SCROLLING

- If a window can be scrolled, do not scroll the command buttons.

  Use buttons to move between multi-page forms, not scroll bars Label buttons Next and Previous

BUTTON ACTIVATION

- **POINTING:** Highlight the button in some visually distinctive manner when the point is resting on it and the button is available for selection

Command Buttons (Scrolling and Button Activation)

BUTTON ACTIVATION

- **ACTIVATION:**

☾ Call attention to the button in another visually distinctive manner when it has been activated or pressed.

☾ If a button can be pressed continuously, permit the user to hold the mouse button down and repeat the action.

Toolbars (Usage, Structure and size)

- Toolbars are compilations of commands, actions, or functions, usually graphical in structure but sometimes textual, grouped together for speedy access.
- Microsoft Windows defines a toolbar as a panel that contains a set of controls.
- Toolbars may also be called button bars, control bars, or access bars.
- Specialized toolbars may also be referred to as ribbons, toolboxes, or palettes.

Toolbars (Usage, Structure and size)

USAGE

- Provide easy and fast access to most frequently used commands or options across multiple screens
- To invoke a sub application within an application.
- To use in place of certain menu items.

STRUCTURE

- **Images:**
  - Provide buttons of equal size.
  - Create a meaningful and unique icon: Design them using icon design guidelines.

Toolbars (Usage, Structure and size)

STRUCTURE

- **Image:**
  - Center the image within the button
- **Text:**
  - Create a meaningful label
  - Create toolbar buttons of equal size
- **Consistency:** Use the same icon throughout an application and between applications.

Toolbars (Usage, Structure and size)

SIZE

- **Button:**
  - 24 (w) by 22 (h) pixels, including border.
  - 32 (w) by 30 (h) pixels, including border.
  - Larger buttons can be used on high-resolution displays.
- **Label:**
  - 16 (w) by 16 (h) pixels and 14 (w) by 24 (h) pixels.
- **Default:**
  - Provide the smaller size as the default size with a user option to change it.
- **Image:** Centre the image in the button.

Toolbars (Organization and Location)

ORGANIZATION:

- Order the buttons based on common and customary grouping schemes.

  — For buttons ordered left to right, place those for the most frequently used actions to the left.

  — For buttons ordered top to bottom, place those for the most frequently used actions at the top.

- Keep related buttons grouped together
- Separate potentially destructive buttons from frequently chosen selections
- Permit user to reconfigure the button organization

Toolbars (Organization and Location)

LOCATION

- Position main features and functions bar horizontally across top of window just below menu bar
- Position subtask and subfeatures bars along sides of window
- Permit the location of the bar to be changed by the user
- Permit display of the bar to be turned on or off by the user.

Toolbars (Active items, Button Activation and Customization)

ACTIVE ITEMS

- Make only currently available toolbar items available
- Temporarily not available items by displaying grayed out

BUTTON ACTIVATION

- **Pointing:** Highlight the button in some visually distinctive manner when the pointer is resting on it
- **Activation:** Call attention to the button in another visually distinctive manner when it has been activated or pressed

Toolbars (Active items, Button Activation and Customization)

Customization

- Permit toolbars to be turned off by user
- Allow the customizing of toolbars however provide default also

KEYBOARD EQUIVALENTS AND ACCELARATORS

- **Equivalents:** Assign keyboard equivalents to facilitate keyboard selection. Maintain the same mnemonic on all identical buttons on all screens.
- **Accelerators:** Assign a keyboard accelerator to facilitate keyboard selection.

Text Entry/Read-Only Controls

- A Text Entry/Read-Only control contains text that is exclusively entered or modified through the keyboard.

TEXT BOXES

Description:

- **A control, usually rectangular in shape, in which:** Text may be entered or edited or Text may be displayed for read-only purposes.
- Usually possesses a caption describing the kind of information contained within it.
- An outline field border:

  >>Is included for enterable/editable text boxes.

  >>Is not included for read-only text boxes.

Text Entry/Read-Only Controls

- **TEXT BOXES**

Description:

- **Two types exist:** Single line and Multiple line.
- When first displayed, the box may be blank or contain an initial value.

Purpose:

- To permit the display, entering, or editing of textual information.
- To display read-only information.

Advantages:

- Very flexible.
- Familiar.
- Consumes little screen space.

Text Entry/Read-Only Controls

- **TEXT BOXES**

Disadvantages:

- Requires use of typewriter keyboard.
- Requires user to remember what must be keyed.

Proper usage:

- Most useful for data that is:•
    - >>Unlimited in scope.
    - >>Difficult to categorize.
    - >>Of a variety of different lengths.
- When using a selection list is not possible.

Text Entry/Read-Only Controls

SINGLE LINE AND MULTIPLE LINE TEXT BOXES

Single line

Description: A control consisting of no more than one line of text.

Purpose: To make textual entries when the information can be contained within one line of the screen.

Typical uses: Typing the name of a file to save, Typing the path of a file to copy, Typing variable data on a form, Typing a command.

Text Entry/Read-Only Controls

SINGLE LINE AND MULTIPLE LINE TEXT BOXES

Multiple line

Description: A control consisting of a multiline rectangular box for multiple lines of text.

Purpose: To type, edit, and read passages of text.

Typical uses: Creating or reading an electronic mail message, Displaying and editing text files.

Text Entry/Read-Only Controls (Captions)

Structure and size:

- Provide a descriptive caption to identify the kind of information to be typed, or contained within, the text box.
- Use a mixed-case font.
- Display the caption in normal intensity or in a colour of moderate brightness.

Formatting: single fields

Position the field caption to the left of the text box

- Place a colon (:) immediately following the caption
- Separate the colon from the text box by one space

Text Entry/Read-Only Controls (Captions)

Formatting:

- Alternately, the caption may be placed above the text box.

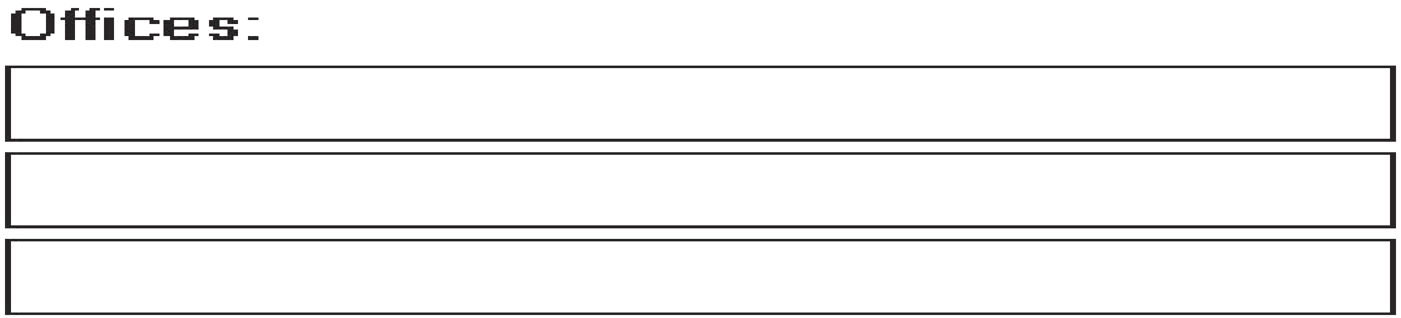
    >>Place a colon (:) immediately following the caption.

    >>Position above the upper-left corner of the box

Multiple occurrence fields:

- For entry/modification text boxes:

    >>Position the caption left-justified one line above the column of entry fields.



Text Entry/Read-Only Controls (Captions)

For display/read-only boxes:

Date:

07/17/94
07/21/94
01/26/95
08/21/95
11/18/96

- If the data field is *long and fixed-length*, or the displayed data is about the same length, **centre the caption** above the displayed text box data.

- If the data displayed is **alphanumeric, short, or quite** variable in length**, left-justify the caption** above the displayed text box data.

Location:

Alice Springs
Kakadu National Park
Traralgon
Wagga Wagga
Whyalla

Text Entry/Read-Only Controls (Captions)

For display/read-only boxes:

- If the data field is **numeric and variable in length, right-justify** the caption above the displayed text box data.

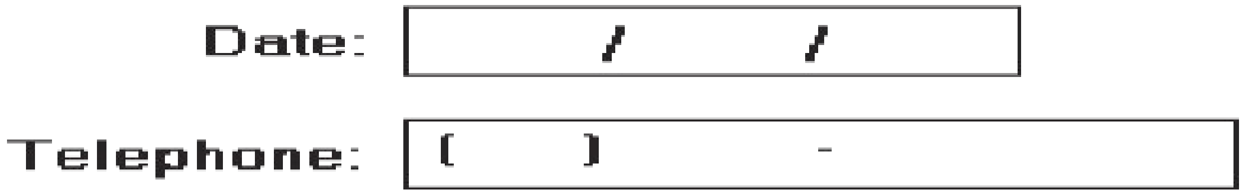
Text Entry/Read-Only Controls (Fields)

Structure:

- Identify entry/modification text boxes with a line border or reverse polarity rectangular box.
  - To visually indicate that it is an enterable field, present the box in a recessed manner

- Present read-only text boxes on the window background

•Break up long text boxes through incorporation of slashes(/), dashes (-), spaces, or common delimiters.



Text Entry/Read-Only Controls (Fields)

Highlighting:

- Call attention to text box data through a highlighting technique

  >>Higher intensity.

  >>If colour is used, choose one that both complements the screen background and contrasts well with it.

Unavailable fields:

- Gray-out temporarily unavailable text boxes

Fonts:

- To support multiple fonts, use a Rich-Text Box.

Text Entry/Read-Only Controls (Fields)

SIZE:

-- Size to indicate the approximate length of the field.

— Text boxes for fixed-length data must be large enough to contain the entire entry.

— Text boxes for variable-length data must be large enough to contain the majority of the entries.

— Where entries may be larger than the entry field, scrolling must be provided to permit keying into, or viewing, the entire field.

— Employ word wrapping for continuous text in multiple-line text boxes.

Selection Controls

- Radio Buttons
- Check Boxes
- Palettes
- List Boxes
- List View Controls
- Drop-down/Pop-up List Boxes

Radio Buttons

Description

- A two part control consisting of the following
  - Small circles, diamonds, or rectangles
  - Choice descriptions
- When a choice is selected
  - The option is highlighted
  - Any existing choice is automatically unhighlighted and deselected
- Purpose
  - To set one item from a small set of option (2 to 8)

Radio Buttons

Proper Usage:

- For mutually exclusive choices (that is, only can be selected)
- Most useful for data and choices that are
  - Discrete, Small and fixed in number, Not easily remembered, Most easily understood when the alternatives can be seen together and compared to one another, Never change in content
- Do not use
  - For commands

Advantages: Easy-to-access choices, Easy-to-compare choices, Preferred by users.

Disadvantages: Consume screen space, Limited number of choices.

Radio Buttons (choice descriptions, Size)

- Provide meaningful, fully spelled-out choice descriptions clearly describing the values or effects set by the radio buttons.
- Display in a single line of text.
- Display using mixed-case letters, using the sentence style.
- Position descriptions to the right of the button. Separate them by at least one space from the button.
- When a choice is conditionally unavailable for selection, display the choice description greyed out or dimmed.
- Include a None choice if it adds clarity.
- **SIZE:** Show a minimum of two choices, a maximum of eight.

Radio Buttons (Defaults and Structure)

DEFAULTS:

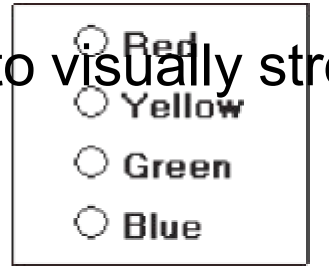
- If there is a default selection, designate it as the default and display its button filled in. Else, display all the buttons without setting a dot
- When the control includes choices whose states cannot be predetermined, display all the buttons without setting a dot, or in the **indeterminate state.**
- When a multiple selection includes choices, display the buttons in another unique manner, such as gray shadow

Radio Buttons (Defaults and Structure)

STRUCTURE

- Left-align the buttons and choice descriptions
- A columnar orientation is the preferred unless vertical space on the screen is limited
- Provide adequate separation between choices so that the buttons are associated with the proper description. A distance equal to three spaces is usually sufficient.

- Enclose the buttons in a border to visually strengthen the relationship they posses



Radio Buttons(Organization, Related Control)

ORGANIZATION

- Arrange selection in expected order or follow other patterns (frequency of occurrence, sequence of use, or importance)

  >>For selections arrayed top to bottom, begin ordering at the top.

  >>For selections arrayed left to right, begin ordering at the left.
- If, under certain conditions, a choice is not available, display it subdued or less brightly than the available choices.

RELATED CONTROL

- Position any control related to a radio button immediately to the right of the choice description. End the label with an arrow
- If the radio button choice description also acts as the label for the control that follows it, end the label with an arrow (>).

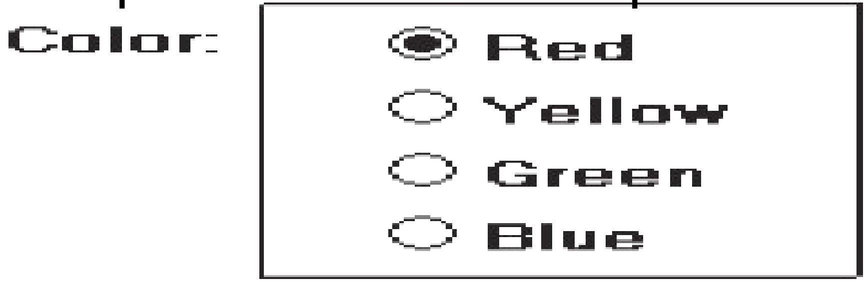
Radio Buttons (Captions)

- **Structure** Provide a caption for each radio button control.

  Exception: In screens containing only one radio button control, the screen title may serve as the caption.
- **Display** full spelled out in mixed-case letters, capitalizing the first letter of all significant words
- **Columnar orientation**
  - With a control border, position the caption:
    - Upper-left-justified within the border

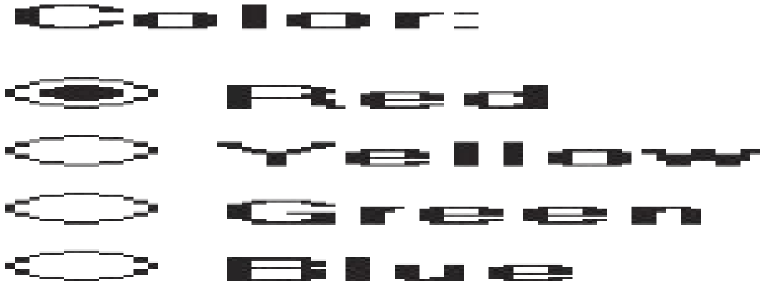
Radio Buttons (Captions)

- **Columnar orientation**
  - Alternatively, to the left of the topmost choice description with (:)



– Without a control border position the caption:

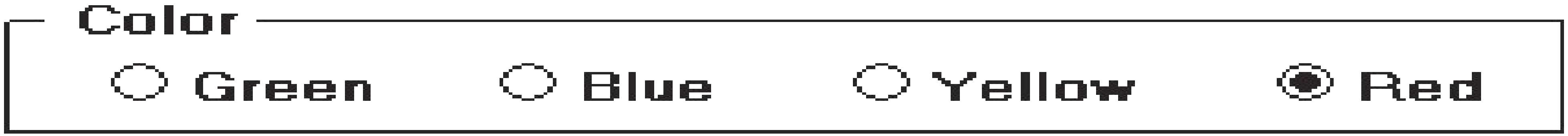
  - Left-justified above the choice description with (:)
  - Alternatively, the caption may be located to the left of the topmost choice description with (:)



Radio Buttons (Captions)

- **Horizontal orientation**
  - Position the caption to the left of the choice

  - Alternatively, with a control border, left-justified within the border



  - Be consistent in caption style and orientation within a screen.

Radio Buttons (Keyboard Equivalents and Selection and Indication)

KEYBOARD EQUIVALENT

- Assign a keyboard mnemonic to each choice description by underlining the applicable letter in the choice description

Pointing: The selection target area should be as large as possible. Include the button and the choice description text.

- Highlight the selection choice in some visually distinctive way when the cursor's resting on it
- This cursor should be as long as the longest choice description plus one space at each end. Do not place the cursor over the small button.

Radio Buttons (Keyboard Equivalents and Selection and Indication)

SELECTION AND INDICATION

- **Activation:** When a choice is selected, distinguish it visually from the unselected choices
- When a choice is selected, any other selected choice must be deselected.
- **Defaults:** If there is a default choice, display the selected choice as set in the control

Check Boxes

- Check box controls differ from radio buttons in that they permit selection of more than one alternative.
- Each option acts as a switch and can be either “on” or “off”
  - When an option is selected(on), a mark (X) appears within the square box, or the box is highlighted in some other manner
  - Otherwise the square is unselected or empty (off)
- Each box can be:
  - Switched on or off independently.
  - Used alone or grouped in sets.

Check Boxes

Purpose:

— To set one or more options as either on or off.

Advantages

— Easy-to-access choices.

— Easy-to-compare choices.

— Preferred by users.

Disadvantages:

— Consume screen space.

— Limited number of choices.

— Single check boxes difficult to align with other screen controls.

Check Boxes

Proper usage:

For nonexclusive choices (that is, more than one can be selected).

— Where adequate screen space is available.

— Most useful for data and choices that are:

Discrete, Small and fixed in number, Not easily remembered, In need of a textual description to describe meaningfully, Most easily understood when the alternatives can be seen together and compared to one another, Never changed in content, Can be used to affect other controls.

!!Other properties are similar to the radio button's properties!! Please refer to

Palettes

Description

- A control consisting of a series of graphical alternatives. The choices themselves are descriptive, being composed of colors, patterns, or images
- In addition to being a standard screen control, a palette may also be presented on a pull-down or pop-up menu or a toolbar.

Purpose

- To set one of a series of mutually exclusive options presented graphically or pictorially

Palettes

Advantages

- Pictures aid comprehension.
- Easy-to-compare choices.
- Usually consume less screen space than textual equivalents

Disadvantages:

- A limited number of choices can be displayed.
- Difficult to organize for scanning efficiency.
- Requires skill and time to design meaningful and attractive graphical representations.

Palettes

Proper usage

- For mutually exclusive choices (that is, only one can be selected).
- Where adequate screen space is available.
- Most useful for data and choices that are:

  Discrete, Frequently selected, Limited in number, Variable in number, Not easily remembered, Most easily understood when the alternatives may be seen together and compared to one another, Most meaningfully represented pictorially or by example, Can be clearly represented pictorially, Rarely changed in content.

Palettes

- **Do not use**
  - Where the alternatives cannot be meaningfully and clearly represented pictorially
  - Where words are clearer than images
  - Where the choices are going to change

Palettes(Graphical Representations)

- Provide meaningful, accurate, and clear illustrations or representations of choices.
- Create images large enough to:

  >>Clearly illustrate the available alternatives.

  >>Permit ease in pointing and selecting.
- Create images of equal size.
- Always test illustrations before implementing them.

SIZE: Present all available alternatives within the limits imposed by:

— The size of the graphical representations.

— The screen display’s capabilities.

Palettes(Layout and organization)

LAYOUT

- Create boxes large enough to:

  >> Effectively illustrate the available alternatives.

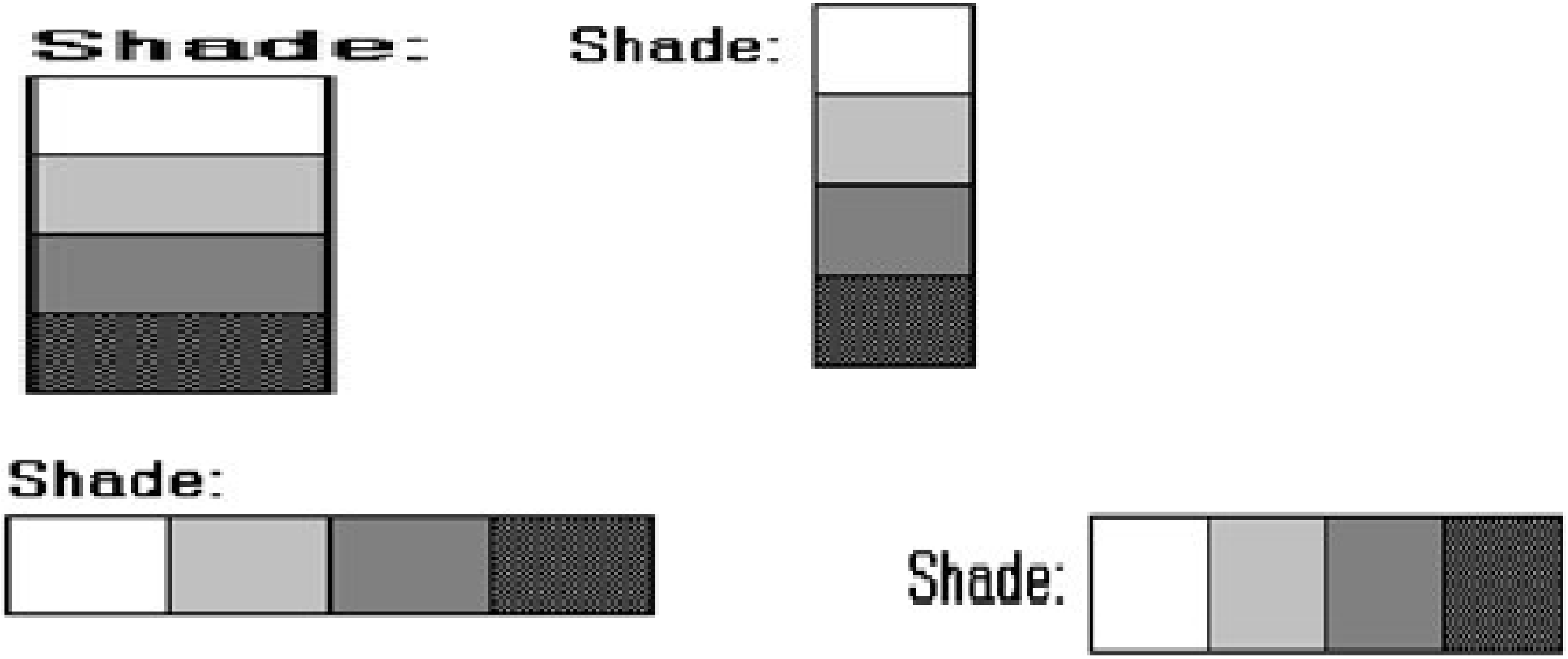
  >> Permit ease in pointing and selecting.

- Create boxes of equal size.
- Position the boxes adjacent to, or butted up against, one another.
- A columnar orientation is the preferred manner.
- If vertical space on the screen is limited, orient the choices horizontally.

Palettes(organization and captions)

ORGANIZATION and CAPTIONS SIMILAR TO RADIO BUTTONS REFER AND WIRTE THE POINTS IN EXAM

CAPTION STYLES:



Palettes(selection method and indication)

POINTING:

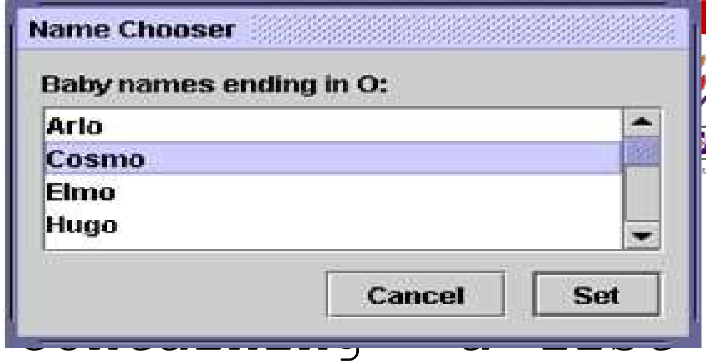
- Highlight the choice in some visually distinctive way when the pointer or cursor is resting on it and the choice is available for selection.

ACTIVATION

- When a choice is selected, distinguish it visually from the unselected choices by highlighting it in a manner different from when it is pointed at, or by placing a bold border around it.

DEFAULT If a palette is displayed with a choice previously selected or a default choice, display the currently active choice in the manner used when it was selected.

List Boxes



- **DESCRIPTION**
- A permanently displayed box-shaped control containing a list of attributes or objects from which
- >>A single selection is made (mutually exclusive), or
- >>Multiple selections are made (non-mutually exclusive)
- The choice may be text, pictorial representations, or graphics.
- Selections are made by using a mouse to point and click.
- Capable of being scrolled to view large lists of choices.
- No text entry field exists in which to type text.
- A list box may be may be associated with a summary list box control, which allows the selected choice to be displayed or an item added to the list.

- **Purpose:**
- — To display a collection of items containing: Mutually exclusive options and Non-mutually-exclusive options.
- **Advantages**
- Unlimited number of choices
- Reminds users of available options.
- **Disadvantages**
- Consumes screen space.
- Often requires an action (scrolling) to see all list choices.
- The list content may change, making it hard to find items.
- The list may be ordered in an unpredictable way, making it hard to find items.

List Boxes

- **Proper Usage**
- Where screen space is available
- When screen space or layout considerations make radio buttons or check boxes impractical.
- Good for data that are
  - Best represented textually
  - Not frequently selected
  - Large in number
  - Fixed in list length
  - Frequently changed
  - Not easily known, learned

List Boxes general guidelines

SELECTION DESCRIPTIONS

- Clearly and meaningfully describe the choices available, spell them fully
- Present in mixed case, using the sentence style
- Left-align into columns

LIST SIZE

- Not actual limit in size.
- Present all available alternatives.
- Require no more than 40 page-downs to search a list
  - If more are required, provide a method for using criteria

List Boxes general guidelines

BOX SIZE:

- Must be long enough to display 6-8 choices
  - If it is the major control within a window, the box may be large
  - If more items are available than are visible in the box, provide vertical scrolling to display all items.
- Must be wide enough to display the longest possible choice.
- When box can’t made wide enough to display longest entry
  - Break the long entries with an ellipsis (…)
  - Provide horizontally scrolling

List Boxes organization, layout & separation

ORGANIZATION

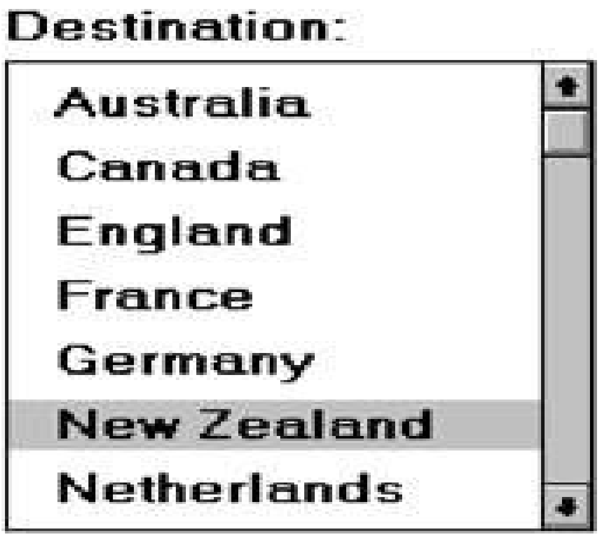
- Order in a logical and meaningful way to permit easy browsing (allow user to change the sort order will be great)
- If a particular choices is not available in the current context, omit , gray or dim it from the list

LAYOUT AND SEPARATION

- Enclose the choices in a box with a solid border(border should be the same color as the choice descriptions)
- Leave one blank character position between the choice descriptions and the left border.
- Leave one blank character position between the longest choice description in the list and the right border, if possible.

List Boxes Captions

- Use mixed-case letters
- Preferred position of the control caption is above upper-left corner of list box alternatively the caption can be located to the left of the topmost choice description
- Be consistent in caption style and orientation within a screen and related screens



List Boxes

Disabling: When a list box is disabled, display its caption and show its entries as greyed out or dimmed.

Selection Method and Indication

Pointing: Highlight the selection choice in some visually distinctive way when the pointer or cursor is resting on it and the choice is available for selection.

Selection: Use a reverse video or reverse colour bar to surround the choice description when it is selected. The cursor should be as wide as the box itself. Mark the selected choice in a distinguishing way.

Activation Require the pressing of a command button when an item, or items, is selected.

Single-Selection List Boxes

Purpose: To permit selection of only one item from a large listing.

Design Guidelines:

- If presented with an associated text box control
  - Position the list box below and as close as possible to the text box
  - The list box caption should be worded similarly to the text box caption

Single-Selection List Boxes

– If the related text box and the list box are very close, the caption may be omitted from the list box

– Use the same background color for the text box as is used in the list box.

Single-Selection List Boxes

Defaults:

- **When the list box is first displayed:** Present the currently active choice highlighted or marked with a circle or diamond to the left of the entry.

If a choice has not been previously selected, provide a default choice and display it in the same manner that is used in selecting it.

If the list represents mixed values for a multiple selection, do not highlight an entry.

Multiple-Selection List Boxes

Purpose:

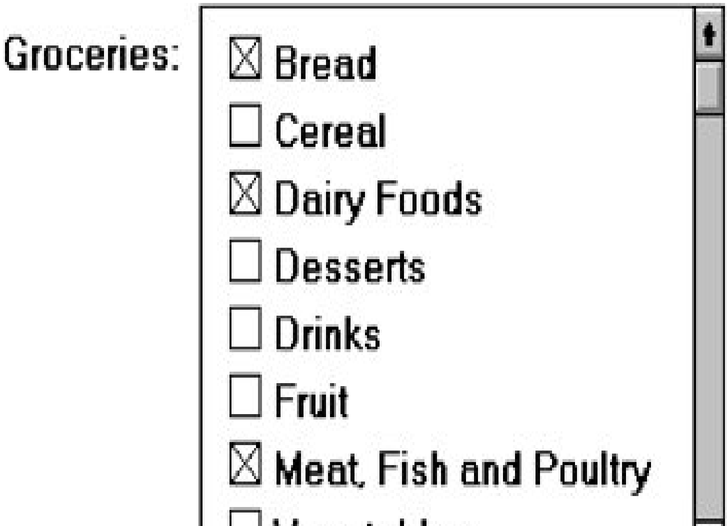
To permit selection of more than one item in a long listing.

- **Extended list box:** Optimized for individual item or range selection.
- **Multiple-selection list box:** Optimized for independent item selection.

Design Guideline

Selection indication

- Mark the selected choice with an X or check mark to the left o
- Consider providing a summary list box
  - Position it to the right of the list box
  - Use the same color for the summary list box



Multiple-Selection List

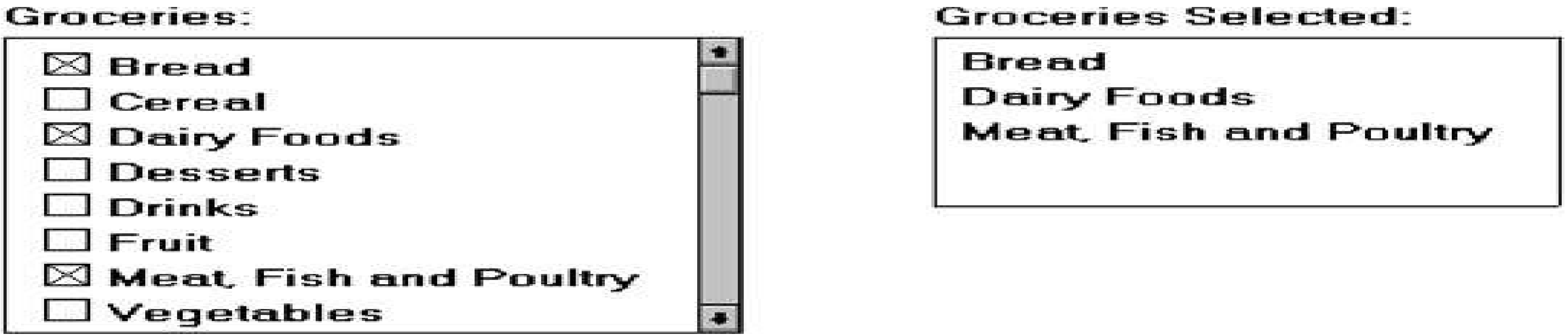
Multiple-Selection List Boxes

- Consider providing a summary list box.

— Position it to the right of the list box.

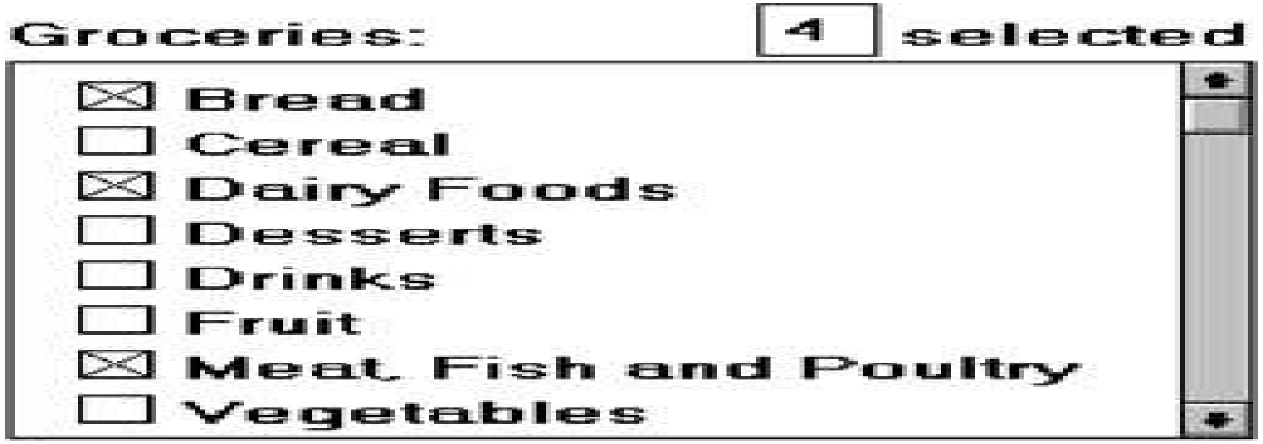
—Use the same colours for the summary list box as are used in the list box.

Provide command buttons to Add (one item) or Add All (items) to the summary list box, and Remove (one item) or Remove All (items) from the summary list box.



Multiple-Selection List Boxes

- Consider providing a display-only text control indicating how many choices have been selected
  - Position it justified upper-right above the list box



- Provide command buttons for <u>*Select All*</u> and <u>*Deselect All*</u>
- When the list box is first displayed
  - Display the currently active choices
  - Mark with and X or check mark to the left of the entry

Drop-Down/Pop-up List Boxes

Description

- A single rectangular control that shows one item with a small button to the right side.
- When the button is selected, a larger associated box appears, containing a list of choices from which one may be selected.
- Selections are made by using the mouse to point and click.
- Text may not be typed into the control.

Purpose:

- To select one item from a large list of mutually exclusive options when screen space is limited.

Drop-Down/Pop-up List Boxes

Advantages

- Unlimited number of choices
- Reminds users of available options.
- Conserves screen space.

Disadvantages

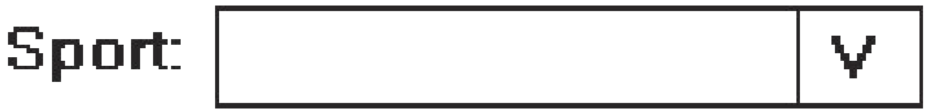
- When displayed, all choices may not always be visible, requiring scrolling
- Requires an extra action to display the list of choices.
- The list may be ordered in an unpredictable way, making it hard to find items.

Drop-Down/Pop-up List Boxes

Proper Usage

- Use drop-down/pop-up when
  - Screen space or layout consideration make radio buttons or single-selection list boxes impractical
  - The first item will be selected most of the time
  - Do not use a drop-down list if it is important that all options be seen together

Prompt Button: Provide a visual cue that a box is hidden by including a downward pointing arrow, or other meaningful image, to the right side of the selection field.



Drop-Down/Pop-up List Boxes

- **<u>!Other properties are the same as List boxes! Please refer to the list box properties and write the same in exam</u>**

Combination Entry/Selection Controls

- It is possible for a control to possess the characteristics of both a **text field and a selection field**. In this type of control, information may either be keyed into the field or selected and placed within it.
- Spin Boxes
- Combo Boxes
- Drop-down/Pop-up Combo Boxes

Spin Boxes

- **Description**
- A single line field followed by two small, vertically arranged buttons (top button arrow pointing up and down button arrow pointing down)
- Selection/entry is made by
  - Using the mouse to point at one of directional buttons
  - Keying a value directly into field itself
- **Purpose:** To make a selection by either scrolling through a small set of meaningful predefined choices or typing text.

Spin Boxes

- **Advantages**
- Consumes little screen spaces
- Useful only for certain kinds of data
- **Disadvantages**
- Difficult to compare choices.
- Useful only for certain kinds of data.
- **Proper usage for**
  - For mutually exclusive choices
  - Where screen is space is limited
  - Small in number
  - Infrequently changed, selected

Spin Boxes

List Size: To reduce the size of potentially long lists, break the listing into subcomponents (break a date into dd mm yy) and to keep list of items relatively short

List Organization

- Order the list in the customary, consecutive, or expected order of the information contained within it.
- When first displayed, present a default choice in the box

Box Size: The spin box should be wide enough to display the longest entry or choice

Caption is mixed-case letters

- Position the caption to the left of the box, Alternatively, left-justified above the box

Spin Boxes

Entry and selection methods: Permit completion by:

• Typing directly into the box.

•Scrolling and selecting with a mouse.

•Scrolling and selecting with the up/down arrow keys.

For alphabetical values:

• Move down the order using the down arrow.

• Move up the order using the up arrow.

For numeric values or magnitudes:

•Show a larger value using the up arrow.

Spin

- Show a smaller value using the down arrow.

Combo Boxes

Description

- A single rectangular text box entry field, beneath which is a larger rectangular list box (resembling a drop-down list box)
- The text box permits a choice to be keyed within it
- As text is typed into the text box, the list scrolls to the nearest match
- Also, when an item in the list box is selected, that item is placed within the text box replacing the existing content
- Information keyed may not necessarily match the list items

Purpose: To allow either typed entry in a text box or selection from a list of options in a permanently displayed list box attached to the text box.

Combo Boxes

Advantages:

- Unlimited number of entries and choices.
- Reminds users of available options.
- Flexible, permitting selection or typed entry.
- Entries not necessarily restricted to items selectable from list box.
- List box always visible.

Disadvantages: Consumes some screen space.

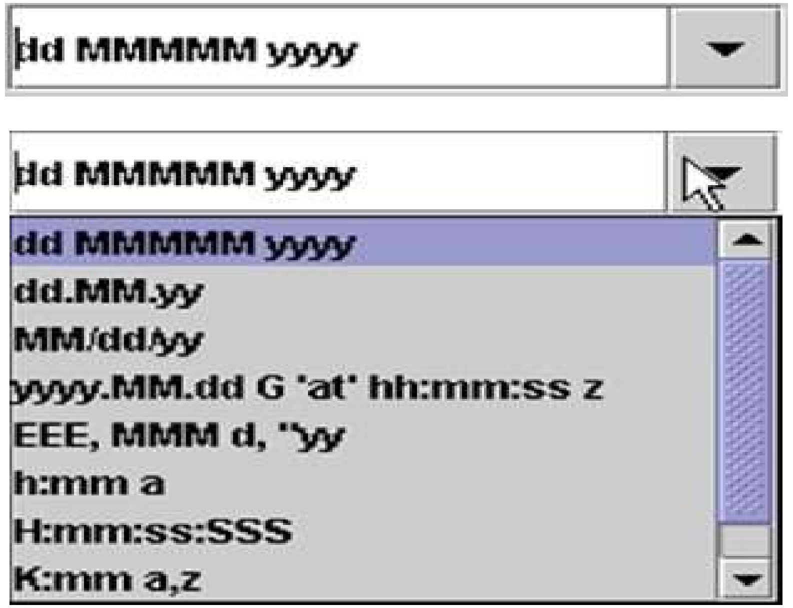
- All list box choices not always visible, requiring scrolling.

Combo

- The list may be ordered in an unpredictable way, making it hard to find items.

Combo Boxes

Pig
Pig
Bird
Cat
Dog
Rabbit
Pig



dd MMMMM yyyy
dd MMMMM yyyy
dd MMMMM yyyy
dd.MM.yy
MM/dd/yy
yyyy.MM.dd G 'at' hh:mm:ss z
EEE, MMM d, ''yy
h:mm a
H:mm:ss:SSS
K:mm a,z

Combo Box Guidelines

For the text box entry field, see “Text Box/Single Line” guidelines. For the list box, see “Drop-down/Pop-up List Box” guidelines.

Drop-down/Pop-up combo Boxes

- A single rectangular text box with a small button to the side and an associated hidden list of options
- Selection are made by using the mouse or keyboard
- The information keyed doesn’t not have to match
- When requested, a larger associated rectangular box appears, containing a scrollable list of choices from which one is selected.
- Selections are made by using the mouse to point and click.
- Combines the capabilities of both a text box and a drop-down/pop-up list box.
- **purpose:** To allow either typed entry or selection from a list of options in a list box that may be closed and retrieved as needed.

Drop-down/Pop-up combo Boxes

Advantages

- Unlimited number of entries and choices
- Flexible, permitting selection or typed entry
- Conserves screen space

Disadvantages

- Requiring scrolling
- The list content may change, making it hard to find items.
- The list may be ordered in an unpredictable way, making it hard to find items.

Proper usage

- Where screen is limited
- For data and choices that are
  - Best represented textually
  - Frequently changed
  - Large in number

Drop-down/Pop-up combo Boxes

- **Prompt Button:** Provide a visual cue that a list box is hidden by including a downward-pointing

- ***Other properties are the same as Drop-down/Pop-up List Box!!***

Other operable Controls

- Other more specialized operable controls also exist
  - slider
  - Tabs
  - command buttons
  - date picker
  - tree view
  - scroll bars and design & usage guidelines
  - Media controls

Slider

- A scale exhibiting degrees of a quality on a continuum
- To make a setting when a continuous qualitative adjustment is acceptable
- Spatial representation of relative setting
- Not as precise as an alphanumeric indication
- Proper usage:
  - When an object has a limited range of possible settings
  - When the range of values is continuous

– When graduations are relatively fine

Custom Controls

- Presentation controls
  - Provide details about other screen elements or controls or assist in giving the screen structure
    - Static Text Fields
    - Group boxes
    - Column Headings
    - ToolTips
    - Balloon Tips
    - Progress indicators
    - Sample box
    - Scrolling tickers

Selecting the Proper Controls

Task	Best Control	If screen Space Constraints Exist
Mutually Exclusive	Radio Buttons	Drop-down/Pop-up List Box
Not Mutually Exclusive	Check Boxes	Multiple-Selection List Box
Select or Type a Value Text Entry Field	Radio Buttons with "Other"	Drop-down Combo Box
Setting a Value within a Range	Spin Button	Text Box

Suggested Uses for Graphical Controls

IF:	USE:
• Mutually exclusive alternative • Best represented verbally • Very limited in number (2 to 8)	
AND: • Typed entry is never necessary • Content can never change • Adequate screen space is available	Radio Buttons
OR: • Typed entry is never necessary • Content can never change • Adequate screen space is not available	Drop-down/Pop-up List Box
OR: • Typed entry may be necessary • Content can change • Adequate screen space is availablLeecture 37 slide 18	Combo box

Suggested Uses for Graphical Controls

IF:	USE:
OR: • Type entry may be necessary •Content can change •Adequate screen space is not available	Drop-down/Pop-up Combo Box

Suggested Uses for Graphical Controls

IF:	USE:
• Mutually exclusive alternative • Best represented verbally • Potentially large in number (9 or more)	
AND: • Typed entry is never necessary • Content can never change • Adequate screen space is available	Single-Selection List Box
OR: • Typed entry is never necessary • Content can never change • Adequate screen space is not available	Drop-down/Pop-up List Box
OR: • Typed entry may be necessary • Content can change • Adequate screen space is availablLeecture 37 slide 20	Combo box

Suggested Uses for Graphical Controls

IF:	USE:
OR: • Typed entry may be necessary •Content can change •Adequate screen space is not available	Drop-down/Pop-up Combo Box

Suggested Uses for Graphical Controls

IF:	USE:
• Mutually exclusive alternative • Best represented graphically • Content rarely changes • Small or large number of items	Palette
IF:	**USE:**
• Mutually exclusive alternatives • Not frequently selected • Content does not change • Predictable, consecutive data • Typed entry sometimes desirable	
And: • Adequate screen space is not available	Spin Box
OR: • Adequate screen space is not available	Combo Box

Suggested Uses for Graphical Controls

IF:	USE:
• Mutually exclusive alternative • Continuous data with a limited range of setting • Value increases/decreases in a well-known, predictable way • Spatial representation enhances comprehension	Slider
IF:	**USE:**
• Nonexclusive alternatives • Best represented verbally • Typed entry is never necessary • Content can never change • Adequate screen space is available	
And: • Very limited in number (2 to 8)	Check Boxes
OR: • Potentially large in number (9 or more)	Multiple-Selection List Box

Thank You..

CS4206PE : HUMAN COMPUTER INTERACTION

Topic: HCI in the software process

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HCI in the software process:

- It is therefore necessary that we go beyond the exercise of identifying paradigms and examine the process of interactive system design. In the previous chapter we introduced some of the elements of a user-centered design process. Here we expand on that process, placing the design of interactive systems within the established frameworks of software development.
- Within computer science there is already a large subdiscipline that addresses the management and technical issues of the development of software systems – called software engineering. One of the cornerstones of software engineering is the software life cycle, which describes the activities that take place from the initial concept formation for a software system up until its eventual phasing out and replacement.

The Software Life Cycle:

- One of the claims for software development is that it should be considered as an engineering discipline, in a way similar to how electrical engineering is considered for hardware development.

Activities in the life cycle

- A more detailed description of the life cycle activities is depicted in Figure 6.1. The graphical representation is reminiscent of a waterfall, in which each activity naturally leads into the next. The analogy of the waterfall is not completely faithful to the real relationship between these activities, but it provides a good starting point for discussing the logical flow of activity. We describe the activities of this waterfall model of the software life cycle next.

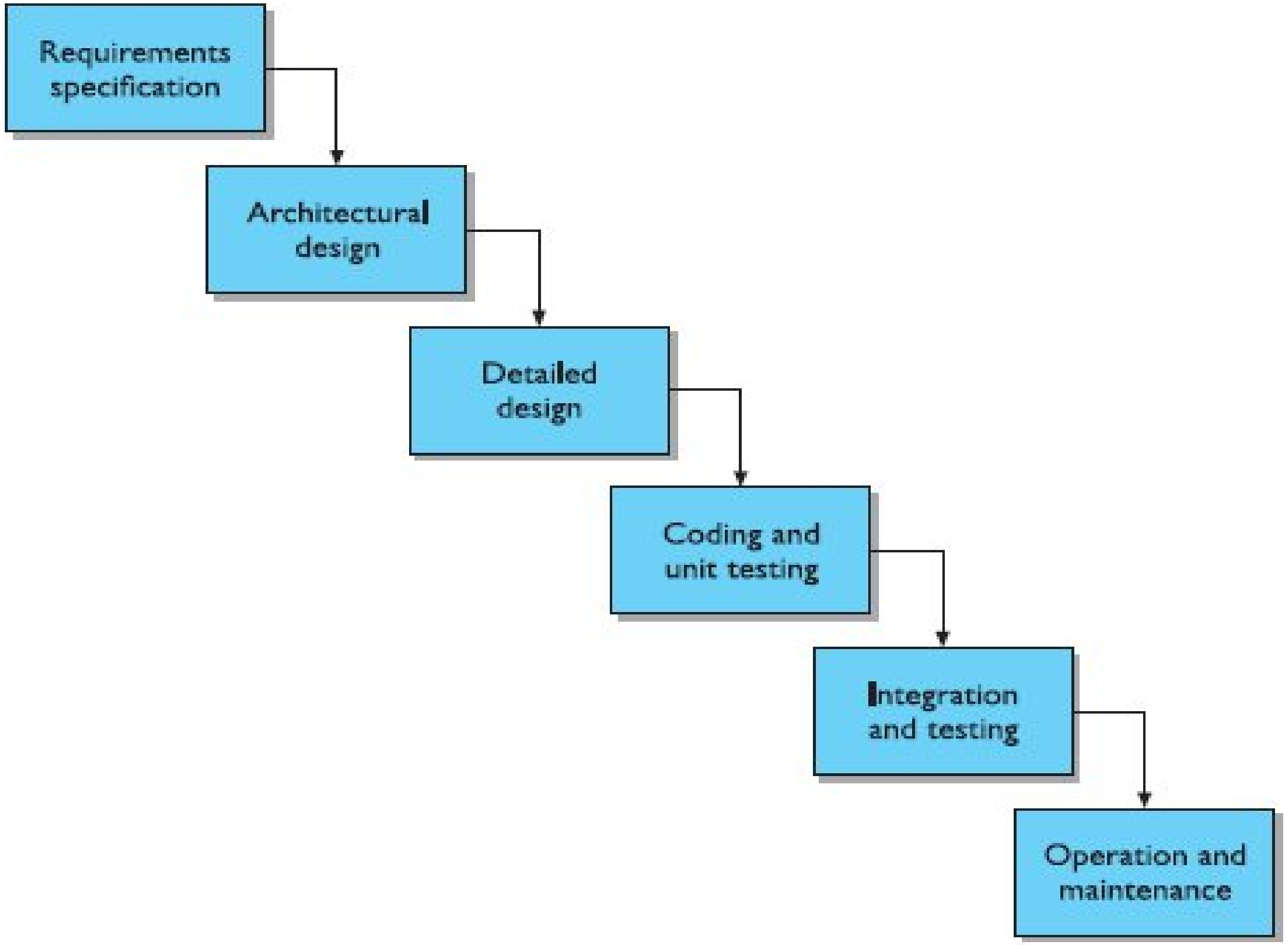

Figure 6.1 The activities in the waterfall model of the software life cycle

Integration and testing

- Once enough components have been implemented and individually tested, they must be integrated as described in the architectural design

Interactive systems and the software life cycle

- The traditional software engineering life cycles arose out of a need in the 1960s and 1970s to provide structure to the development of large software systems. In those days, the majority of large systems produced were concerned with data-processing applications in business

Usability Engineering:

- One approach to user-centered design has been the introduction of explicit usability engineering goals into the design process, as suggested by Whiteside and colleagues at IBM and Digital Equipment Corporation [377] and by Nielsen at Bellcore [260, 261]. Engineering depends on interpretation against a shared background of meaning, agreed goals and an understanding of how satisfactory completion will be judged

Iterative Design and Prototyping:

A point we raised earlier is that requirements for an interactive system cannot be completely specified from the beginning of the life cycle. The only way to be sure about some features of the potential design is to build them and test them out on real users.

The design can then be modified to correct any false assumptions that were revealed in the testing. This is the essence of iterative design, a purposeful design process which tries to overcome the inherent problems of incomplete requirements specification by cycling through several designs, incrementally improving upon the final product with each pass.

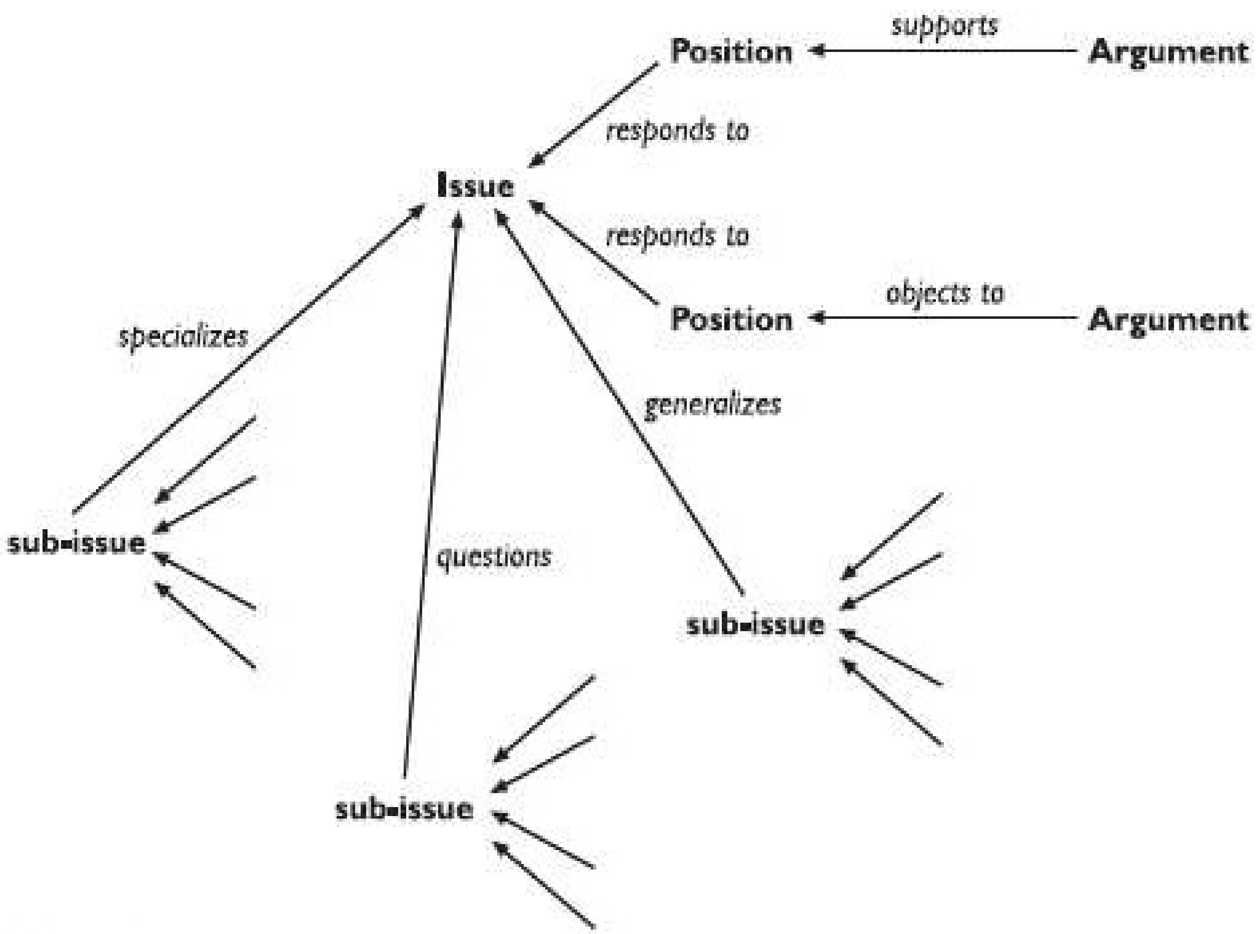

Figure 6.8 The structure of a gIBIS design rationale

Design Rules:

- One of the central problems that must be solved in a user-centered design process is how to provide designers with the ability to determine the usability consequences of their design decisions. We require design rules, which are rules a designer can follow in order to increase the usability of the eventual software product. We can classify these rules along two dimensions, based on the rule’s authority and generality

Principles to Support Usability:

- The most abstract design rules are general principles, which can be applied to the design of an interactive system in order to promote its usability. we looked at the different paradigms that represent the development of interactive systems. Derivation of principles for interaction has usually arisen out of a need

- to explain why a paradigm is successful and when it might not be.

Table 7.2 Summary of principles affecting flexibility

Principle	Definition	Related principles
Dialog initiative	Allowing the user freedom from artificial constraints on the input dialog imposed by the system	System/user pre-emptiveness
Multi-threading	Ability of the system to support user interaction pertaining to more than one task at a time	Concurrent vs. interleaving, multi-modality
Task migratability	The ability to pass control for the execution of a given task so that it becomes either internalized by the user or the system or shared between them	–
Substitutivity	Allowing equivalent values of input and output to be arbitrarily substituted for each other	Representation multiplicity, equal opportunity
Customizability	Modifiability of the user interface by the user or the system	Adaptivity, adaptability

Table 7.3 Summary of principles affecting robustness

Principle	Definition	Related principles
Observability	Ability of the user to evaluate the internal state of the system from its perceivable representation	Browsability, static/dynamic defaults, reachability, persistence, operation visibility
Recoverability	Ability of the user to take corrective action once an error has been recognized	Reachability, forward/ backward recovery, commensurate effort
Responsiveness	How the user perceives the rate of communication with the system	Stability
Task conformance	The degree to which the system services support all of the tasks the user wishes to perform and in the way that the user understands them	Task completeness, task adequacy

Empirical methods: experimental evaluation:

- One of the most powerful methods of evaluating a design or an aspect of a design is to use a controlled experiment. This provides empirical evidence to support a particular claim or hypothesis. It can be used to study a wide range of different issues at. different levels of detail

Table 9.1 Choosing a statistical technique

Independent variable	Dependent variable	
Parametric		
Two valued	Normal	Student's *t* test on difference of means
Discrete	Normal	ANOVA (ANalysis Of VAriance)
Continuous	Normal	Linear (or non-linear) regression factor analysis
Non-parametric		
Two valued	Continuous	Wilcoxon (or Mann–Whitney) rank-sum test
Discrete	Continuous	Rank-sum versions of ANOVA
Continuous	Continuous	Spearman's rank correlation
Contingency tests		
Two valued	Discrete	No special test, see next entry
Discrete	Discrete	Contingency table and chi-squared test
Continuous	Discrete	(Rare) Group independent variable and then as above

Hearing impairment

- Compared with a visual disability where the impact on interacting with a graphical interface is immediately obvious, a hearing impairment may appear to have little impact on the use of an interface. After all, it is the visual not the auditory channel that is predominantly used. To an extent this is true, and computer technology can actually enhance communication opportunities for people with hearing loss. Email and instant messaging are great levellers and can be used equally by hearing and deaf users alike.

Standards, Gold Rules, and Heuristics

- Guidelines for designing user interfaces, e.g., ISO 9241- Gold Rules: Design principles for user-centered design, e.g., Shneiderman's 8 Golden Rules- Heuristics: General guidelines for designing user interfaces, e.g., Nielsen's 10 Heuristics.

- HCI Patterns- HCI Patterns: Reusable solutions to common design problems- Examples: Wizard pattern, Carousel pattern- Benefits: Improve usability, reduce design time

- Evaluation Techniques- Evaluation Techniques: Methods for assessing the usability of a system- Types: - Expert analysis (heuristic evaluation, cognitive walkthrough) - User participation (user testing, surveys)-
- Goals: - Identify usability problems - Improve user experience
- Goals of Evaluation- Identify usability problems- Improve user experience- Inform design decisions- Measure user satisfaction

- Evaluation through Expert Analysis- Heuristic Evaluation: Expert review of a system against a set of heuristics- Cognitive Walkthrough: Expert review of a system to identify usability problems- Benefits: Quick, inexpensive, identifies major usability problems
- Evaluation through User Participation- User Testing: Observing users interacting with a system to identify usability problems- Surveys: Collecting user feedback through questionnaires- Benefits: Provides detailed, qualitative feedback, identifies usability problems
- Choosing an Evaluation Method- Consider the goals of the evaluation- Consider the resources available (time, budget, participants)- Consider the type of system being evaluated- Combine multiple methods for a more comprehensive evaluation

- Universal Design- Universal Design: Designing products to be usable by everyone, regardless of age, ability, or cultural background- Benefits: Improves usability, accessibility, and user experience.
- Universal Design Principles- Equitable Use: Design for all users- Flexibility in Use: Design for different user needs and preferences- Simple and Intuitive Use: Design for easy use- Perceptible Information:
- Design for clear communication- Tolerance for Error: Design for user mistakes- Low Physical Effort: Design for minimal user effort- Size and Space for Approach and Use:
- Design for user accessibility Multi-Modal Interaction- Multi-Modal Interaction: Using multiple modes of interaction (e.g., voice, gesture, text) to interact with a system- Benefits: Improves usability, accessibility, and user experience- Examples: Voice assistants, gesture-based interfaces, multi-touch interfaces

Thank You..

CS4206PE : HUMAN COMPUTER INTERACTION

Topic: Cognitive models Goal and task hierarchies Design Focus

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Cognitive Models:

- The techniques and models in this chapter all claim to have some representation of users as they interact with an interface; that is, they model some aspect of the user understands, knowledge, intentions or processing. The level of representation differs from technique to technique – from models of high-level goals and the results of problem-solving activities, to descriptions of motor-level activity, such as keystrokes and mouse clicks. The formalisms have largely been developed by psychologists, or computer scientists, whose interest is in understanding user behaviour

- The presentation of the cognitive models in this chapter follows this classification scheme, divided into the following categories:
- hierarchical representation of the user’s task and goal structure
- linguistic and grammatical models
- physical and device-level models.

Goal and Task Hierarchies:

- Many models make use of a model of mental processing in which the user achieves goals by solving subgoals in a divide-and-conquer fashion. We will consider two models, GOMS and CCT, where this is a central feature.

- Imagine we want to produce a report on sales of introductory HCI textbooks. To achieve this goal we divide it into several subgoals, say gathering the data together, producing the tables and histograms, and writing the descriptive material.

GOMS:

- The GOMS model of Card, Moran and Newell is an acronym for Goals, Operators, Methods and Selection [56]. A GOMS description consists of these four elements: Goals These are the user's goals, describing what the user wants to achieve.
- Further, in GOMS the goals are taken to represent a 'memory point' for the user, from which he can evaluate what should be done and to which he may return should any errors occur.

- Operators These are the lowest level of analysis. They are the basic actions that the user must perform in order to use the system. They may affect the system (for example, press the ‘X’ key) or only the user’s mental state (for example, read the dialog box). There is still a degree of flexibility about the granularity of operators; we may take the command level ‘issue the SELECT command’ or be more primitive: ‘move mouse to menu bar, press center mouse button ..’
- Methods As we have already noted, there are typically several ways in which a goal can be split into subgoals. For instance, in a certain window manager a currently selected window can be closed to an icon either by selecting the ‘CLOSE’ option from a pop-up menu, or by hitting the ‘L7’ function key. In GOMS these two goal decompositions are referred to as methods, so we have the CLOSE-METHOD and the L7-METHOD

DESIGN FOCUS GOMS saves money

- Some years ago the US telephone company NYNEX were intending to install a new computer system to support their operators. Before installation a detailed GOMS analysis was performed taking into account the cognitive and physical processes involved in dealing with a call. The particular technique was rather different from the original GOMS notation as described here. Because an operator performs several activities in parallel a PERT-style GOMS description was constructed [192, 154]. The PERT analysis was used to determine the critical path, and hence the time to complete a typical task. It was discovered that rather than speeding up operations, the new system would take longer to process each call. The new system was abandoned before installation, leading to a saving of many millions of dollars.

Cognitive complexity theory

- Cognitive complexity theory, introduced by Kieras and Polson [199], begins with the basic premises of goal decomposition from GOMS and enriches the model to provide more predictive power. CCT has two parallel descriptions: one of the user's goals and the other of the computer system (called the device in CCT). The description of the user's goals is based on a GOMS-like goal hierarchy, but is expressed primarily using production rules.

Linguistic Models:

- **BNF**
- Representative of the linguistic approach is Reisner's use of Backus–Naur Form (BNF) rules to describe the dialog grammar [301]. This views the dialog at a purely syntactic level, ignoring the semantics of the language. BNF has been used widely to specify the syntax of computer programming languages, and many system dialogs can be described easily using BNF rules. For example, imagine a graphics system that has a
- line-drawing function. To select the function the user must select the 'line' menu option. The line-drawing function allows the user to draw a polyline, that is a sequence of line arcs between points. The user selects the points by clicking the mouse button in the drawing area. The user double clicks to indicate the last point of the polyline.

Task–action grammar

- Measures based upon BNF have been criticized as not ‘cognitive’ enough. They ignore the advantages of consistency both in the language’s structure and in its use of command names and letters. Task–action grammar (TAG) [284] attempts to deal with some of these problems by including elements such as parametrized

- grammar rules to emphasize consistency and encoding the user’s world knowledge (for example, up is the opposite of down).

The Challenge of Display-Based Systems:

- Both goal hierarchical and grammar-based techniques were initially developed when most interactive systems were command line, or at most, keyboard and cursor based.
- There are significant worries, therefore, about how well these approaches can generalize to deal with more modern windowed and mouse-driven interfaces.

- Both families of techniques largely ignore system output – what the user sees.
- The implicit assumption is that the users know exactly what they want to do and execute the appropriate command sequences blindly.

Cognitive Architectures:

- The formalisms we have seen so far have some implicit or explicit model of how the user performs the cognitive processing involved in carrying out a task. For instance, the concept of taking a problem and solving it by divide and conquer using subgoals is central to GOMS. CCT assumes the distinction between long- and short-term memory, with production rules being stored in long-term memory and ‘matched’ against the contents of short-term (or working) memory to determine which ‘fire’. The values for various motor and mental operators in KLM were based on the Model Human Processor (MHP) architecture of Card, Moran and Newell [56]. Another common assumption, which we have not discussed in this chapter, is the distinction
- between linguistic levels – semantic, syntactic and lexical – as an architectural model of the user’s understanding.

Ubiquitous Computing and Augmented Realities:

- There are several ways in which the earliest assumptions of HCI are challenged. For example, we no longer assume there is a single user; rather, we consider groups and larger organizational concerns when discussing interactions. In this chapter, we challenge another assumption concerning the form factor of the computing device. Traditionally, we think of computers as a glass box, a workstation with keyboard, mouse and monitor sitting on a desk that we seek out when we want to do some work.

Since the late 1980s, this traditional form factor has been expanded to include a variety of more mobile devices and computing services that are distributed throughout the physical world and more tightly integrated with it.

The trend is towards a ubiquitous or pervasive computing experience, in which computing devices become so commonplace that we do not distinguish them from the ‘normal’ physical surroundings. Improved display technologies give us the ability to augment the physical world with electronic information through head-mounted displays or steerable projection surfaces. We have also seen display technologies that provide complete virtual replacements of the physical world, creating a so-called virtual reality.

Application themes for ubicomp

- Many applications-focussed researchers in HCI seek the holy grail of ubicomp, the killer app that will cause significant investment in the infrastructure that will then enable a wide variety of ubicomp applications to flourish. It could be argued that person– person communication is such a killer app for ubicomp, as it has caused a large investment in environmental and personal infrastructure that has moved us close (though not entirely) to a completely connected existence. Whether or not personal communication is the killer app, the vision of ubicomp from the human perspective is much more holistic.

VR technology

- The technology involved in VR is quite elaborate. The individual devices have been discussed in Chapter 2, but now we shall see how they work together.

  Since the user has to 'see' a new environment, a headset is usually used in a VR setup. With independent screens for each eye, in order to give a 3D image, the headset is often a large, relatively cumbersome piece of head-mounted gear. However, smaller, lighter VR goggles are now available and may soon become only slightly oversized spectacles.

Immersive VR

- Virtual reality can be used to produce environments that mimic our everyday world. Architects have always used models and sketches to show clients how a building will appear. Now they can use VR to take clients through a virtual tour of the building, fly over it from above, look at it from the streets outside, enter the doors and walk through the corridors. Similar techniques are used to plan kitchens and even gardens.

- **Information and Data Visualization:**
  Virtual reality and 3D displays can be used to visualize scientific data and other complex information. Whether or not 3D representations are used, animation techniques, especially when under interactive user control, can give a sense of engagement with data, and encourage discovery and pattern formation.

Scientific and technical data

Three-dimensional representations of scientific and technical data can be classified by the number of dimensions in the virtual world that correspond to physical spatial dimensions, as opposed to those that correspond to more abstract parameters. Perhaps the most engaging images are where all three dimensions have some physical validity.

DESIGN FOCUS Getting the size right

- If we display the height of the 4–6 group proportional to the percentage of families it makes it look as if this is much more than 15% of the data. This is because the column is three times wider than the rest. We actually perceive the data to be in the ratio 25:50:10:45. The right thing to do is to draw the area of the columns proportional to the number of families, which makes the data look right.
- Similar problems arise in 3D representations. If we draw a map with 3D columns proportional to the population rising from each country, we will probably not be able to see anything except a single enormous block for China! We should display the heights of the blocks proportional to the population density. Of course, if we start with density data, we can simply use height to start with.
- If data ranges are extremely large, we may use non-linear (for example, logarithmic) scales. Users clearly
- need to be aware of this, but at least if density data are used, bigger areas/volumes represent bigger data.

Thank You..