UNIVERSITAS INDONESIA

Veritas, Probitas, Iustitia

FAKULTAS ILMU KOMPUTER

# TOPIC 8

# USER INTERFACE DESIGN

ANALISIS DAN PERANCANGAN SISTEM INFORMASI

CSIM603183

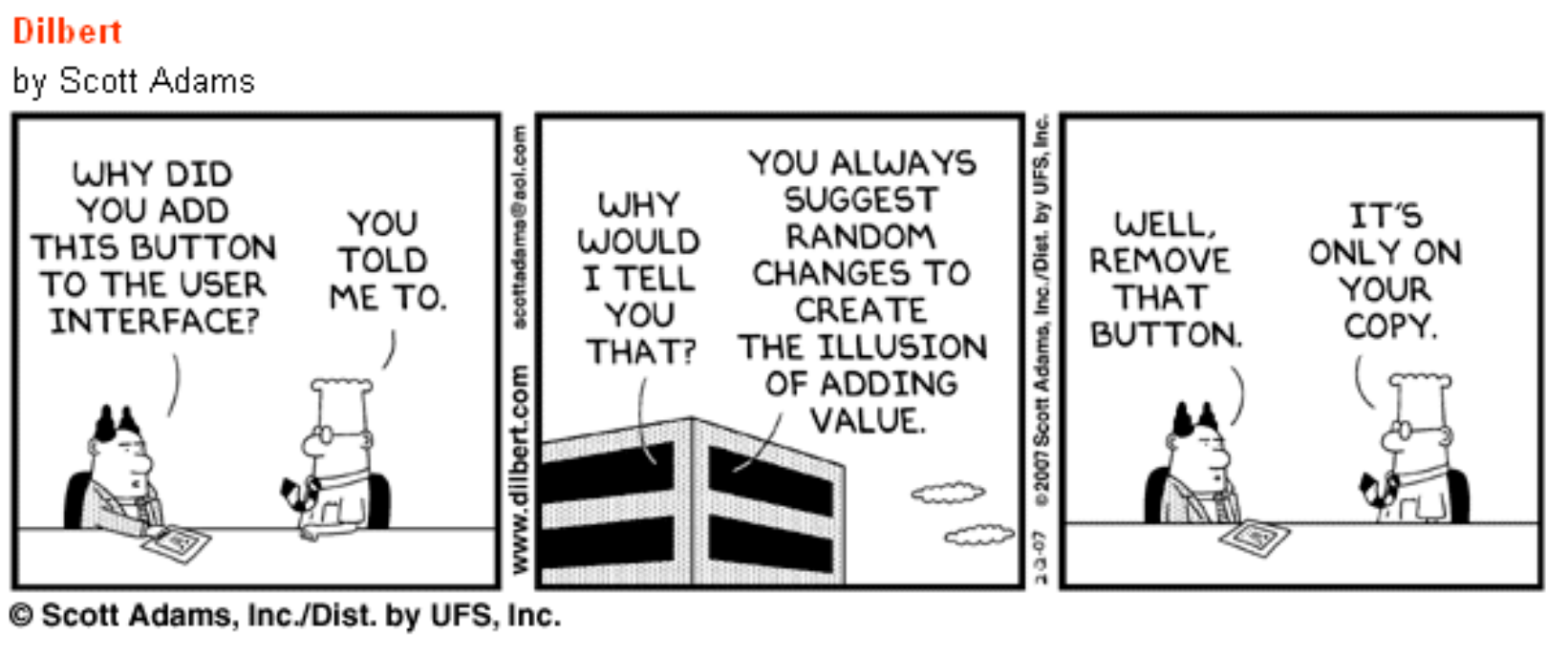
# Learning Objectives

1. Able to explain fundamental principles of user interface design
2. Able to explain how to create user interface design
3. Able to explain how to structure user interface design
4. Able to explain how to design user interface standards
5. Able to explain general principles and techniques for navigation design
6. Able to explain general principles and techniques for input design
7. Able to explain general principles and techniques for output design
8. Able to create user interface

# Scenario 1: User VS Analyst

- User : Tombol “Delete” gunanya buat apa ya ?
- Analyst : menghapus file
- User : Lalu tombol “Hapus” itu gunanya apa ?
- Analyst : Menghapus file juga
- User : Kenapa ada tombol yg namanya beda, namun fungsinya sama ?
- Analyst : Untuk variasi saja, memberikan user pilihan lebih banyak …
- User : oooo ☺

# Scenario 2


Dilbert
by Scott Adams
WHY DID YOU ADD THIS BUTTON TO THE USER INTERFACE?
YOU TOLD ME TO.
WHY WOULD I TELL YOU THAT?
YOU ALWAYS SUGGEST RANDOM CHANGES TO CREATE THE ILLUSION OF ADDING VALUE.
WELL, REMOVE THAT BUTTON.
IT'S ONLY ON YOUR COPY.
www.dilbert.com scottadams@aol.com
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# User Interface Design (1)

- UI Design is **an art**
- Goal of UI Design : to make the interface **pleasing** to the eye and **simple** to use
- Greatest problem is **using space effectively**
  - Analyst must balance the need for simplicity and pleasant appearance against the need to present the information across multiple pages or screens, which decrease simplicity

# User Interface Design (2)

- Ideally, UI design involves a team of specialists, e.g.
  1. graphic designers
  2. interaction / interface designers
  3. information architects
  4. technical writers
  5. marketers
  6. test engineers
  7. usability engineers
  8. software engineers
  9. users

# Key Definitions (1)

- The **user interface** defines how the system will interact with external entities
- The **system interfaces** define how systems exchange information with other systems

# Key Definitions (2)

- The **navigation mechanism** provides the way for users to tell the system what to do
- The **input mechanism** defines the way the system captures information
- The **output mechanism** defines the way the system provides information to users or other systems

# Key Definitions (3)

- **Graphical user interface (GUI)** is the most common type of interfaces most students are likely to use personally and for developing systems.

# Principles for User Interface Design

1. Layout
2. Content awareness
3. Aesthetics
4. User experience
5. Consistency
6. Minimal user effort

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# USER INTERFACE DESIGN PRINCIPLES

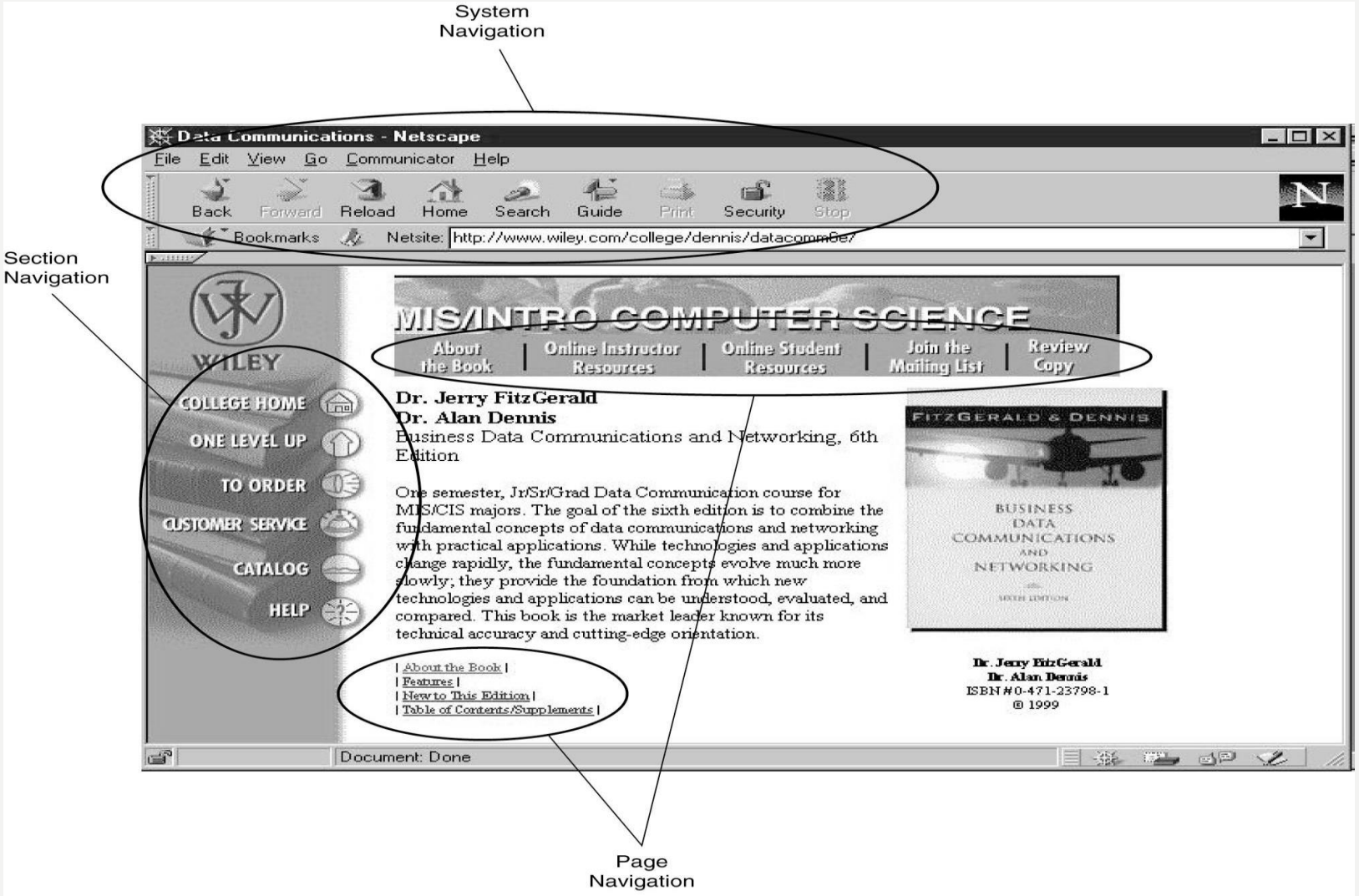
# #1 Layout Concepts (1)

- The screen is often divided into three boxes
  - Navigation area (top)
  - Status area (bottom)
  - Work area (middle)
- Information can be presented in multiple areas
- Similar areas should be grouped together

# #1 Layout Concepts (2)

- Areas and information should minimize user movement from one to another
  - Left-to-right & top-to-bottom
  - Chronological order
  - Least-to-most specific
  - Most-to-least frequent
- Ideally, areas will remain consistent in
  - Size
  - Shape
  - Placement for entering data
  - Reports presenting retrieved data

# Layout with Multiple Navigation Areas



# #2 Content Awareness

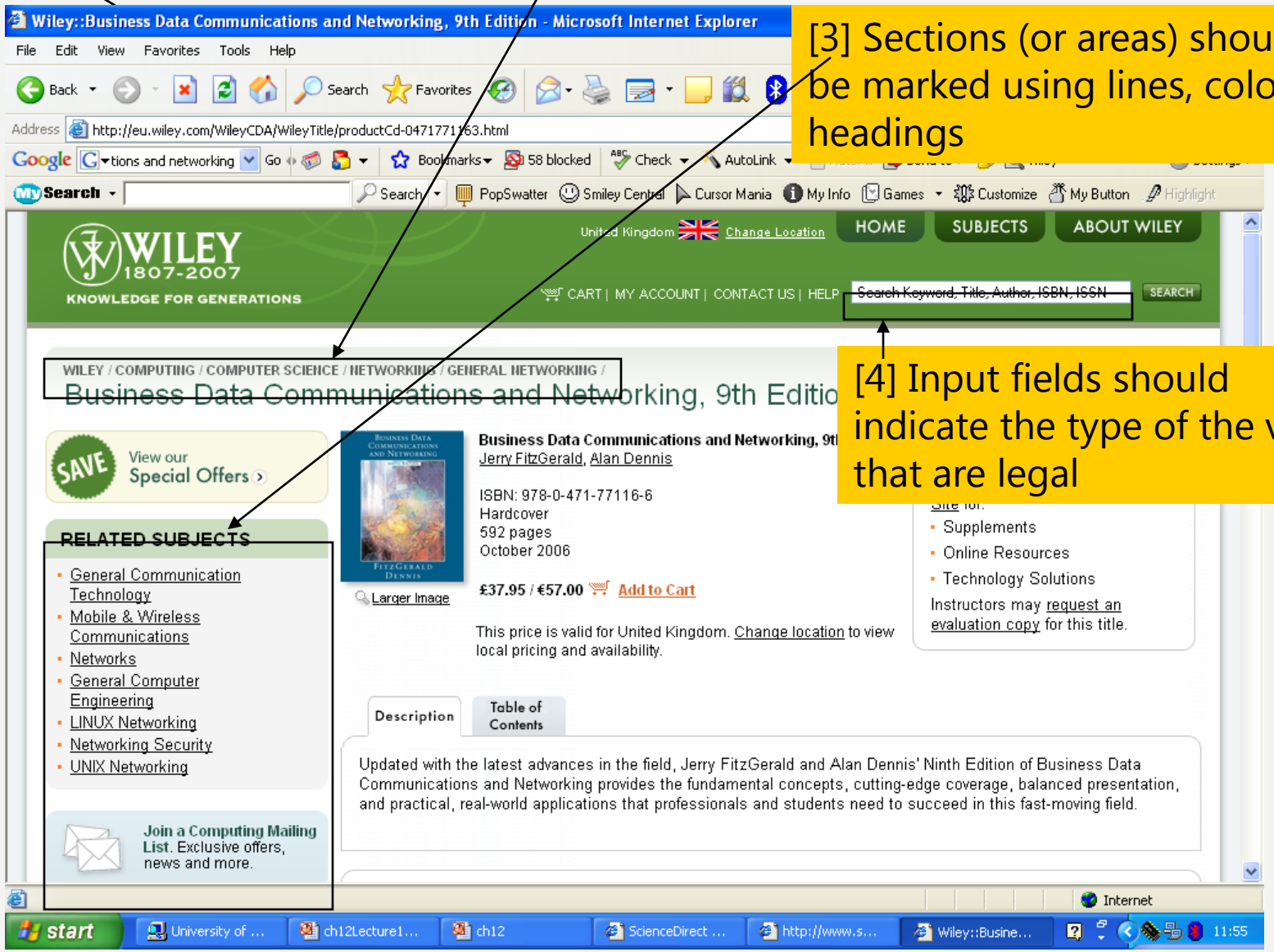
- All interfaces should have **titles**
- **Menus** should show
  - where you are
  - where you came from to get there
- It should be clear what information is within each area
- Fields and field labels should be selected carefully
- Use dates and version numbers to aid system users

[1] All interfaces should be titled

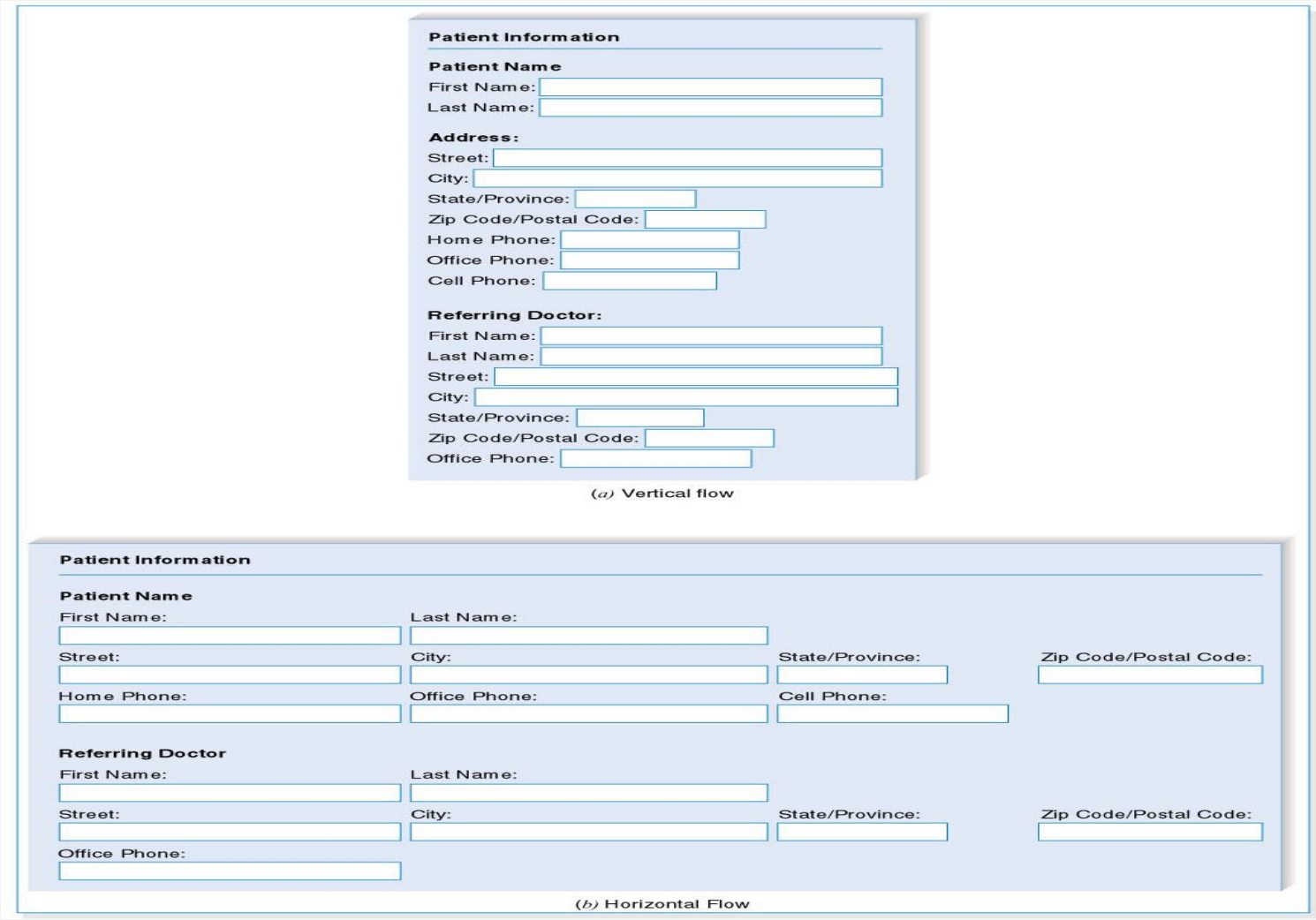
[2] Menus should indicate current location and at least most recent location (ideally a history of recent locations)

[3] Sections (or areas) should be marked using lines, colours, headings

[4] Input fields should indicate the type of the values that are legal



# Flow between Interface Sections



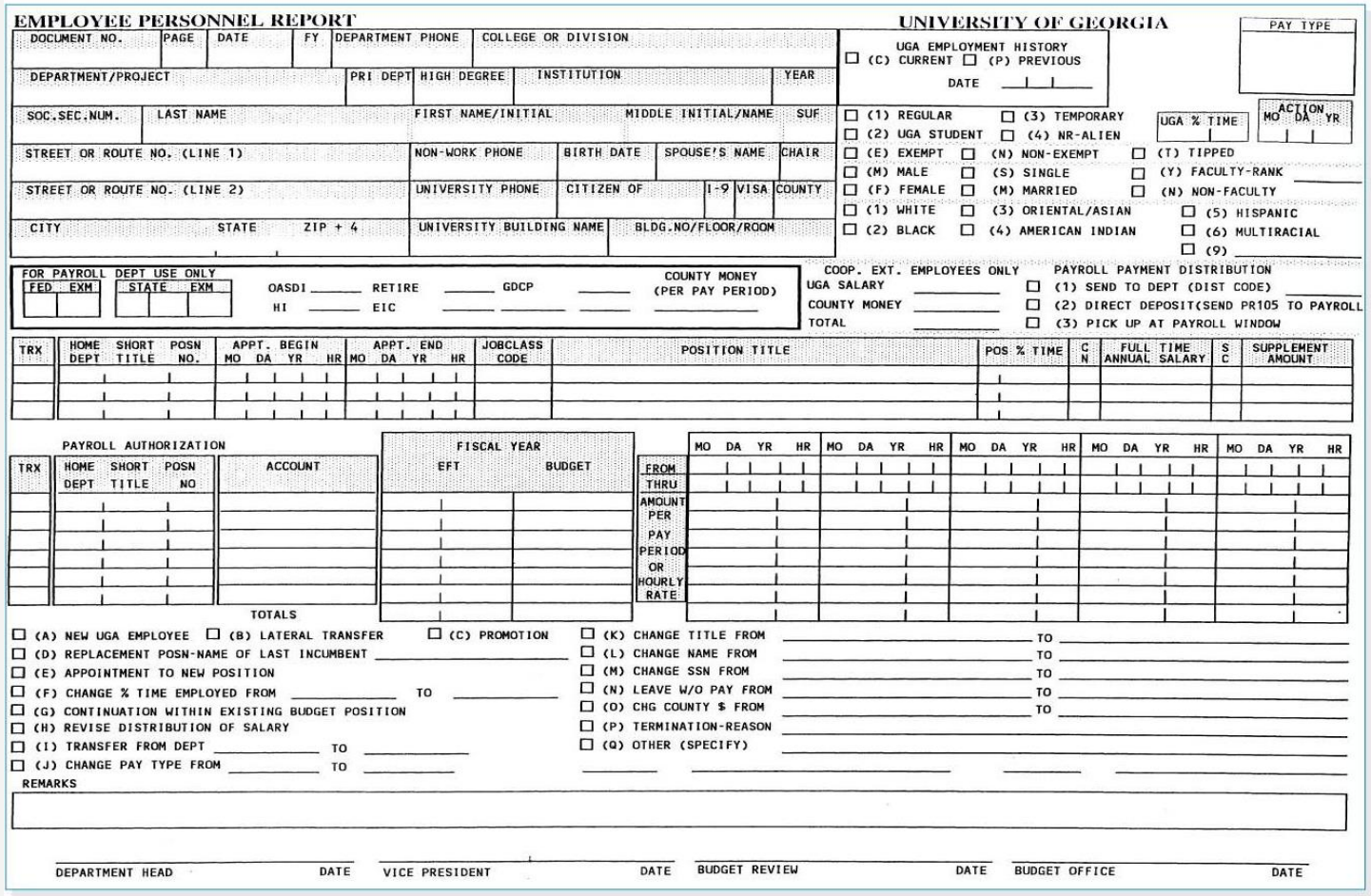
# #3 Aesthetics (1)

- Interfaces need to be functional and inviting to use
- Avoid squeezing in too much, particularly for novice users
- Design text carefully
  - Be aware of font and size
    - Text should have same font and font size
      - Changes in font and size = changes in kind of information presented
      - Avoid italics and underlining
    - Serif fonts [eg. Times Roman] for printed reports
    - San-serif fonts [eg. Helvetica or Arial] for displays and headings
  - Avoid using all capital letters

# #3 Aesthetics (2)

- Colors and patterns should be used carefully
- Test quality of colors by trying the interface on a black/white monitor
- Use colors to separate or categorize items

# Form Example



EMPLOYEE PERSONNEL REPORT

UNIVERSITY OF GEORGIA

DOCUMENT NO. | PAGE | DATE | FY | DEPARTMENT PHONE | COLLEGE OR DIVISION

DEPARTMENT/PROJECT | PRI DEPT | HIGH DEGREE | INSTITUTION | YEAR

SOC.SEC.NUM. | LAST NAME | FIRST NAME/INITIAL | MIDDLE INITIAL/NAME | SUF

STREET OR ROUTE NO. (LINE 1) | NON-WORK PHONE | BIRTH DATE | SPOUSE'S NAME | CHAIR

STREET OR ROUTE NO. (LINE 2) | UNIVERSITY PHONE | CITIZEN OF | I-9 | VISA | COUNTY

CITY | STATE | ZIP + 4 | UNIVERSITY BUILDING NAME | BLDG.NO/FLOOR/ROOM

UGA EMPLOYMENT HISTORY
☐ (C) CURRENT ☐ (P) PREVIOUS
DATE ___/___/___

PAY TYPE

ACTION MO DA YR

UGA % TIME

☐ (1) REGULAR ☐ (3) TEMPORARY
☐ (2) UGA STUDENT ☐ (4) NR-ALIEN
☐ (E) EXEMPT ☐ (N) NON-EXEMPT ☐ (T) TIPPED
☐ (M) MALE ☐ (S) SINGLE ☐ (Y) FACULTY-RANK
☐ (F) FEMALE ☐ (M) MARRIED ☐ (N) NON-FACULTY
☐ (1) WHITE ☐ (3) ORIENTAL/ASIAN ☐ (5) HISPANIC
☐ (2) BLACK ☐ (4) AMERICAN INDIAN ☐ (6) MULTIRACIAL
☐ (9) _____

FOR PAYROLL DEPT USE ONLY
FED EXM | STATE EXM
OASDI ____ RETIRE ____ GDCP ____ COUNTY MONEY (PER PAY PERIOD)
HI ____ EIC ____

COOP. EXT. EMPLOYEES ONLY
UGA SALARY ____
COUNTY MONEY ____
TOTAL ____

PAYROLL PAYMENT DISTRIBUTION
☐ (1) SEND TO DEPT (DIST CODE) ____
☐ (2) DIRECT DEPOSIT(SEND PR105 TO PAYROLL
☐ (3) PICK UP AT PAYROLL WINDOW

| TRX | HOME DEPT | SHORT TITLE | POSN NO. | APPT. BEGIN MO DA YR HR | APPT. END MO DA YR HR | JOBCLASS CODE | POSITION TITLE | POS % TIME | C N | FULL TIME ANNUAL SALARY | S C | SUPPLEMENT AMOUNT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

PAYROLL AUTHORIZATION

| TRX | HOME DEPT | SHORT TITLE | POSN NO | ACCOUNT | FISCAL YEAR EFT | FISCAL YEAR BUDGET |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| TOTALS | | | | | | |

| | MO DA YR HR | MO DA YR HR | MO DA YR HR | MO DA YR HR | MO DA YR HR |
|---|---|---|---|---|---|
| FROM | | | | | |
| THRU | | | | | |
| AMOUNT PER PAY PERIOD OR HOURLY RATE | | | | | |

☐ (A) NEW UGA EMPLOYEE ☐ (B) LATERAL TRANSFER ☐ (C) PROMOTION
☐ (D) REPLACEMENT POSN-NAME OF LAST INCUMBENT _____
☐ (E) APPOINTMENT TO NEW POSITION
☐ (F) CHANGE % TIME EMPLOYED FROM _____ TO _____
☐ (G) CONTINUATION WITHIN EXISTING BUDGET POSITION
☐ (H) REVISE DISTRIBUTION OF SALARY
☐ (I) TRANSFER FROM DEPT _____ TO _____
☐ (J) CHANGE PAY TYPE FROM _____ TO _____

☐ (K) CHANGE TITLE FROM _____ TO _____
☐ (L) CHANGE NAME FROM _____ TO _____
☐ (M) CHANGE SSN FROM _____ TO _____
☐ (N) LEAVE W/O PAY FROM _____ TO _____
☐ (O) CHG COUNTY $ FROM _____ TO _____
☐ (P) TERMINATION-REASON _____
☐ (Q) OTHER (SPECIFY) _____

REMARKS

DEPARTMENT HEAD ____ DATE ____ VICE PRESIDENT ____ DATE ____ BUDGET REVIEW ____ DATE ____ BUDGET OFFICE ____ DATE ____

# #4 User Experience

- Types of users:
  - Novice → need easy for learning
  - Expert → need easy for re-use
- How easy is the program to learn?
- How easy is the program to use for the expert?
- Consider adding shortcuts for the expert
- Where there is low employee turnover, some training can lessen the impact of less precise interfaces

# #5 Consistency

- Enables users to predict what will happen
- Reduces learning curve
- Considers items within an application and across applications
- Pertains to many different levels
  - Navigation controls
  - Terminology
  - Report and form design

# #6 Minimize Effort

- Three clicks rule
  - **Users should be able to go from the start or main menu of a system to the information or action they want in no more than three mouse clicks or three keystrokes**

# UI Design Principles (Guideline)

| Principle | Description |
|---|---|
| Layout | The interface should be a series of areas on the screen that are used consistently for different purposes—for example, a top area for commands and navigation, a middle area for information to be input or output, and a bottom area for status information. |
| Content awareness | Users should always be aware of where they are in the system and what information is being displayed. |
| Aesthetics | Interfaces should be functional and inviting to users through careful use of white space, colors, and fonts. There is often a tradeoff between including enough white space to make the interface look pleasing without losing so much space that important information does not fit on the screen. |
| User experience | Although ease of use and ease of learning often lead to similar design decisions, there is sometimes a tradeoff between the two. Novice users or infrequent users of software will prefer ease of learning, whereas frequent users will prefer ease of use. |

# UI Design Principles (Guideline)

| Principle | Description |
| --- | --- |
| Consistency | Consistency in interface design enables users to predict what will happen before they perform a function. It is one of the most important elements in ease of learning, ease of use, and aesthetics. |
| Minimal user effort | The interface should be simple to use. Most designers plan on having no more than three mouse clicks from the starting menu until users perform work. |

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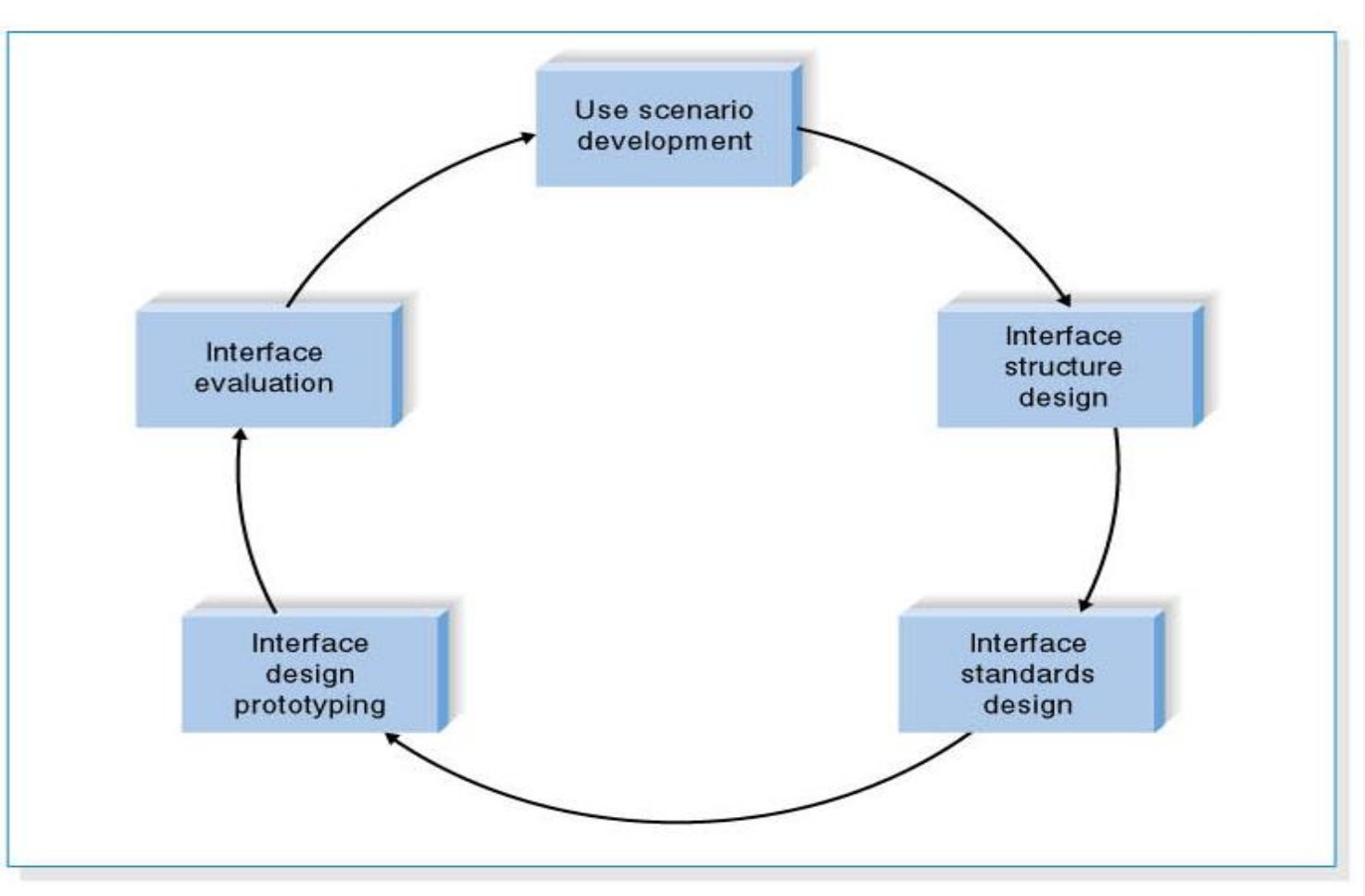
# USER INTERFACE DESIGN PROCESS

# User Interface Design Process



# #1 Use Scenario Development

- An outline of steps to perform work
- User interface design is a **use-case driven, incremental, and iterative process.**
- Presented in a simple narrative tied through the related **use case and DFD**
- Document the most common paths through the use case so interface designs will be easy to use for those situations.
- Given that the design process is use case driven, the analysts begin the user interface design process by **examining the *use cases*** and their associated ***sequence diagrams*.**

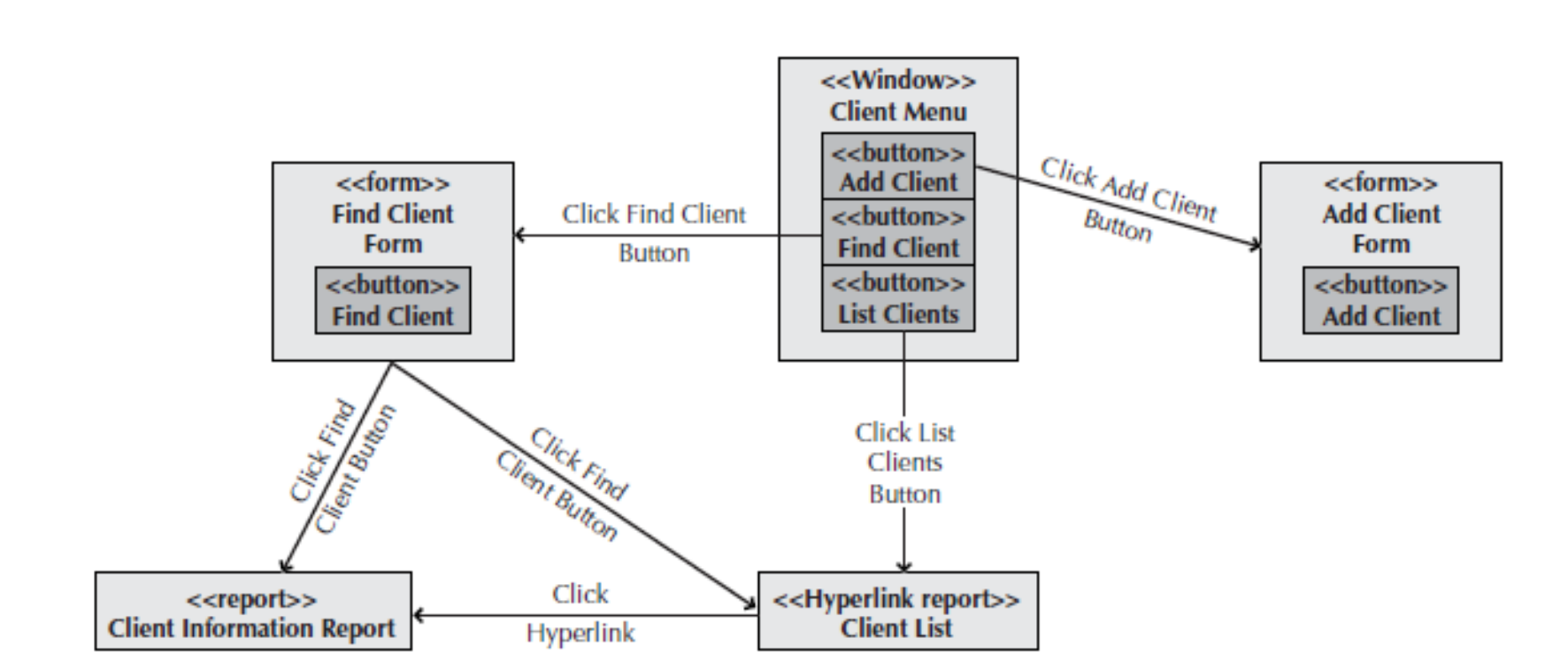
# Your Turn ☺

1. Visit the Web site for your university and navigate through several of its Web pages.
2. Develop two use scenarios for it.

# #2 Interface/Navigation Structure Design

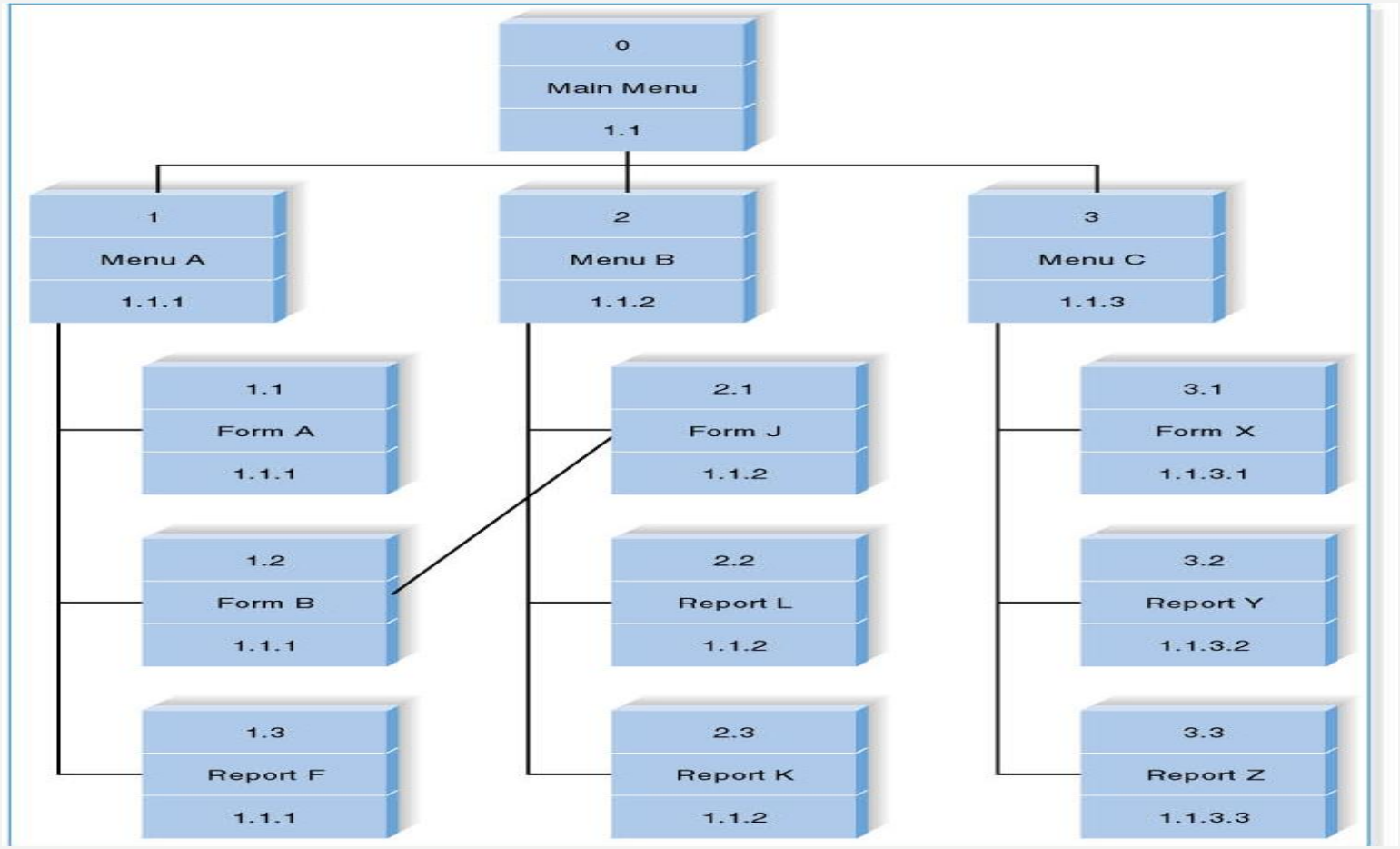
- A diagram showing how all screens, forms, and reports are related
- Shows how user moves from one to another
- A WND is very similar to a behavioral state machine
- A behavioral state machine typically models the ***state* changes of an object**, whereas a WND models the **state changes of the user interface**. In a WND, each state of the user interface is represented as a box.
- A box typically corresponds to a user interface component, such as a *window, form*, *button,* or *report*.

# Example Windows Navigation Diagram (WND)




- A WND is very similar to a behavioral state machine

# Example Other Interface Structure Design



# #3 Interface Standards Design

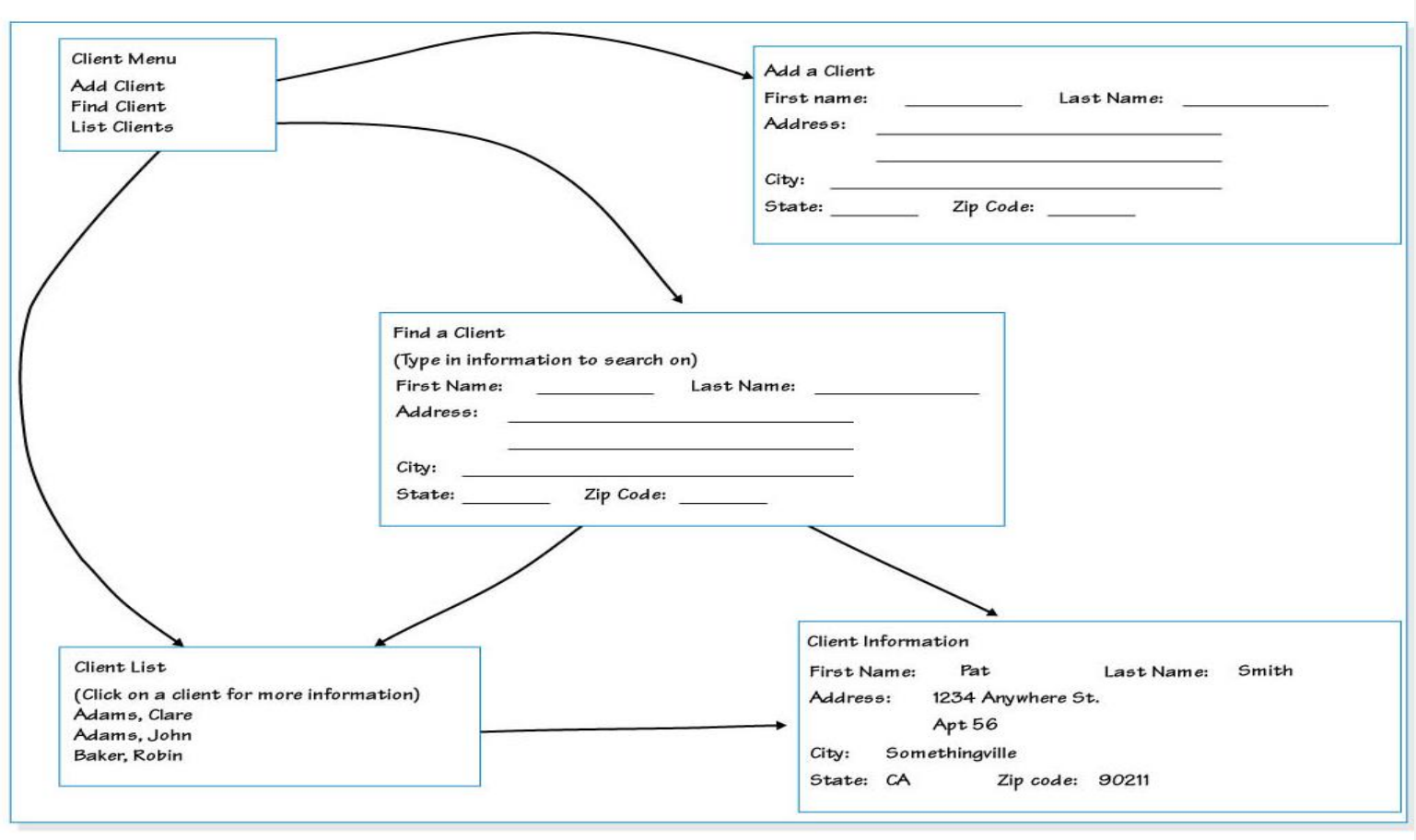
The basic elements that are common across individual screens, forms, and reports within the application.

1. **Interface metaphor**
    - Desktop, checkbook, shopping cart
2. **Interface objects**
3. **Interface actions**
    - Language style (buy vs purchase; modify vs change)
4. **Interface icons**
5. **Interface templates** → general appearance

# #4 Interface Design Prototyping

- A mock-up or simulation of screen, form, or report
- Common methods include
  - Storyboarding
  - Windows layout diagram
  - UI prototype

# Storyboard Example



# #5 Interface Evaluation

- **Heuristic evaluation**
  - Compare design to checklist
- **Walkthrough evaluation**
  - Team simulates movement through components
- **Interactive evaluation**
  - Users try out the system
- **Formal usability testing**
  - Expensive
  - Detailed use of special lab testing

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# NAVIGATION DESIGN

# Navigation Design (1)

- **Navigation** → movement between screens, reports forms and feedback to users by system
- **Assumptions**
  - Users do not read the manual
  - Users do not attended training
  - Users do not have external help at hand
- All controls should be clear and understandable and placed in an intuitive location on the screen.
- Ideally, the controls should anticipate what the user will do and simplify his or her efforts.

# Navigation Design (2)

- **Basic Principle**
  - Prevent mistakes
    - Limit choices
    - Never display commands that can't be used (or "gray them out")
    - Confirm actions that are difficult or impossible to undo
  - Simplify recovery from mistakes (Undo, redo)
  - Use consistent grammar order

# Navigation Design (3)

- **Three approaches to defining user commands:**
  - Language
  - Menu
  - Direct Manipulation**: change the size of objects, drag and drop**

# Kinds of Navigation Control (1)

**#1 Languages**

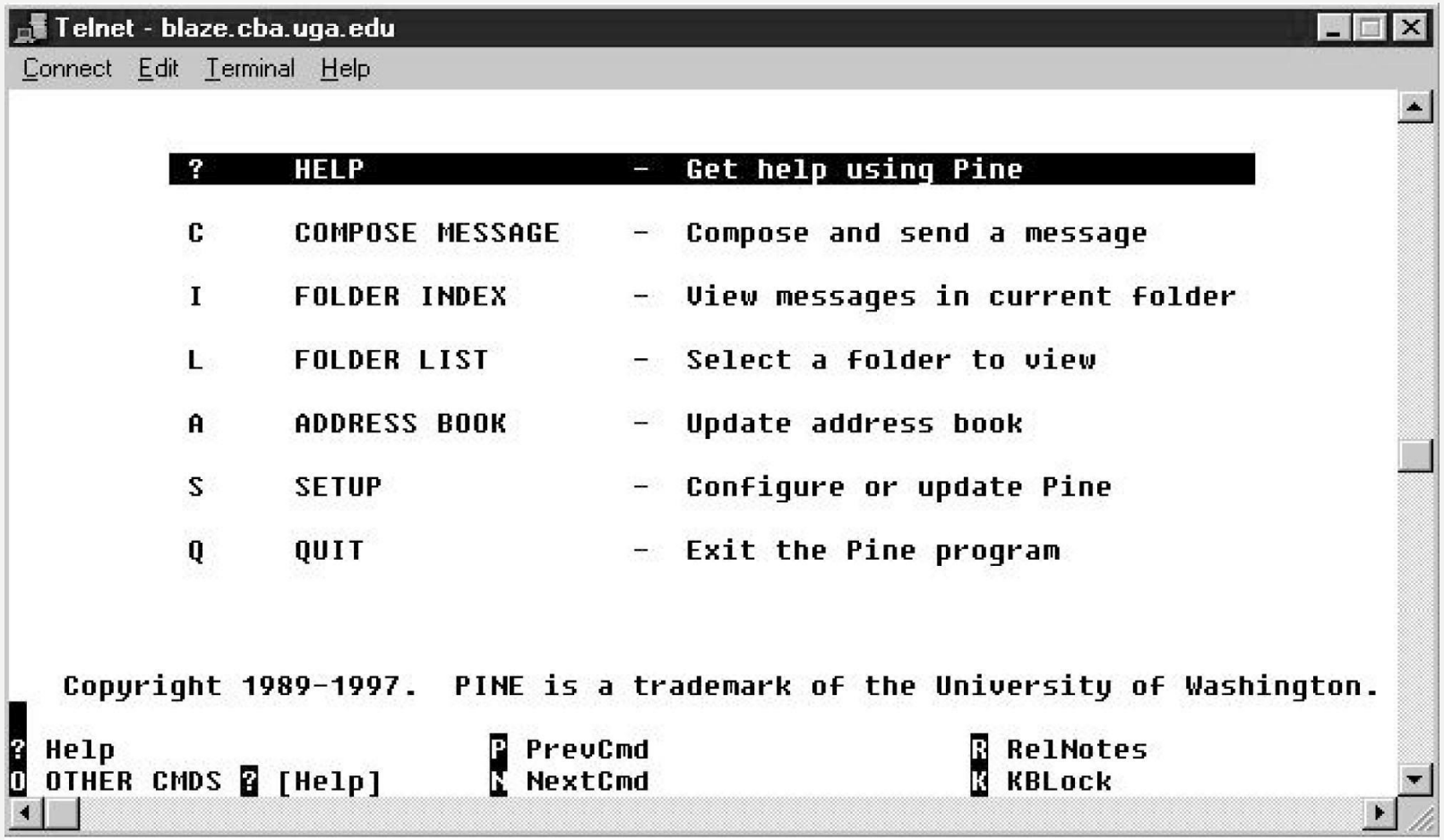
- Command language
  - Have (formal) syntax rules (or grammar)
  - Enable arbitrarily complex commands to be constructed by user
  - Even large (and complex) languages can be made easier to use, e.g. via syntax sensitive and (ideally) syntax directed editors (a form of structure editor)
- Natural language
  - Use to simplify grammar or dictionary of key words to interpret user natural language string e.g. Microsoft's Office Assistant; Google

# Kinds of Navigation Control (2)

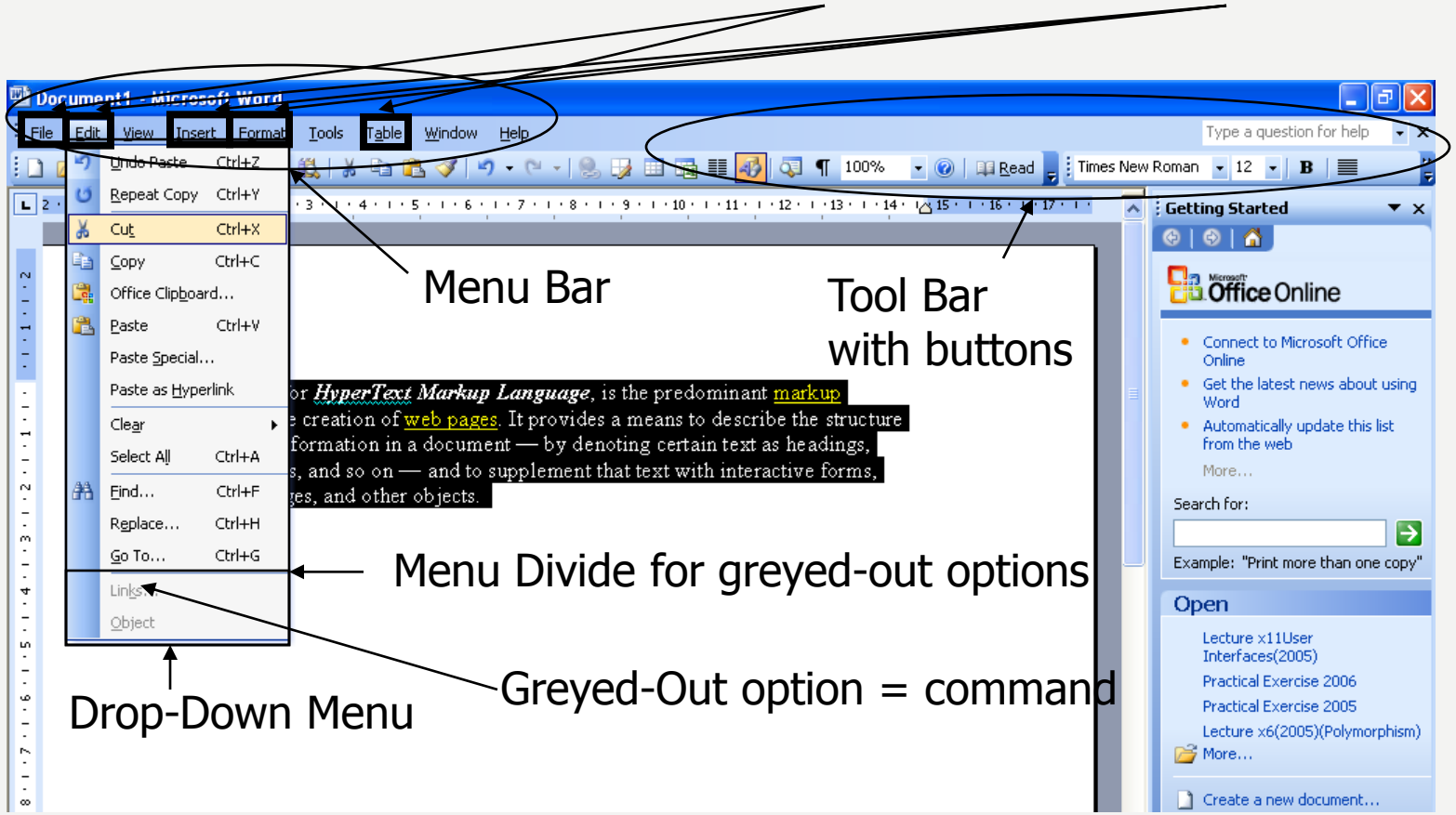
**#2 Menus**

- Menu options enable user to choose action to be performed (or applied to selected object)
- Options set should reflect current state of object (possibly history of previously applied operations)
- Larger menus should be structured as submenu's hierarchically, and cascaded to aid user
- "hot keys" provide use with single keystroke option for commonly used actions

# A Traditional Menu in a UNIX System



# Menus can group options by interface objects OR interface actions



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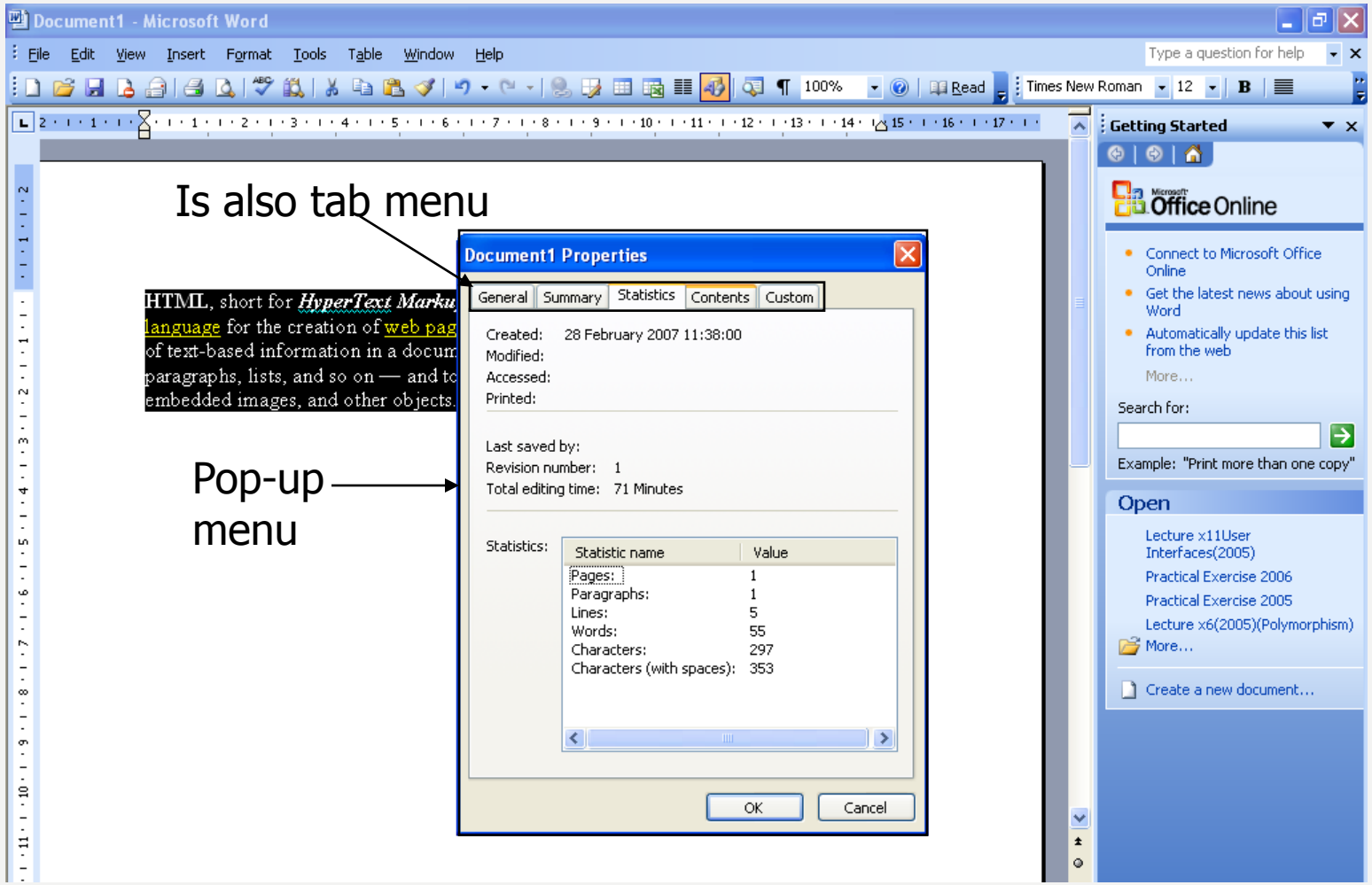
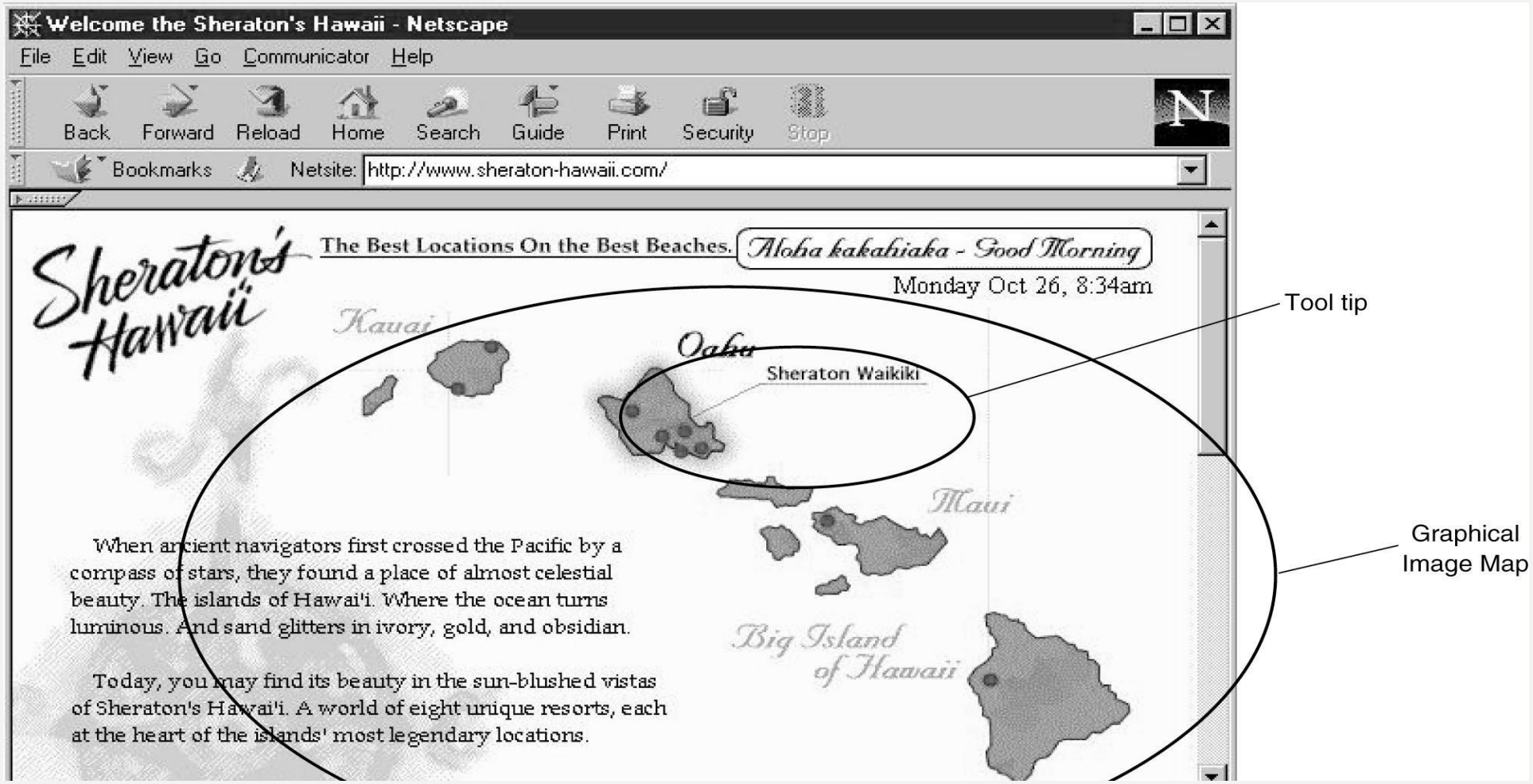


# Image Map


Welcome the Sheraton's Hawaii - Netscape
File Edit View Go Communicator Help
Back Forward Reload Home Search Guide Print Security Stop
Bookmarks Netsite: http://www.sheraton-hawaii.com/
Sheraton's Hawaii
The Best Locations On the Best Beaches.
Aloha kakahiaka - Good Morning
Monday Oct 26, 8:34am
Kauai
Oahu
Sheraton Waikiki
Maui
Big Island of Hawaii
When ancient navigators first crossed the Pacific by a compass of stars, they found a place of almost celestial beauty. The islands of Hawai'i. Where the ocean turns luminous. And sand glitters in ivory, gold, and obsidian.
Today, you may find its beauty in the sun-blushed vistas of Sheraton's Hawai'i. A world of eight unique resorts, each at the heart of the islands' most legendary locations.
Tool tip
Graphical Image Map

# #3 Direct Manipulation

- WIMPs interfaces support direct manipulation
  - Provide screen cursor via mouse (or trackball, touch screen, pen, etc.) and mouse that enables object(s) at interface to be selected, or cursor positioned within components of an object (e.g. within text), or action applied to selected object (e.g. “cut” selected text) via menu option
    - Keyboard can also be used via 6543 keys
  - Used with icons to start programs
  - Used to shape and size objects
  - May not be intuitive for all commands

# #3 Kinds of menu and their appropriate use (1)

| Type of Menu | When to Use | Notes |
|---|---|---|
| **Menu bar**<br>List of commands at the top of the screen; always on-screen | Main menu for system | Use the same organization as the operating system and other packages (e.g., File, Edit, View).<br>Menu items are always one word, never two.<br>Menu items lead to other menus rather than perform action.<br>Never allow users to select actions they can't perform (instead, use grayed-out items). |
| **Drop-down menu**<br>Menu that drops down immediately below another menu; disappears after one use | Second-level menu, often from menu bar | Menu items are often multiple words.<br>Avoid abbreviations.<br>Menu items perform action or lead to another cascading drop-down menu, pop-up menu, or tab menu. |
| **Pop-up menu**<br>Menu that pops up and floats over the screen; disappears after one use | As a shortcut to commands for experienced users | Pop-up menus often (not always) are invoked by a right click in Windows-based systems.<br>These menus are often overlooked by novice users, so usually they should duplicate functionality provided in other menus. |
| **Tab menu**<br>Multipage menu with one tab for each page that pops up and floats over the screen; remains on-screen until closed | When user needs to change several settings or perform several related commands | Menu items should be short to fit on the tab label.<br>Avoid more than one row of tabs, because clicking on a tab to open it can change the order of the tabs and in virtually no other case does selecting from a menu rearrange the menu itself. |

# #3 Kinds of menu and their appropriate use (2)

| Type of Menu | When to Use | Notes |
|---|---|---|
| **Tool bar**<br>Menu of buttons (often with icons) that remains on screen until closed | As a shortcut to commands for experienced users | All buttons on the same tool bar should be the same size.<br>If the labels vary dramatically in size, then use two different sizes (small and large).<br>Buttons with icons should have a tool tip, an area that displays a text phrase explaining the button when the user pauses the mouse over it. |
| **Image map**<br>Graphic image in which certain areas are linked to actions or other menus | Only when the graphic image adds meaning to the menu | The image should convey meaning to show which parts perform action when clicked.<br>Tool tips can be helpful. |

# Messages (1)

- Dialogue with user
  - Presents status information
  - Dialogue requires user to acknowledge message
  - May be text or icons
  - Must be useful dialogue for user
    - e.g. unique number enables helpdesk or web knowledge-base to be searched effectively
    - May involve non-trivial dialogue to aid user in correcting error

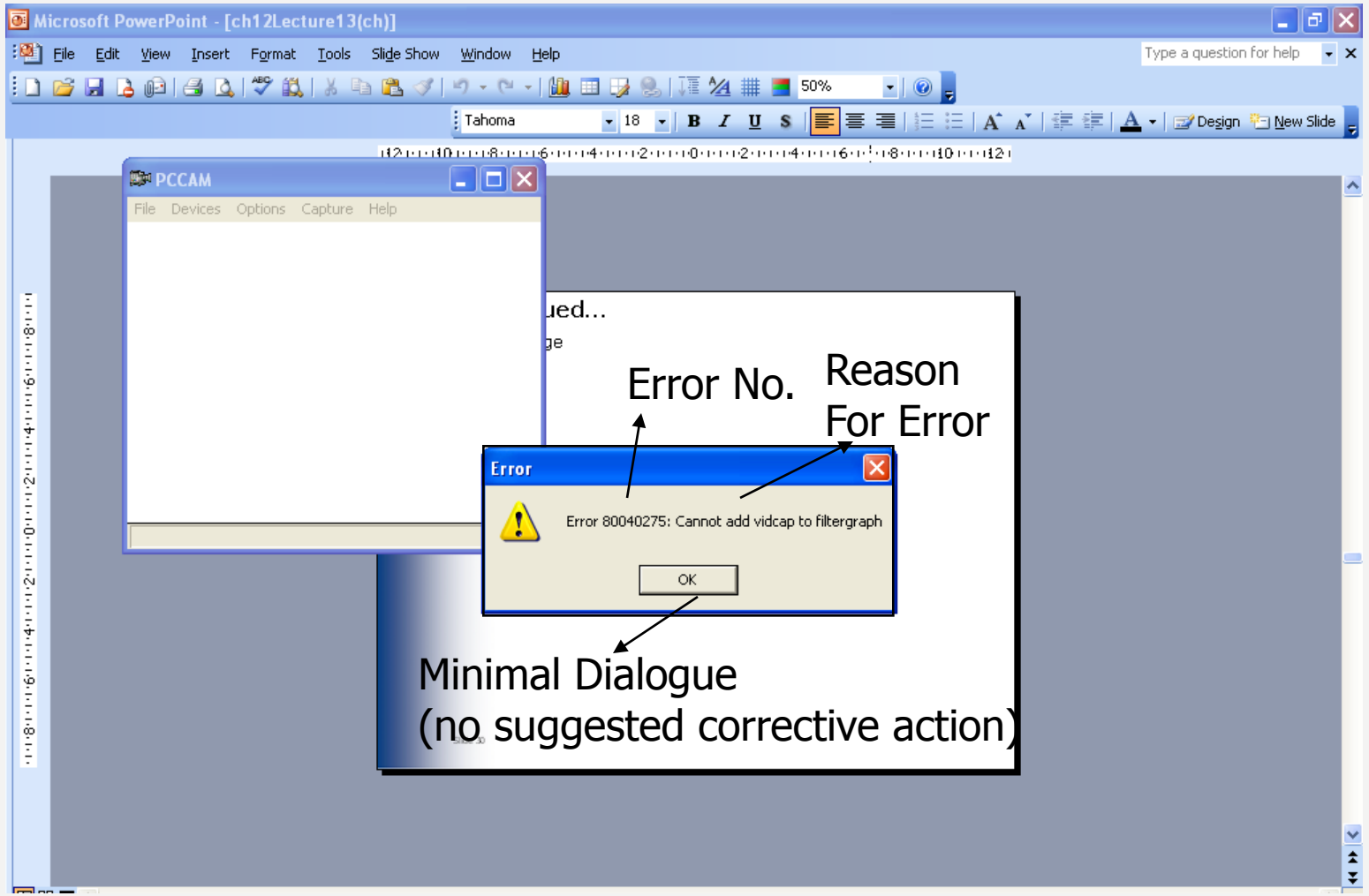
# Messages (2)

- Kinds of message
  - **Error message**
    - User has selected impermissible or unsupported operation
    - Dialogue explains nature of impermissible or unsupported action, suggest corrective measures
  - **Confirmation message**
    - User selects action which cannot be undone
    - Dialogue explains nature of actions effect on object action is applied to
    - User confirms action or cancels action at end of dialogue

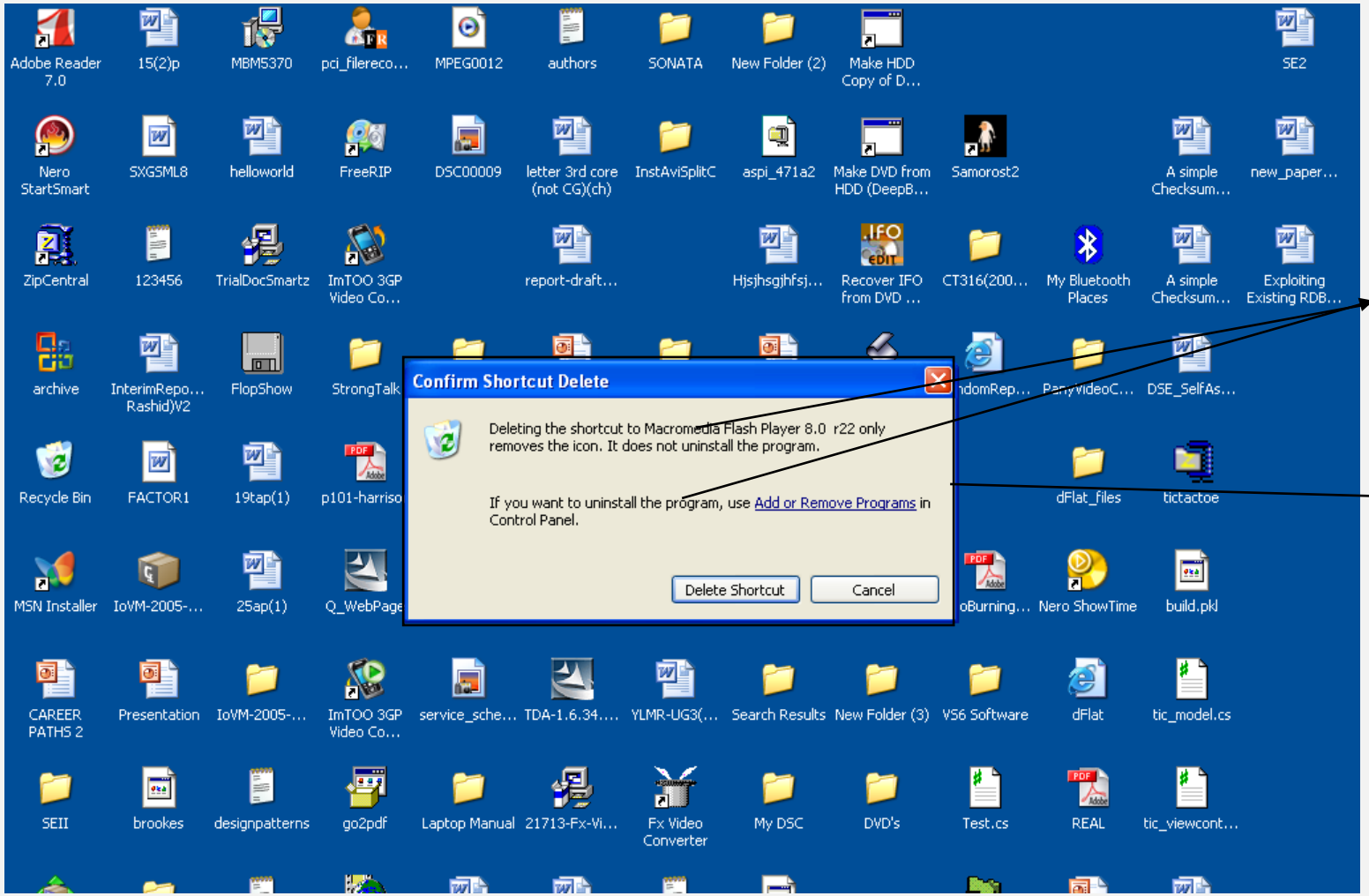
# Messages (3)

- **Acknowledgment message**
  - Only for critical actions
  - Object action applied to should have screen representation updated to confirm state change to user
- **Delay message**
  - For any action that has indeterminate termination
  - Dialogue allows user to cancel action
  - Dialogue shows predicted completion time and elapsed time e.g. as updating icon
- **Help message**
  - System wide feature
  - Organized as table of contents and/or keyword search
  - Context-sensitive via state of selected object or action to be applied to object.

# Error Massages



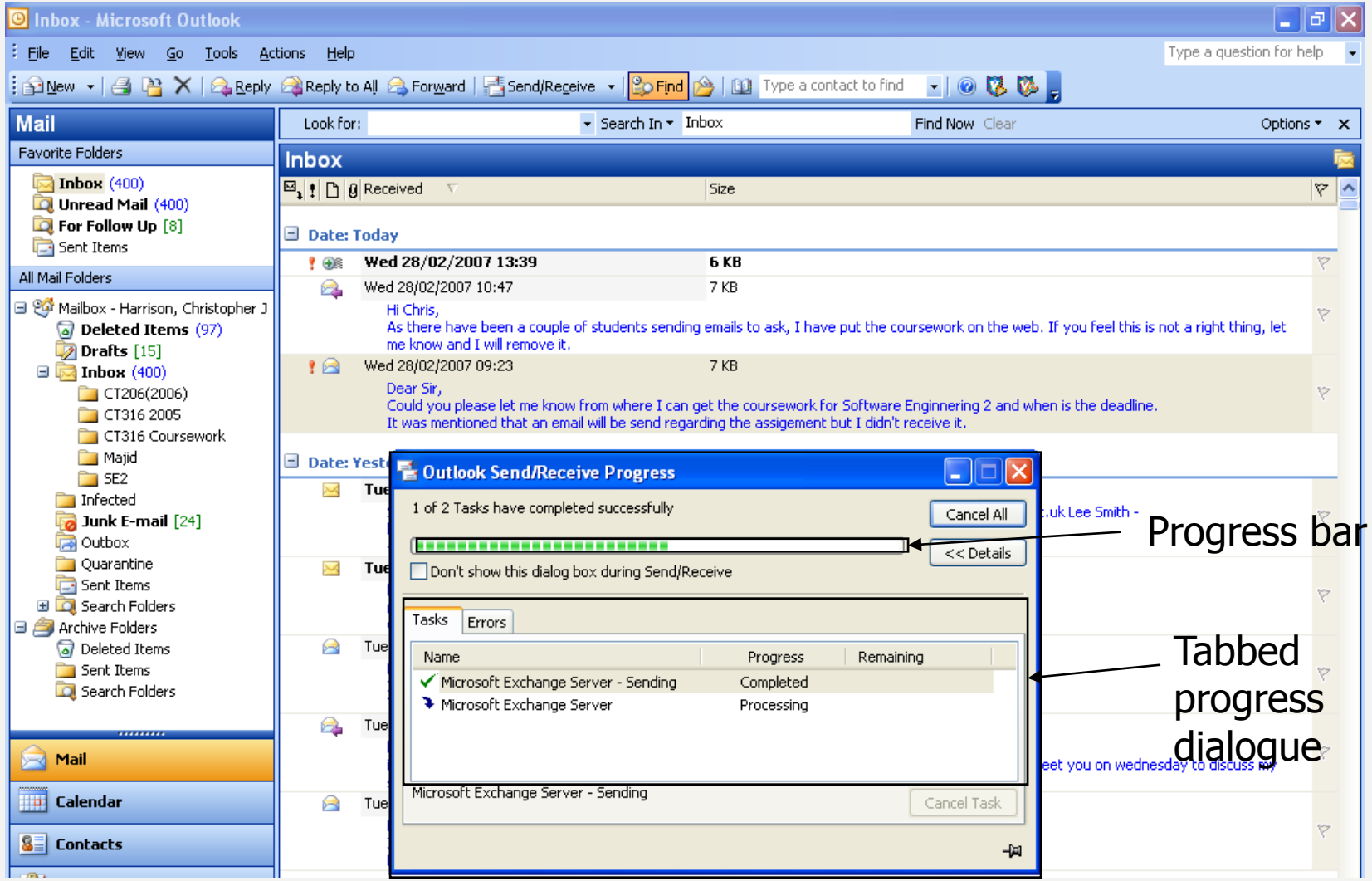
# Confirmation Messages



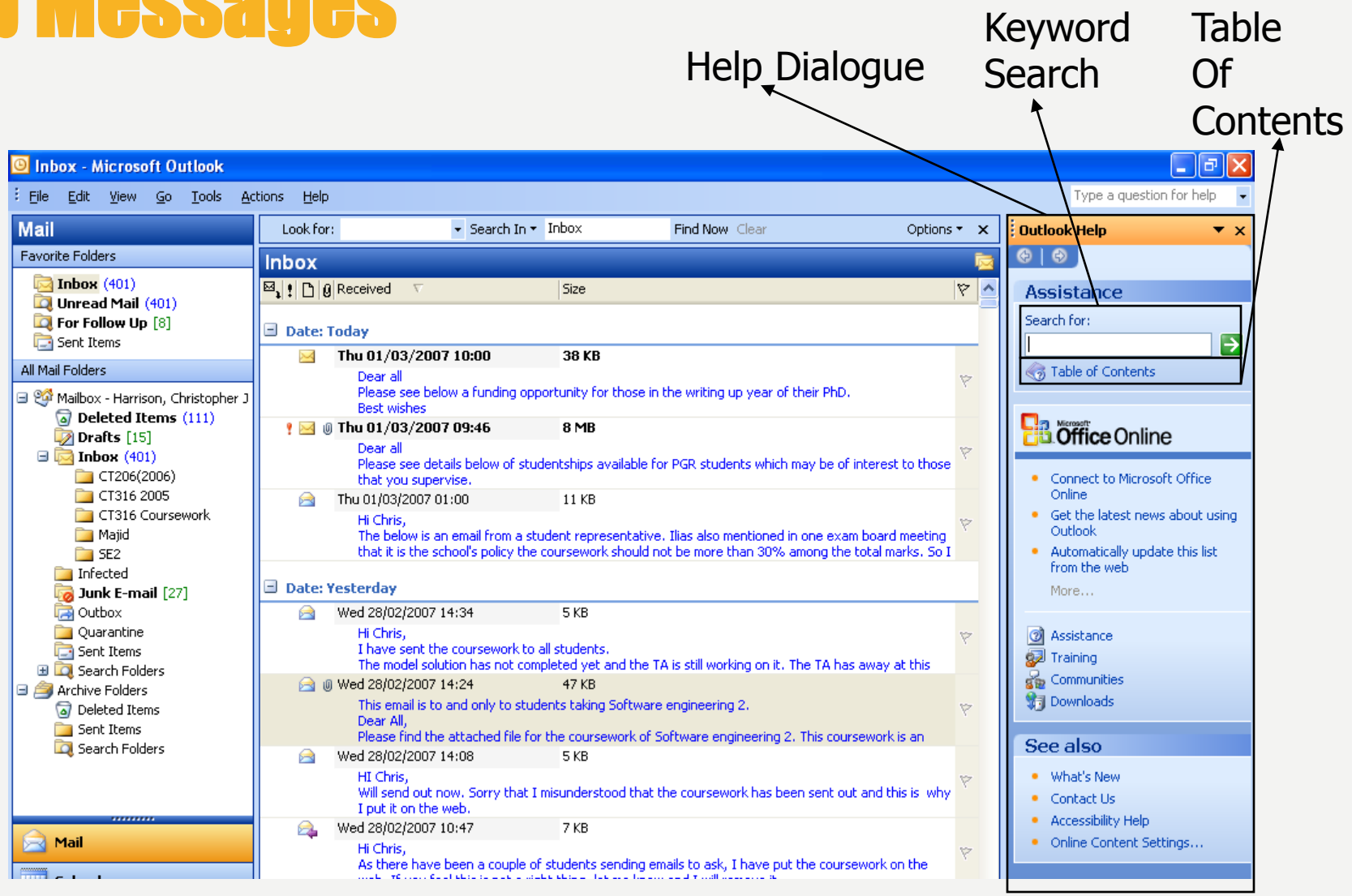

Explanation of Cause and suggested Corrective action

Confirmation Dialogue

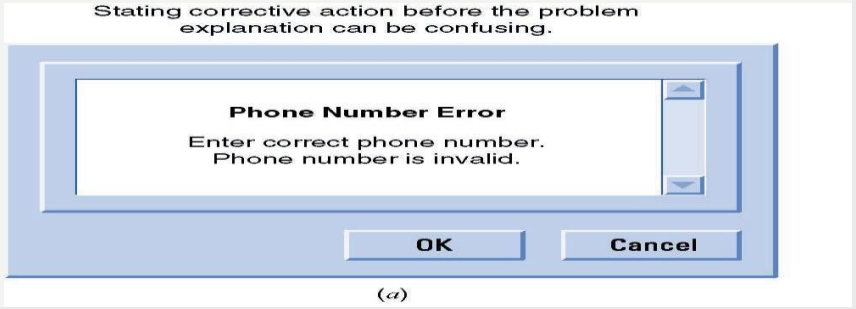
# Delay Messages



# Help Messages



# Systematic Construction of an Error Message Dialogue



# Message Tips

1. Should be clear, concise, and complete
2. Should be grammatically correct and free of jargon and abbreviations (unless they are the users)
3. Avoid negatives and humor

# Types of Messages (summary)

| Type of Messages | When to Use | Notes |
|---|---|---|
| **Error message**<br>Informs the user that he or she has attempted to do something to which the system cannot respond | When user does something that is not permitted or not possible | Always explain the reason and suggest corrective action.<br>Traditionally, error messages have been accompanied by a beep, but many applications now omit it or permit users to remove it. |
| **Confirmation message**<br>Asks the user to confirm that he or she really wants to perform the action selected | When user selects a potentially dangerous choice, such as deleting a file | Always explain the cause and suggest possible action.<br>Often include several choices other than "OK" and "cancel." |
| **Acknowledgment message**<br>Informs the user that the system has accomplished what it was asked to do | Seldom or never; users quickly become annoyed with all the unnecessary mouse clicks | Acknowledgment messages are typically included because novice users often like to be reassured that an action has taken place.<br>The best approach is to provide acknowledgment information without a separate message on which the user must click. For example, if the user is viewing items in a list and adds one, then the updated list on the screen showing the added item is sufficient acknowledgment. |
| **Delay message**<br>Informs the user that the computer system is working properly | When an activity takes more than seven seconds | This message should permit the user to cancel the operation in case he or she does not want to wait for its completion.<br>The message should provide some indication of how long the delay may last. |
| **Help message**<br>Provides additional information about the system and its components | In all systems | Help information is organized by table of contents and/or keyword search.<br>*Context-sensitive help* provides information that is dependent on what the user was doing when help was requested.<br>Help messages and on line documentation are discussed in Chapter 13. |

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# INPUT DESIGN

# Basic Principle of Input Design

1. The goal is to simply and easily capture accurate information for the system
2. Reflect the nature of the inputs
3. Find ways to simplify their collection

# Online versus Batch Processing

- **Online processing** immediately records the transaction in the appropriate database
- **Batch processing** collects inputs over time and enters them into the system at one time in a batch
- Batch processing simplifies data communications and other processes, master files are not updated real time

# Capture Data at the Source

1. Reduces duplicate work
2. Reduces processing time
3. Decreases cost
4. Decreases probability of error

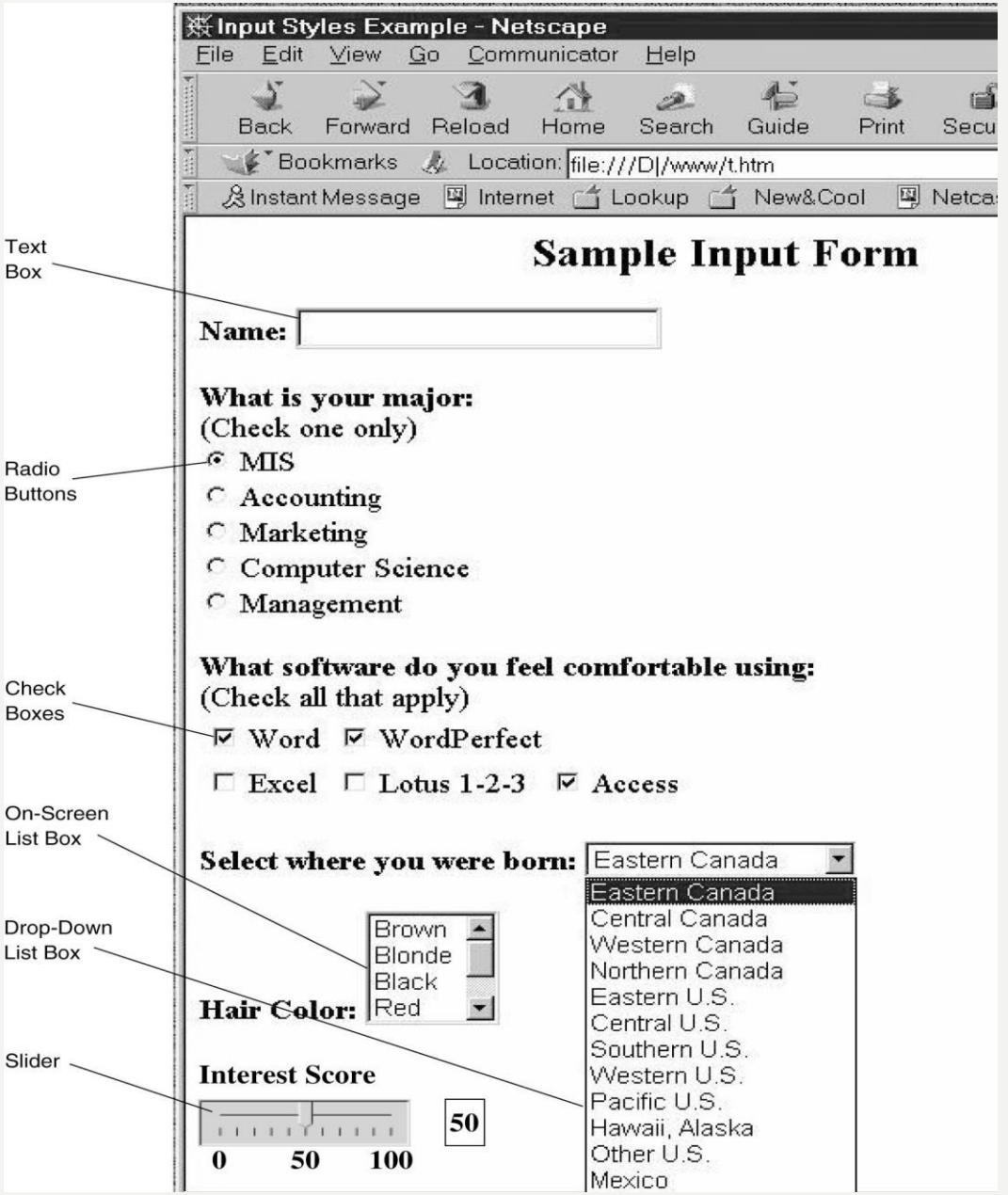
# Source Data Automation

- Can be obtained by using the following technologies:
  - bar code readers
  - optical character recognition
  - magnetic stripe readers
  - smart cards
  - RFID (radio frequency identification tags)
- ***How can internet be used for source data automation?***

# Minimize Keystrokes

- Never ask for information that can be obtained other ways
  - Lookups
  - Dropdown lists
  - Default values

# Example


Input Styles Example - Netscape
File Edit View Go Communicator Help
Back Forward Reload Home Search Guide Print
Bookmarks Location: file:///D|/www/t.htm
Instant Message Internet Lookup New&Cool
Sample Input Form
Text Box
Name:
What is your major:
(Check one only)
Radio Buttons
MIS
Accounting
Marketing
Computer Science
Management
What software do you feel comfortable using:
(Check all that apply)
Check Boxes
Word
WordPerfect
Excel
Lotus 1-2-3
Access
On-Screen List Box
Select where you were born:
Eastern Canada
Central Canada
Western Canada
Northern Canada
Eastern U.S.
Central U.S.
Southern U.S.
Western U.S.
Pacific U.S.
Hawaii, Alaska
Other U.S.
Mexico
Drop-Down List Box
Brown
Blonde
Black
Red
Hair Color:
Slider
Interest Score
50
0
50
100

# Types of Inputs

1. Data items linked to fields
2. Text
3. Numbers
4. Selection boxes
    - **Check boxes**
    - **Radio buttons**
    - **On-screen list boxes**
    - **Drop-down list boxes**
    - **Combo boxes**
    - **Sliders**

# Types of Selection Box (1)

- **Check Box**
  - Lists all alternatives with box to select
  - Enables multiple alternatives from list
  - Alternatives may not be mutually exclusive
  - No negatives alternatives
  - Box labels should be ordered
  - Max. 10 alternatives (if >10 use subcategories)

# Types of Selection Box (2)

- **Radio Buttons**
  - Lists all mutually exclusive alternatives, each with circle to select
  - Enables single unique alternative from list
  - Max. 6 alternatives (if >6 use drop-down list box)
  - If 2 alternatives, use one check box instead
  - Avoid radio buttons & check boxes

# Types of Selection Box (3)

- **On-screen list box**
  - List of alternatives in a box
  - Only use if no room for check boxes or radio buttons
  - Enables [1] single unique alternative c.f. radio button or [2] multiple alternatives (c.f. check boxes)
  - Alternatives in list can be scrolled
- **Drop-down list box**
  - Selected item in one-line box, box opens to reveal alternatives
  - Use when no room to display all alternatives
  - Similar to radio buttons but more compact
  - Hides alternatives until opened
  - Simplifies design if no. of alternatives is unclear

# Types of Selection Box (3)

- **Combo box**
  - Drop-down list box for keyboard entry with scrolling
  - Use as shortcut for experienced users
- **Slider**
  - Graphic scale with sliding pointer to select a number
  - Used when entering approximate value from large continuous scale
  - Slider selection of value is inexact
  - Can include updating number box to indicate current exact value on scale

# Types of Input Validation (1)

- All data must be validated to ensure accuracy = at least one check, ideally ALL appropriate checks (URR = “think” ***U****nits*, ***R***ange, ***R***esolution)
- Data failing any check should be rejected until valid

# Six different kinds of check

## Completeness check

- Ensures all required data has been entered
- Used when several fields must be completed before form can be processed
- If any of required data is missing, incomplete for re-presented to user, e.g. with required fields highlighted

## Format check

- Ensures data values are correct type and in correct format
- Used when fields contain numeric values or values are codes
- Ideally values are not entered as text, if string is entered it must be convertible to numeric value
- If coded values have format, values must be checked against format

# Six different kinds of check

## Range check

- Ensures data values are within specified range
- Used with ALL numeric data
- Can include logical checks e.g. implied age >110 years

## Check digit check

- Check digits added to numeric codes
- Used for all numeric codes

# Six different kinds of check

- **Consistency checks**
  - Ensures data combinations are valid
  - Used when data values are related
  - Related data common, e.g. date of birth precedes date of driving license issue
  - System prompts for invalid related values to be consistent
- **Database checks**
  - Data values compared with stored (correct) values
  - Used when critical values are already stored (elsewhere)
    - e.g. National Insurance number
  - Usually performed after all other kinds of check
    - Possibly opening database (or file) and always reading requires extra processing so only validated valued are queried and compared for correctness

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# OUTPUT DESIGN

# Output Design

- Outputs are what the system produces, whether on the screen, on paper, or in other media, such as the Web.
- Basic Principles
  - **Understand Report Usage**
  - **Manage Information Load**
  - **Minimize Bias**

# #1 Understand Report Usage

- Reports are used to identify specific items or used as references to find information, so the order in which items are sorted on the report or grouped within categories is critical.
- Web reports that are intended to be read from start to finish should be presented in one **long scrollable page**, whereas reports that are used primarily to find specific information should be broken into **multiple pages**, each with a **separate link.**
- Page numbers and the date on which the report was prepared are also important for reference reports.

# #1 Understand Report Usage

- ***Real-time reports*** provide data that are accurate to the second or minute at which they were produced (e.g., stock market quotes).
- ***Batch reports*** are those that report historical information that may be months, days, or hours old, and they often provide additional information beyond the reported information (e.g., totals, summaries, historical averages).
- **There are no inherent advantages to real-time reports over batch reports.**
- The only advantages lie in the time value of the information. If the information in a report is time critical (e.g., stock prices, air-traffic control information), then real-time reports have value.

# #2 Manage Information Load

- Most managers get too much information, not too little (i.e., the *information load* that the manager must deal with is too great).
- The goal of a well-designed report is **to provide all the information needed to support the task for which it was designed.**
- This does not mean that the report needs to provide all the information available on the subject—just what the users decide they need in order to perform their jobs.
- In some cases, this can result in the production of several different reports on the same topics for the same users because they are used in different ways.

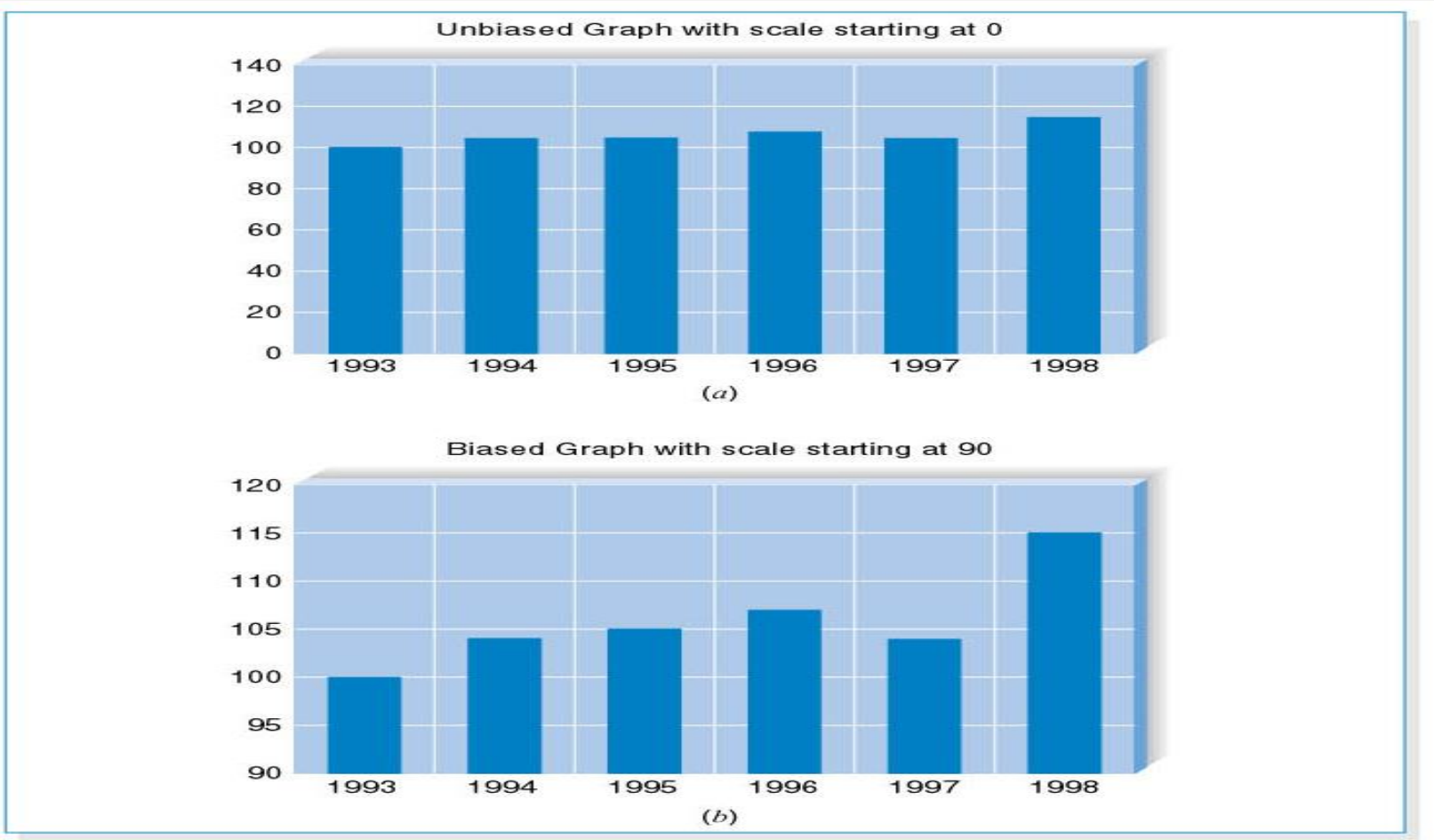
# #3 Minimize Bias

- No analyst sets out to design a biased report.
- The problem with bias is that it can be very subtle; analysts can introduce it unintentionally.
- *Bias* can be introduced by the way lists of data are sorted because **entries that appear first in a list can receive more attention** than those later in the list.
  - Data are often sorted in **alphabetical order**, making those entries starting with the letter *A* more prominent.
  - Data can be sorted in **chronological order** (or reverse chronological order), placing more emphasis on older (or most recent) entries.
  - Data may be sorted by **numeric value**, placing more emphasis on higher or lower values.

# #3 Minimize Bias

For example, consider a monthly sales report by state. Should the report be listed in alphabetical order by state name, in descending order by the amount sold, or in some other order (e.g., geographic region)? There are no easy answers to this, except to say that the order of presentation should match the way the information is used.

# Bias in Graphs



# Types of Output

| Type of Report | When to Use | Notes |
|---|---|---|
| **Detail report**<br>Lists detailed information about all the items requested | When user needs full information about the items | This report is usually produced only in response to a query about items matching some criteria.<br>This report is usually read cover to cover to aid understanding of one or more items in depth. |
| **Summary report**<br>Lists summary information about all items | When user needs brief information on many items | This report is usually produced only in response to a query about items matching some criteria, but it can be a complete database.<br>This report is usually read for the purpose of comparing several items to each other.<br>The order in which items are sorted is important. |
| **Turnaround document**<br>Outputs that "turn around" and become inputs | When a user (often a customer) needs to return an output to be processed | Turnaround documents are a special type of report that are both outputs and inputs. For example, most bills sent to consumers (e.g., credit-card bills) provide information about the total amount owed and also contain a form that consumers fill in and return with payment. |
| **Graphs**<br>Charts used in addition to and instead of tables of numbers | When users need to compare data among several items | Well-done graphs help users compare two or more items or understand how one has changed over time.<br>Graphs are poor at helping users recognize precise numeric values and should be replaced by or combined with tables when precision is important.<br>Bar charts tend to be better than tables of numbers or other types of charts when it comes to comparing values between items (but avoid three-dimensional charts that make comparisons difficult).<br>Line charts make it easier to compare values over time, whereas scatter charts make it easier to find clusters or unusual data.<br>Pie charts show proportions or the relative shares of a whole. |

# Summary

- The fundamental goal of navigation design is to make the system as simple to use as possible
- The goal of input mechanism is to simply and easily capture accurate information
- The goal of the output mechanism is to provide accurate information to users that minimize information overload and bias