SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

User Interface Design & Implementation

Menu Selection and Form Fill-in

Week 3 – Lecture 7

January – May Term, 2020

Assigned Reading: Chapter 8

Recall

Five main types of interaction style

1. Direct Manipulation
2. Menu Selection
3. Form Fill-in
4. Command Language
5. Natural Language

Today's Topics

- Menu selection: making choices
  - Single menus
  - Multiple menus
  - Menu contents
- Form fill-in for data entry
- Dialog boxes: combination of menus and forms

Today's Topics

- **Menu selection: making choices**
  - Single menus
  - Multiple menus
  - Menu contents
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- Dialog boxes: combination of menus and forms

Menu – the Real Thing

Helps diners organize their meal choices.

Choices are broken down into 3 groups:

1. Breakfast
2. Lunch
3. Dinner

Items are clearly categorized, e.g.:

Hot Items

Cold Items

Appetizers

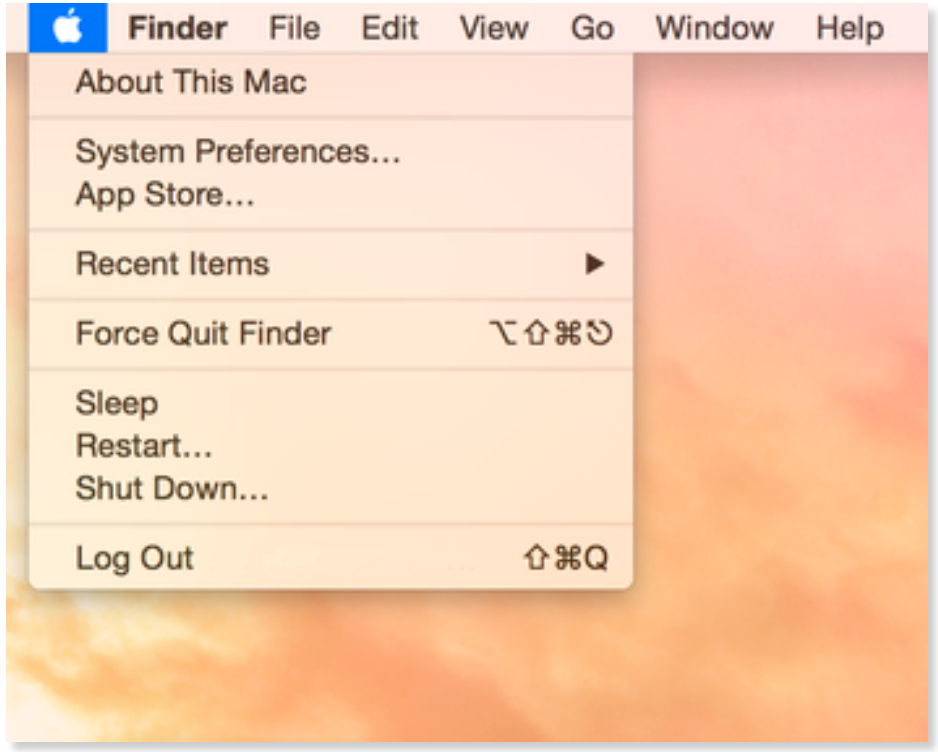
Entrees

Dessert

Hierarchical decomposition - Natural and comprehensible to most people

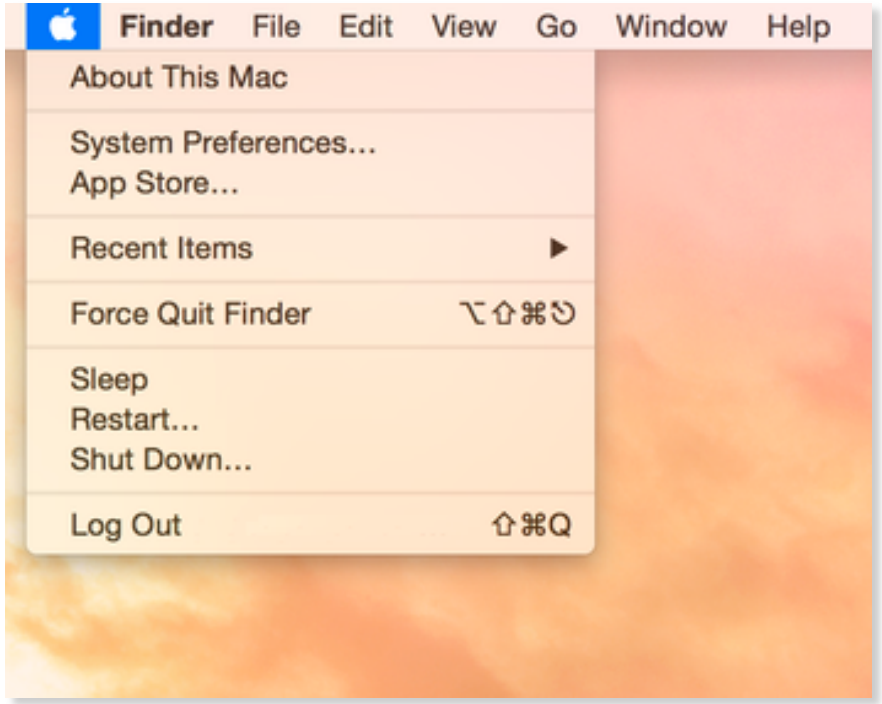
Menu – Computing

A **menu** is a list of **options** or **commands** presented to the user of a computer.



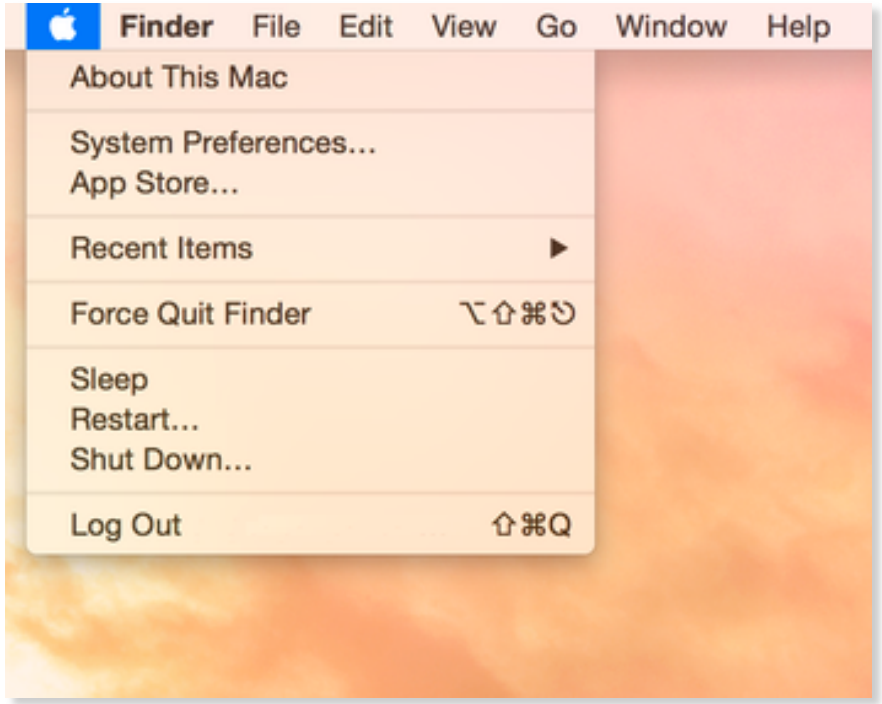
Menu Selection

- Primary goal: making choices
  - Menu Organization
    - Sensible
    - Comprehensible
    - Memorable
    - Convenient
  - Relevant to the user's tasks
    - Carefully consider task objects and actions



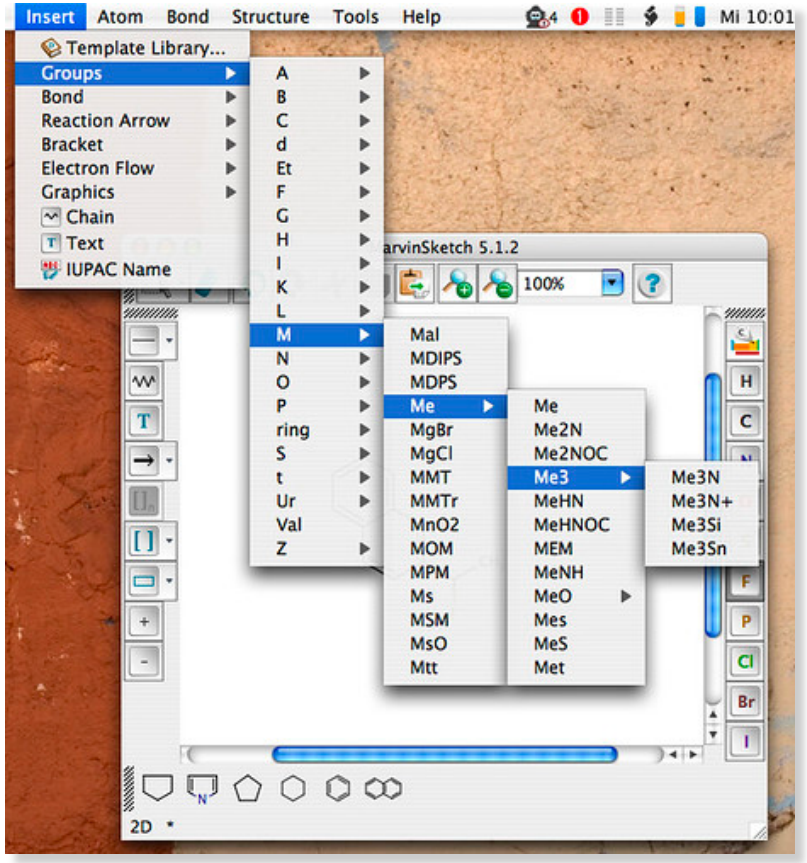
Menu Selection

- Advantages
  - Easily recognizable
  - Do not require users to remember any special syntax
  - Good for intermittent users
  - Help in structuring decision-making processes
  - Can be used with pointing devices or keystrokes



Menu Selection

- Poorly designed menus can be counter-productive
  - User can get easily lost navigating menus
  - User can become frustrated
  - Unclear categories or item labels can make it difficult to navigate and reduce performance
  - Bad menus can make us “dislike” an interface



Early User Studies on Menus

- 1982-1983, study by Liebelt et al
- Experiment 1
  - 1. Menus constructed with meaningful organization
  - 2. Menus constructed in a disorganized fashion

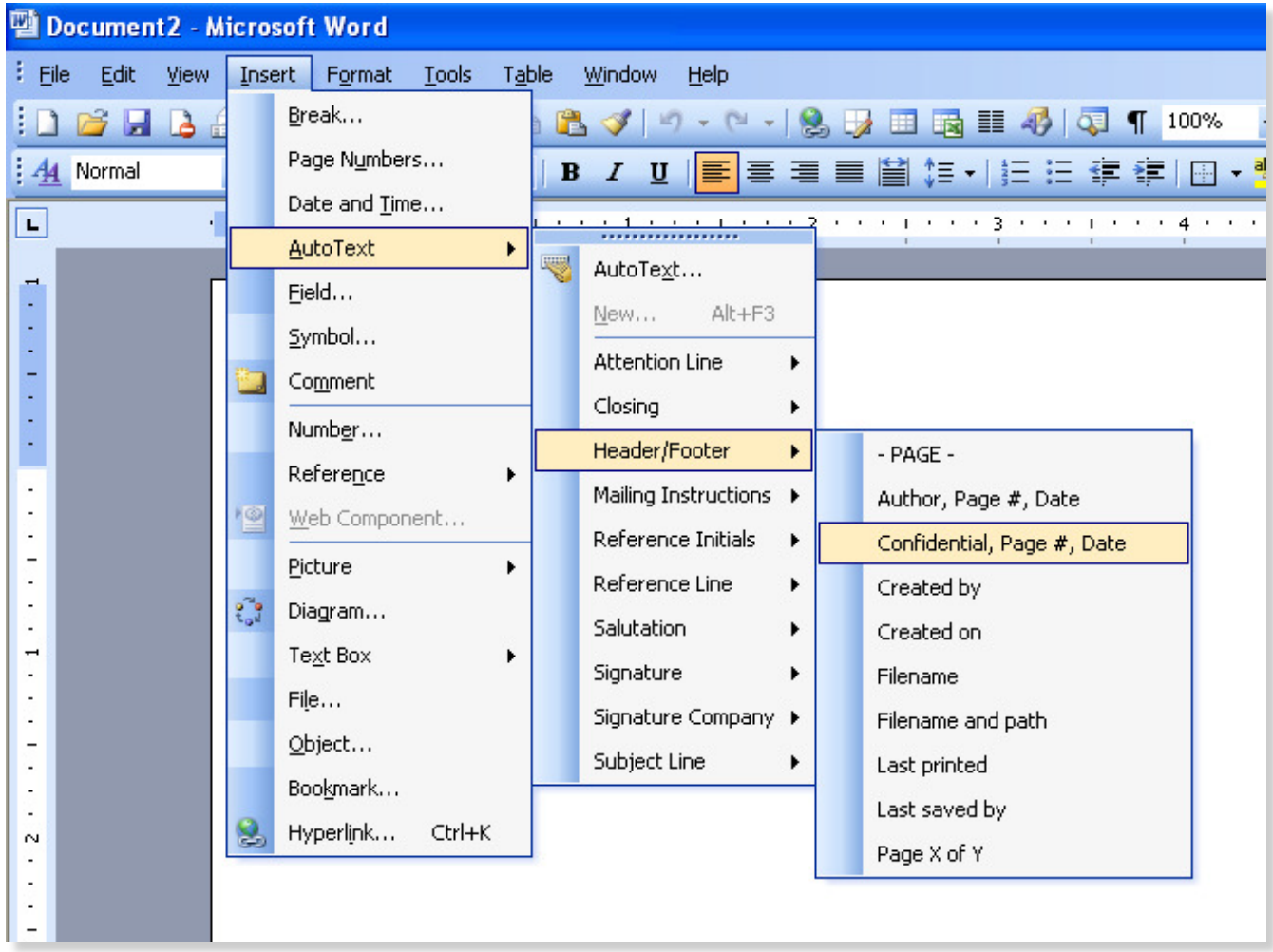
  RESULT: Users using **menu 1** required 50% less time to perform selection tasks
- Experiment 2
  - 1. Items placed in menu via meaningful categories
  - 2. Items placed in menu via Alphabetical order
  - 3. Items placed in menu via Random order

  RESULT: Users using **menu 1** demonstrated superior performance

Three Sub-topics

Three sub-topics here:

1. Single Menus
   – different forms
2. Multiple Menus
   – different organizations
3. Menu Contents
   – four issues

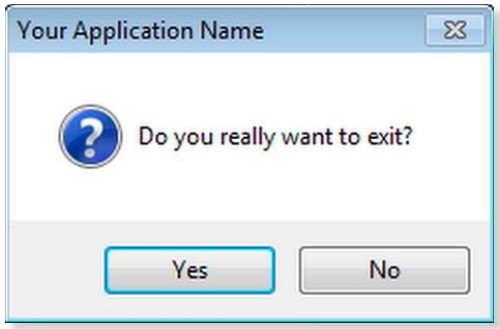


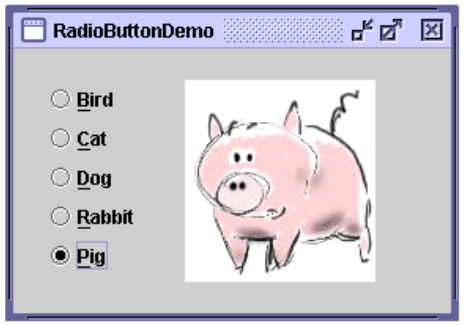
Today's Topics

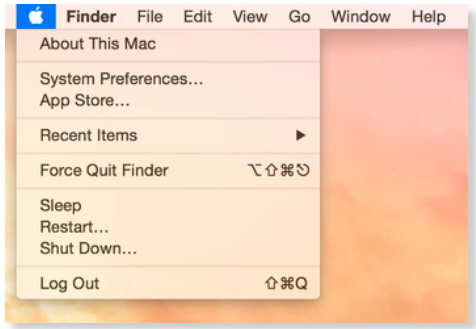
- Menu selection: making choices
  - **Single menus**
  - Multiple menus
  - Menu contents
- Form fill-in for data entry
- Dialog boxes: combination of menus and forms
- Consideration for small screens

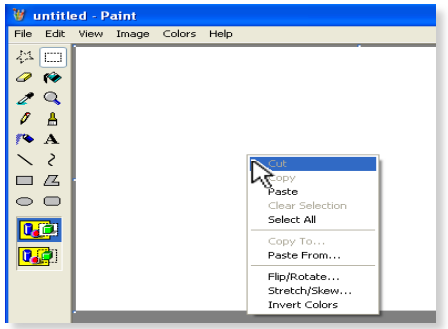
Single Menus

1. Binary menus
2. Multi-choice menus
3. Pull-down menus
4. Pop-up menus
5. Icon menus, palettes and toolbars



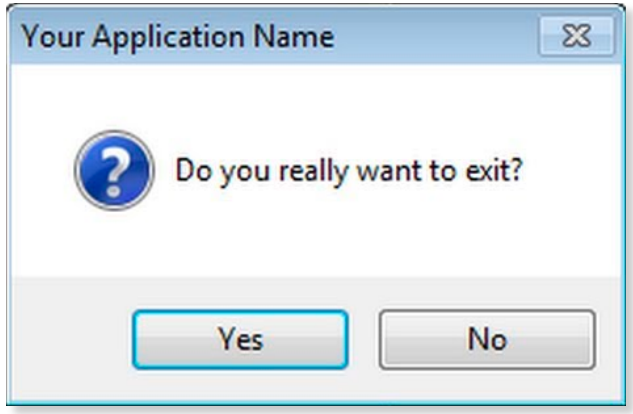


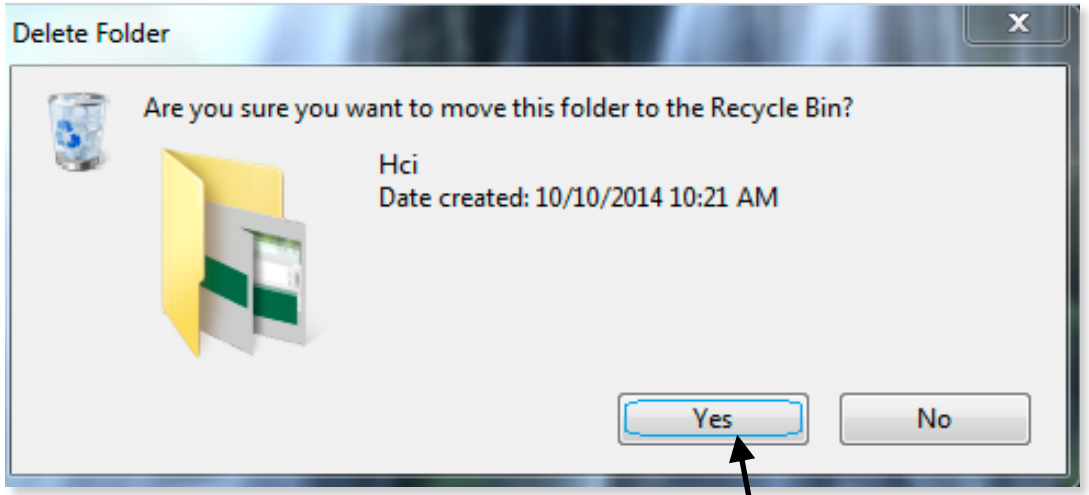




#1 Binary Menus

- Binary menus
  - Yes/No – OK/Cancel questions
  - Common in dialog box
  - Nice and easy. . . .
  - Default choice (avoid error)

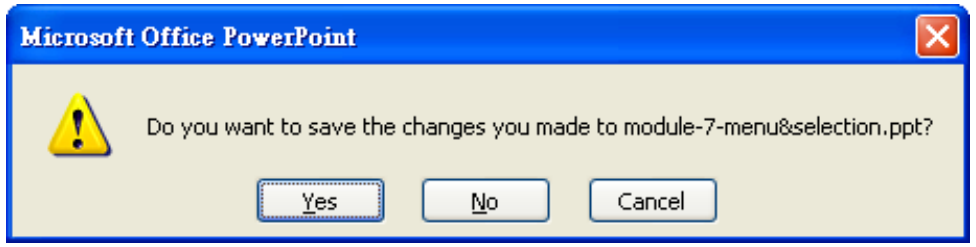


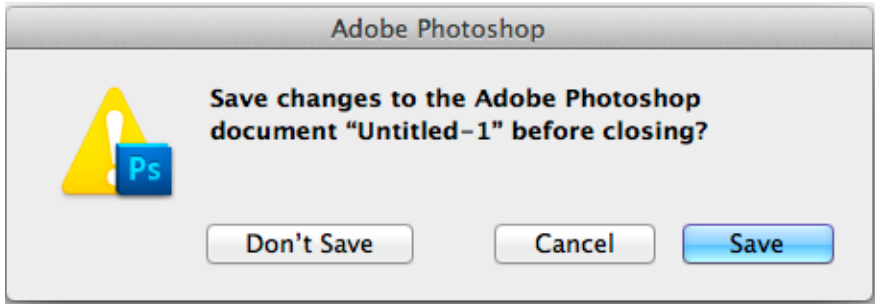


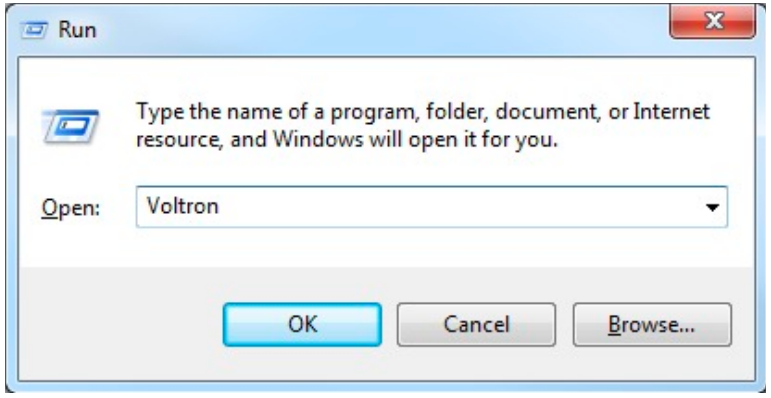
Usually with shortcut key

#2 Multi-choice Menus

- We can still use buttons for a few number of items…

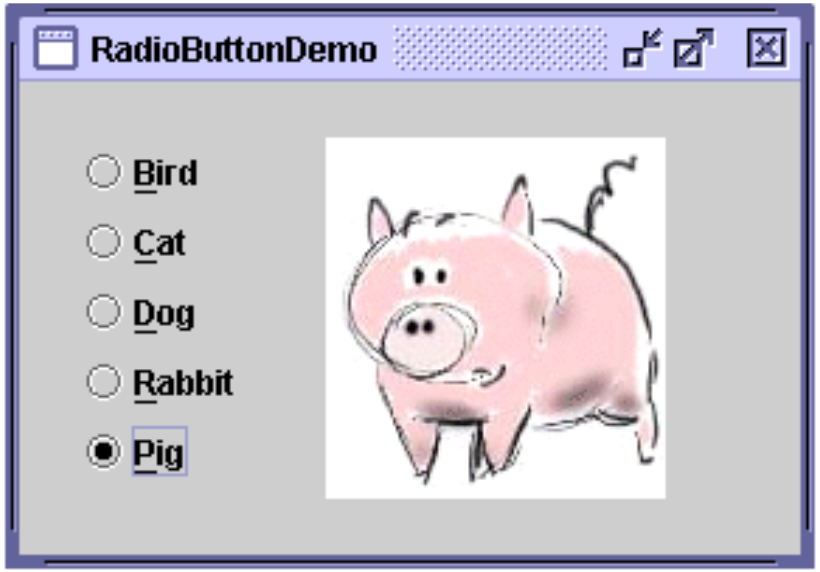




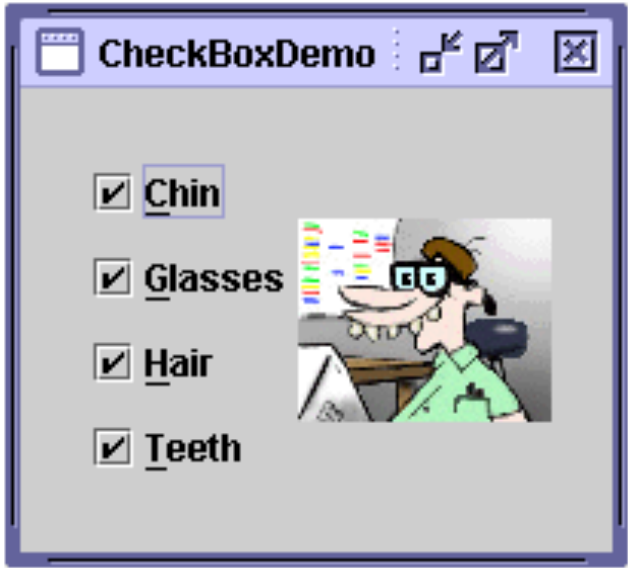


#2 Multi-choice Menus

- Selecting multiple items with radio buttons and checkboxes



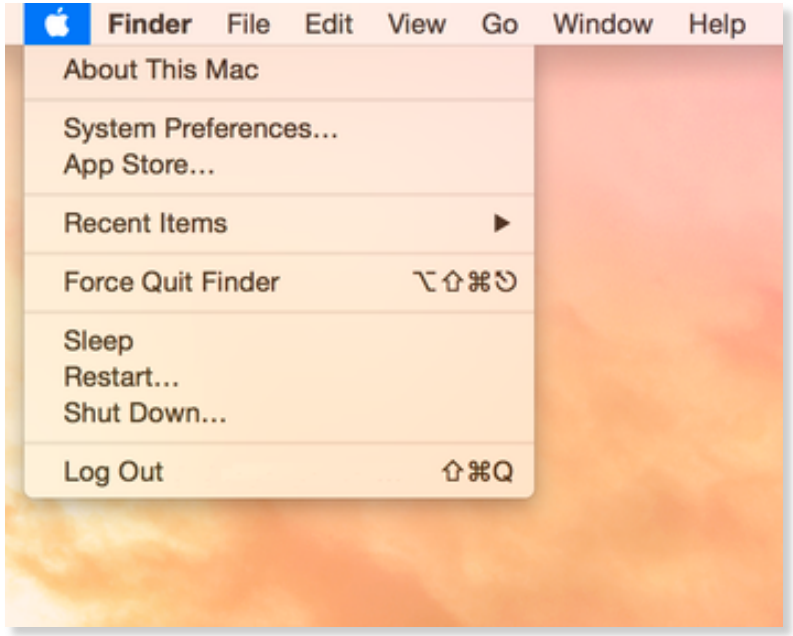
Radio Buttons
Generally only one choice allowed



Checkboxes
Typically can make more than one choice

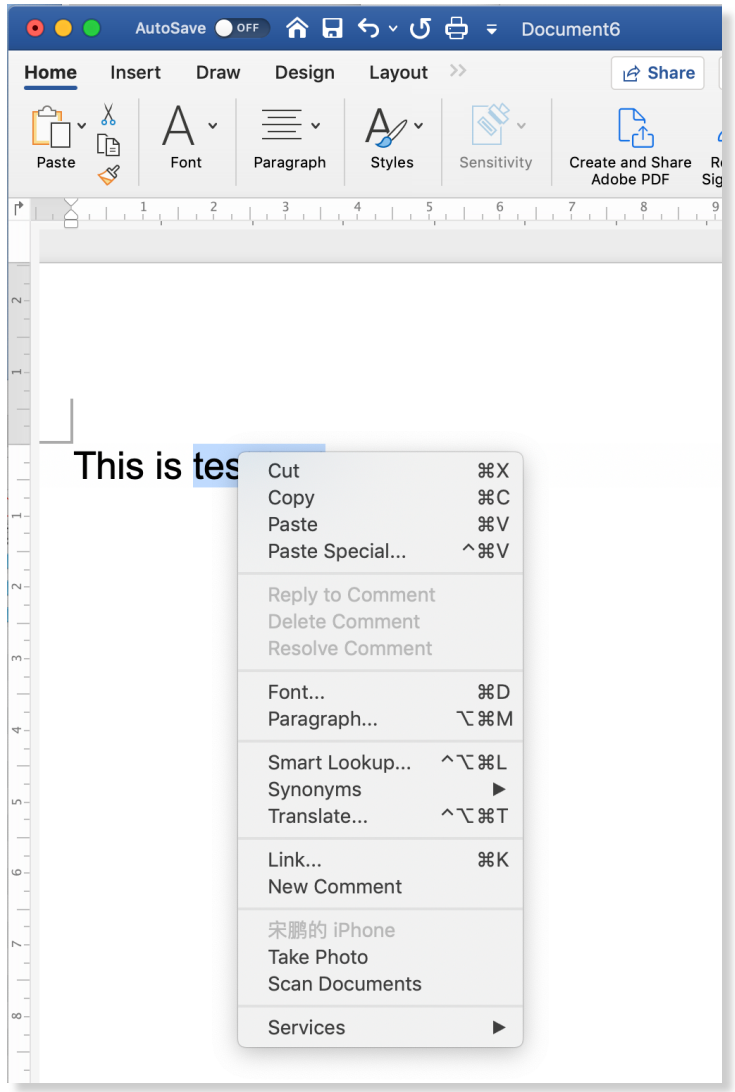
#3 Pull-down Menus

- Pull-down menus
  - Always available to the user by making selections on a top menu bar
  - Users always know where these menus are found
  - Benefit: selection choices are hidden until needed
  - Keyboard shortcuts (important to support expert user efficiency)
  - Can be hierarchical (refer to Tree Structure Menus)



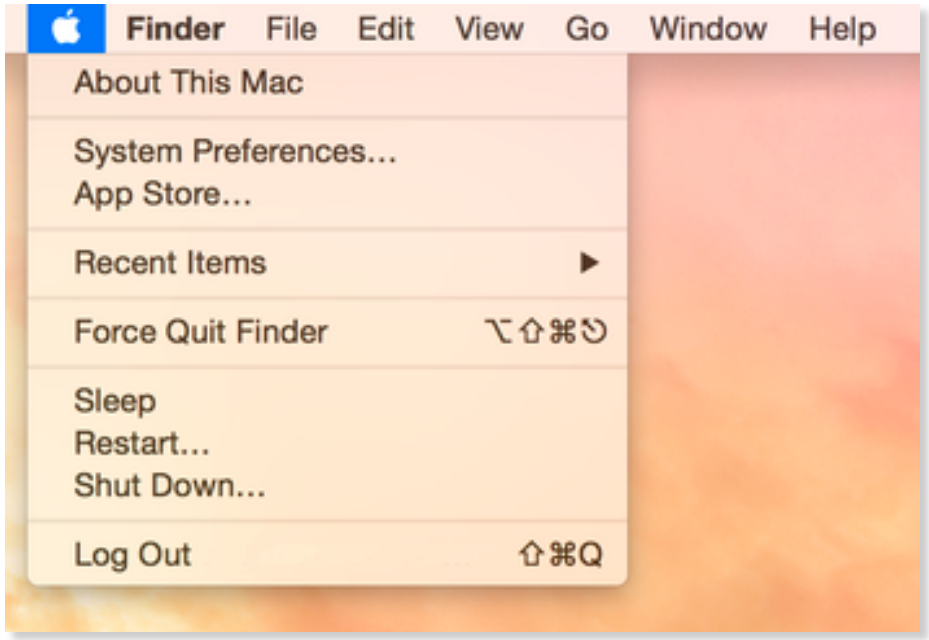
#4 Pop-up Menus

- Similar to “pull-down” menus, but pop-up menus allow to have the menu appear anywhere
- Typically launched with a button click
  - For example, in Microsoft Word, right-clicking “pops up” a menu



#5 Icon Menus, Palettes and Toolbars

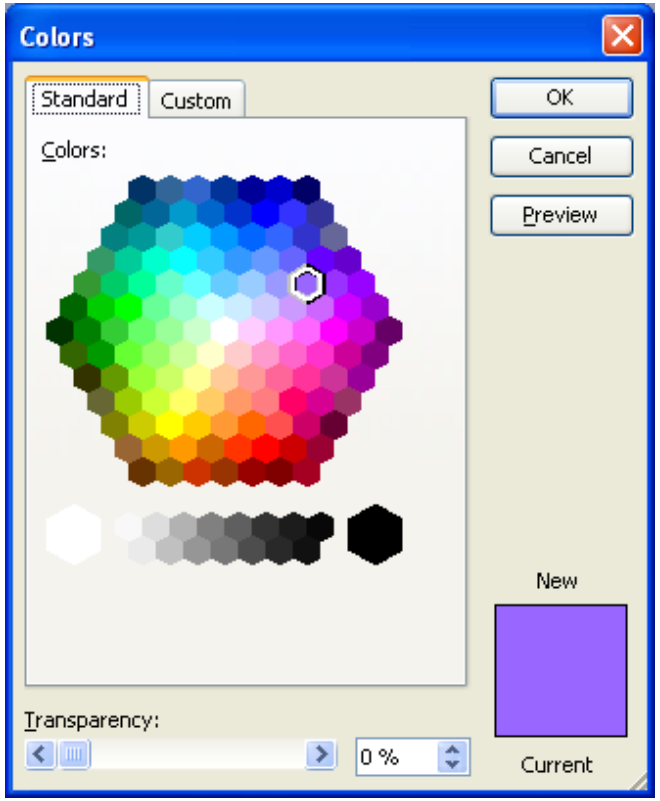
- Rather than basic text menus, **icon menus** let users combine graphics with text for menu selections on the computer

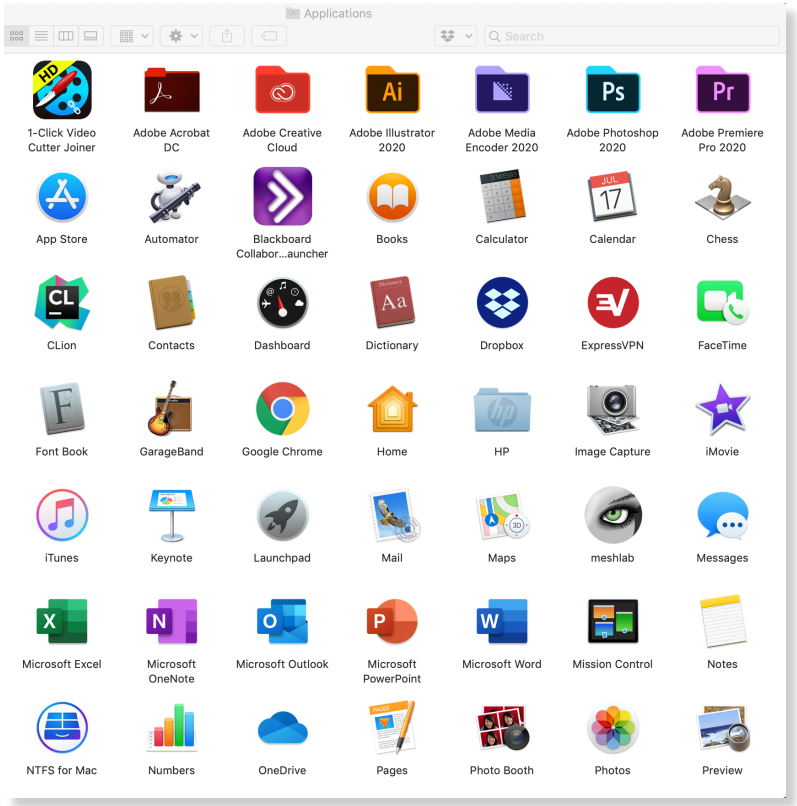


Pull-down menu

Icon menu

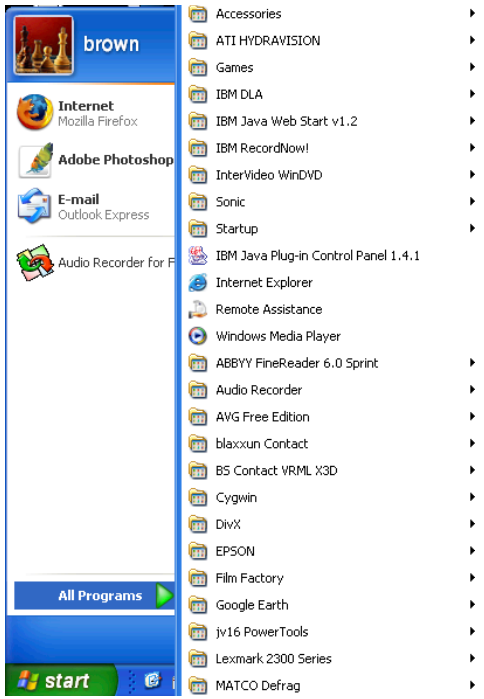
#5 Icon Menus, Palettes and Toolbars

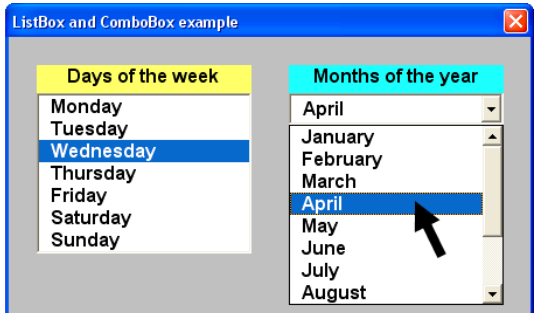


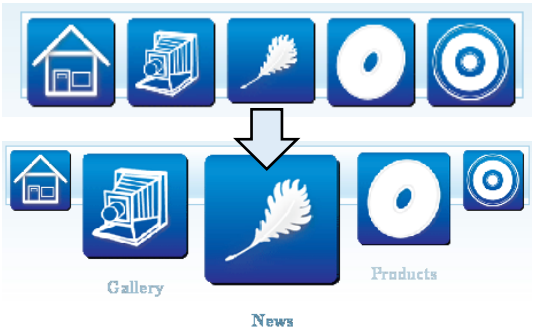


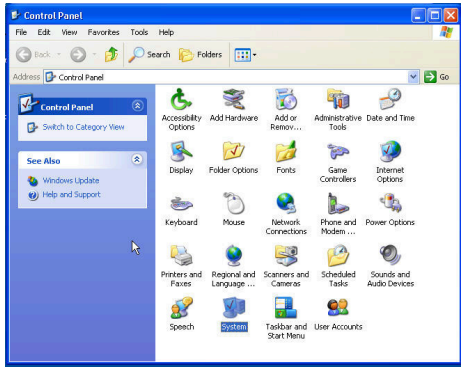
Menus for Long Lists of Items

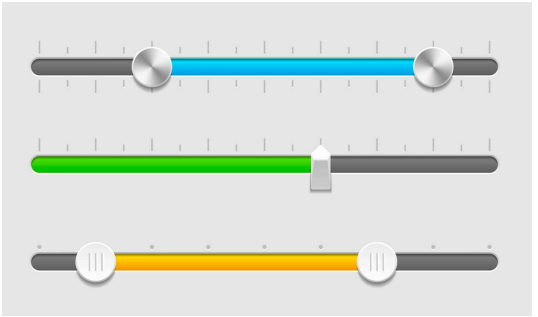
1. Scrolling menus
2. Combo boxes and List boxes
3. Fisheye menus and toolbars
4. Sliders
5. 2D menus
6. Embedded menus





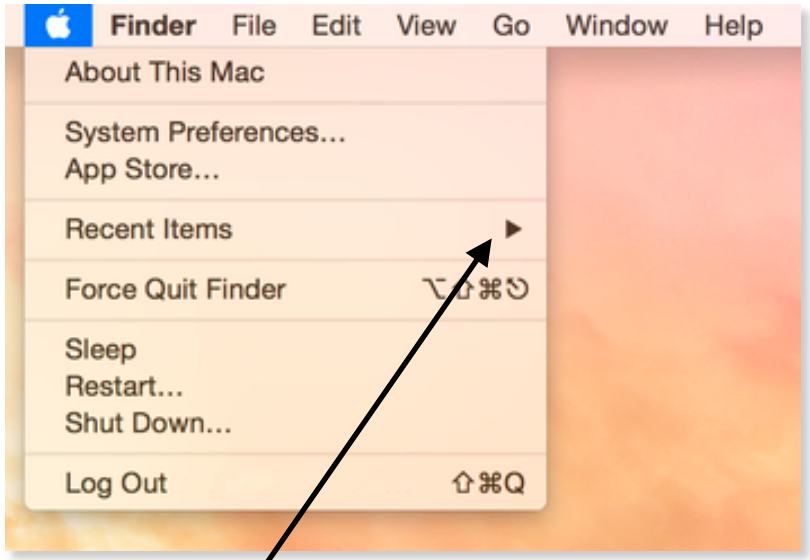


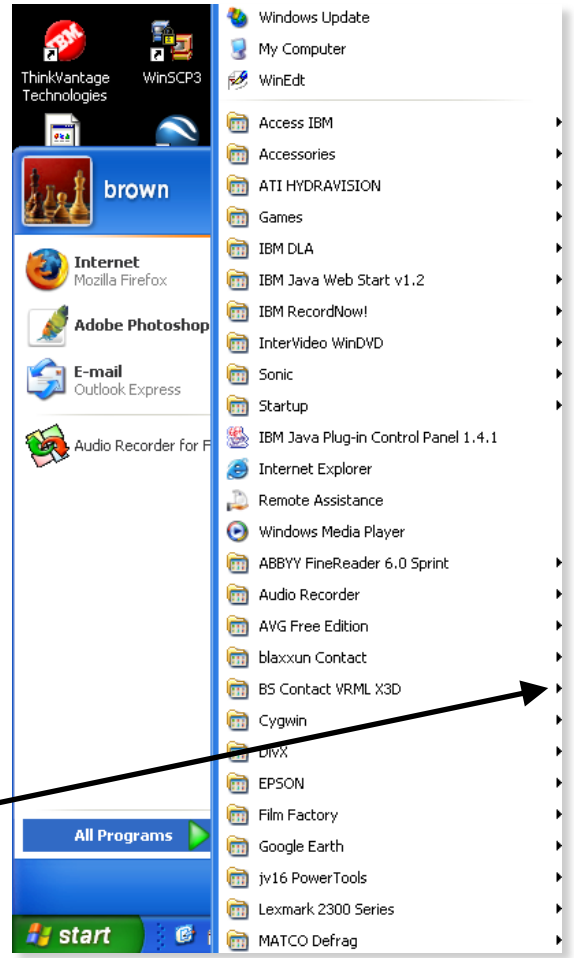




#1 Scrolling Menu

- List of items are shown, with one entry (typically an arrow) that leads to more items

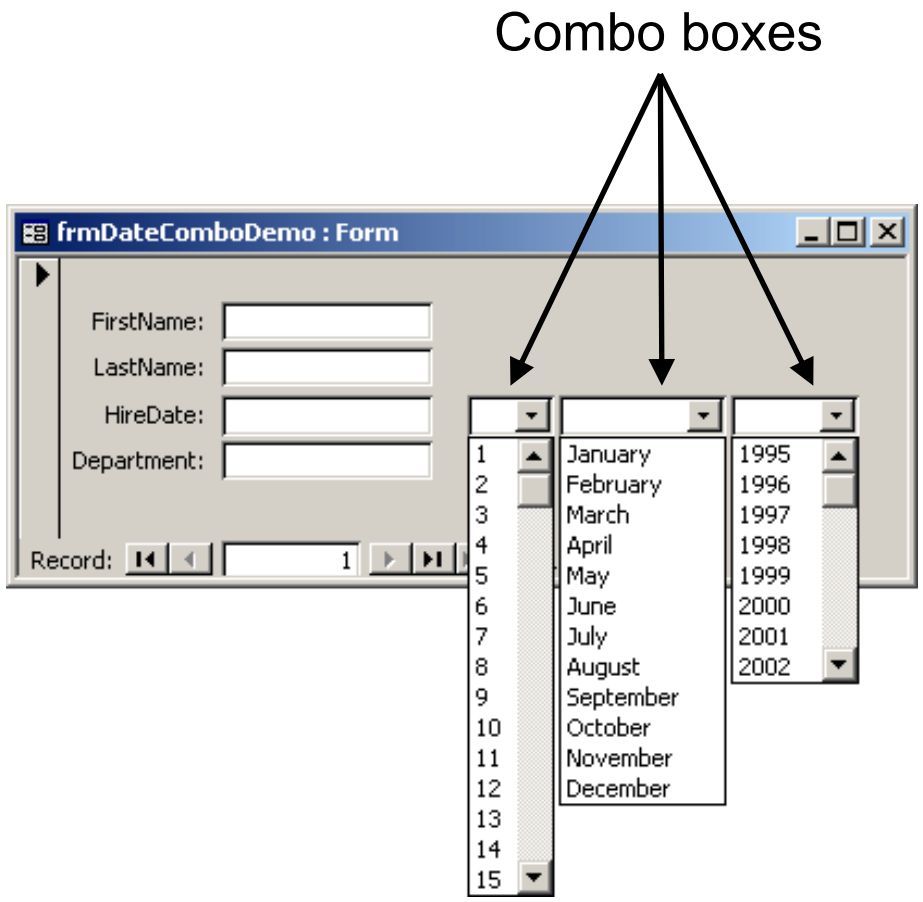




Click here expands menu choices
* Arrow to indicate next set of items

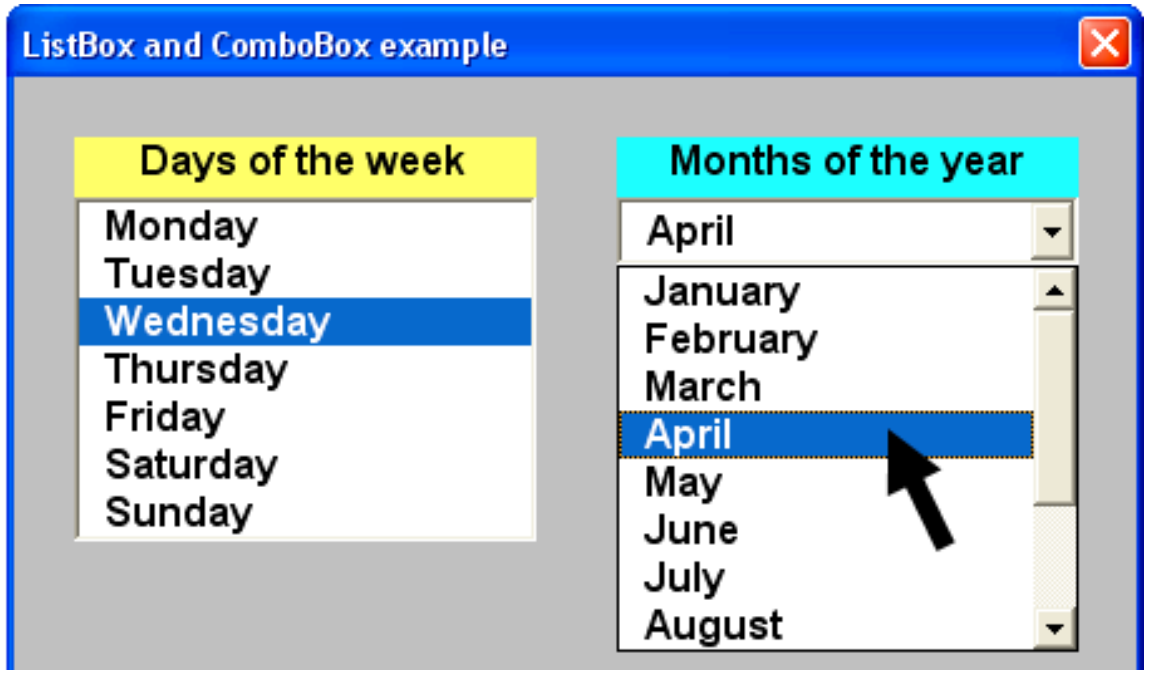
#2 Combo Boxes

- Typically allow one choice to be selected
- Use less screen space as selection choices are hidden until needed
- Choices are well-ordered/categorized
- Although combo boxes look like text entries, this is not form “fill-in”, because there is nothing to fill in



#2 List Boxes

- Differences between combo boxes and list boxes
  - list boxes allow one or multiple choices to be selected
  - list boxes occupy more space



List boxes Combo boxes

#3 Fisheye Menus and Toolbars

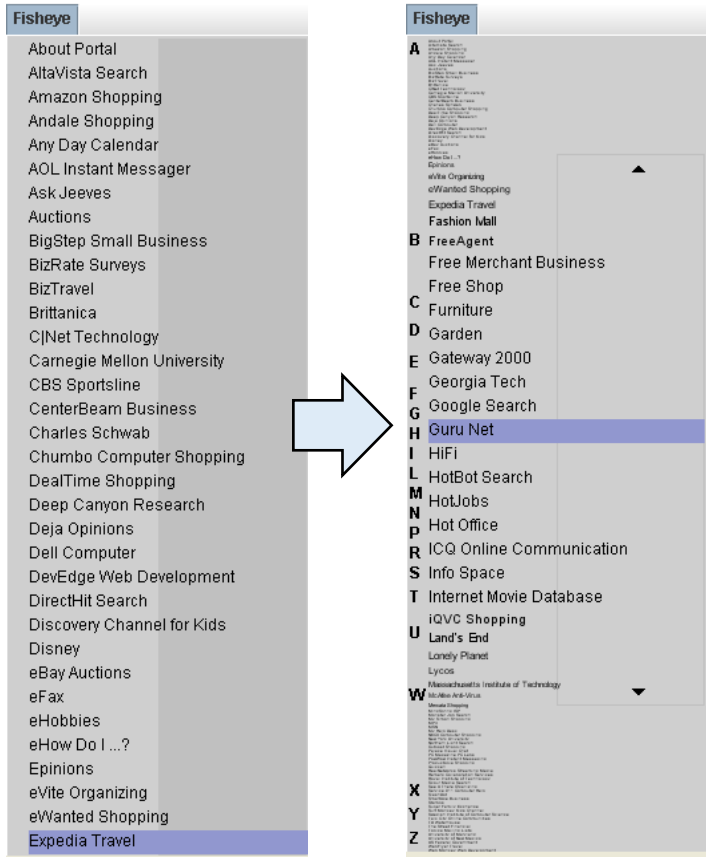
- A **fisheye lens** is an ultra wide-angle lens that produces strong visual distortion intended to create a wide panoramic or hemispherical image

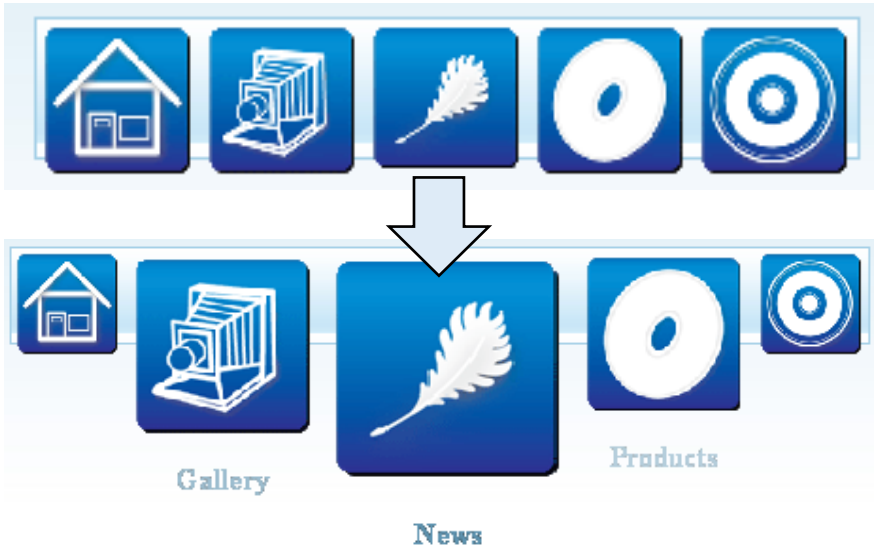
Fish eyes have a more spherical lens

Example photo taken with a fisheye lens

#3 Fisheye Menus and Toolbars

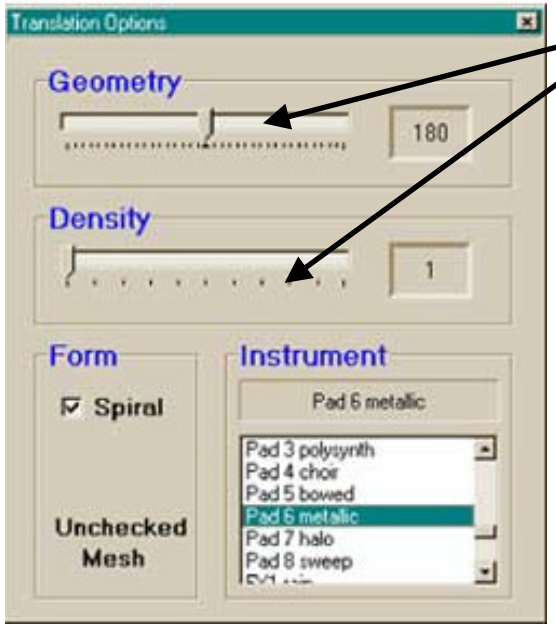
- Fisheye menus and toolbars change the size of the menu items to an area of focus around the mouse pointer.



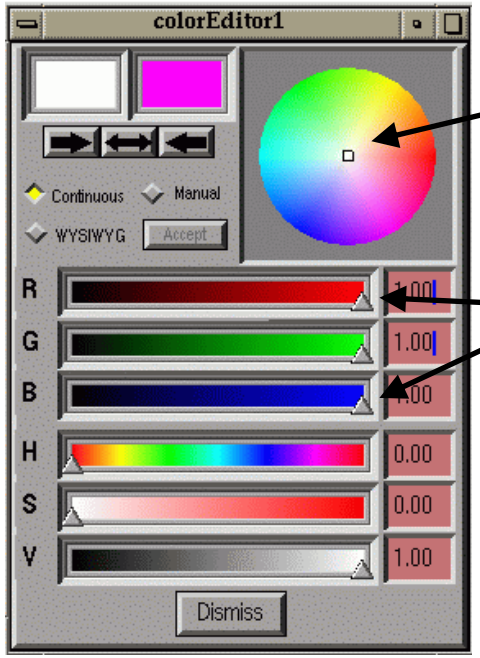


#4 Sliders

- Sliders allow users to make selections from a range of choices/values that are continuous, but discrete

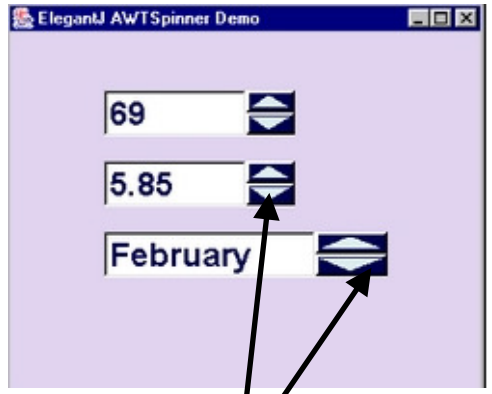


Sliders



More than 1D

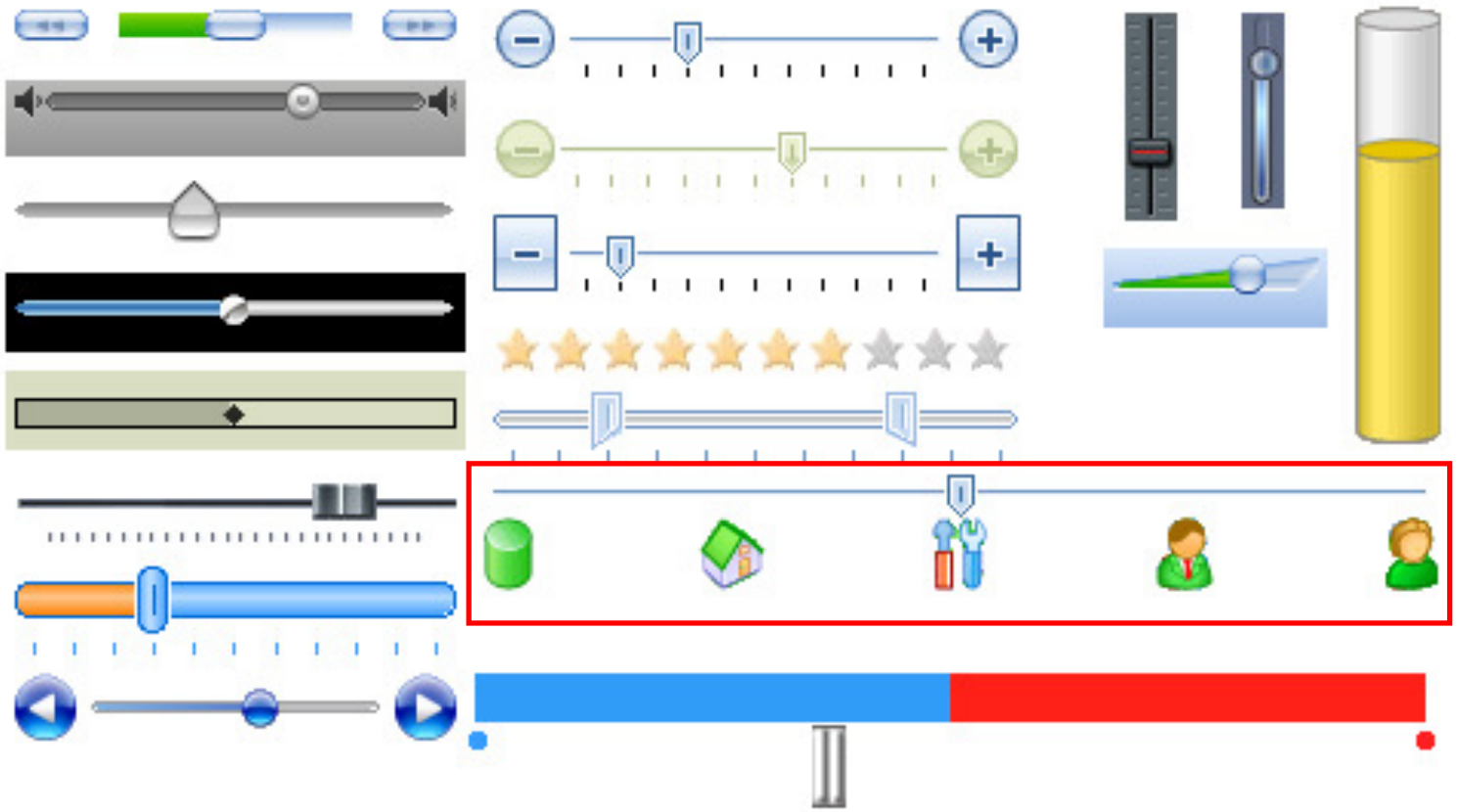
Sliders



Variant: Spinners (or spin box)
Similar to sliders and to combo-lists.
Allows user to move through finite range of choices.

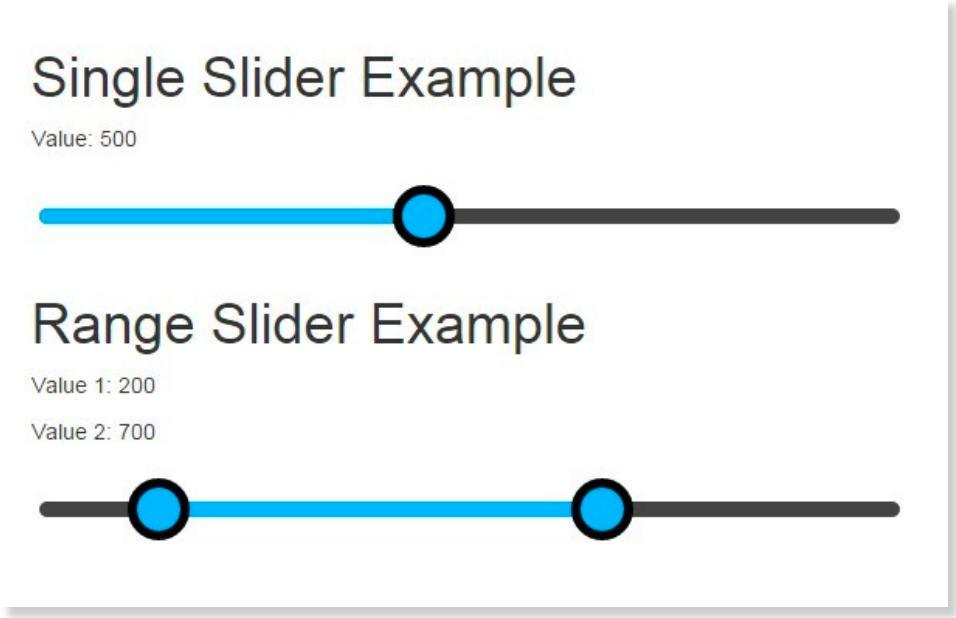
#4 Sliders

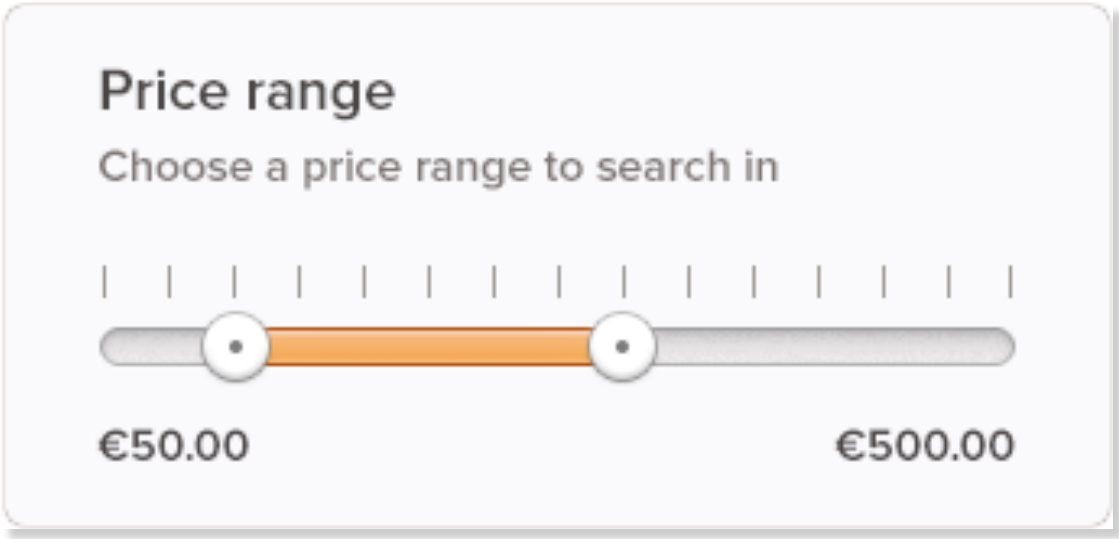
- Sliders can have different appearance; not necessary to have numerical and continuous values



#4 Sliders

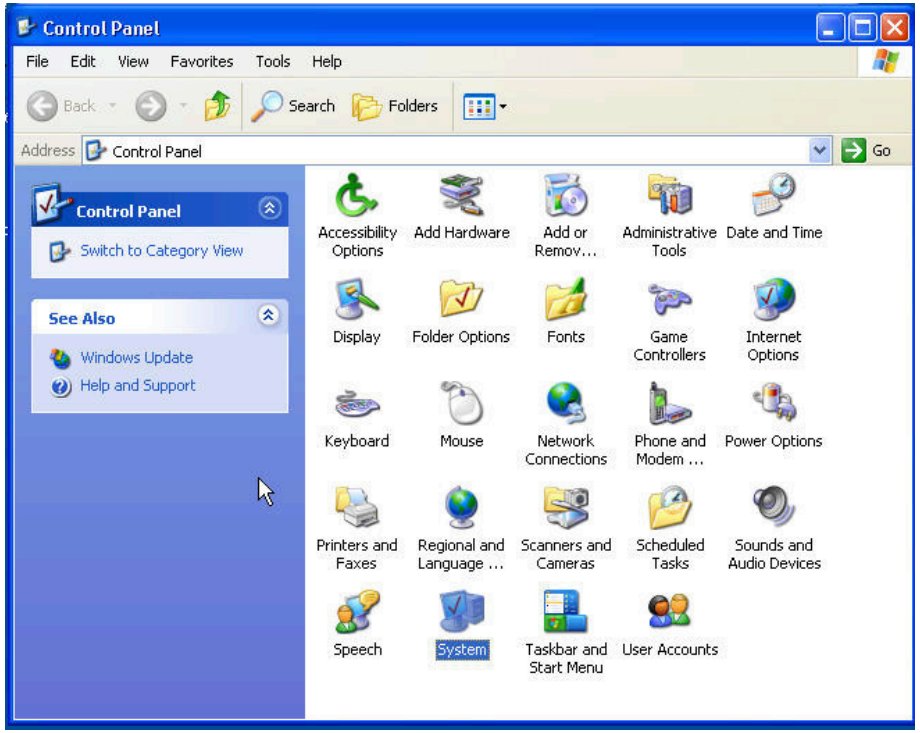
- Variant: Range slider
  - Sliders with two markers (max. and min.)





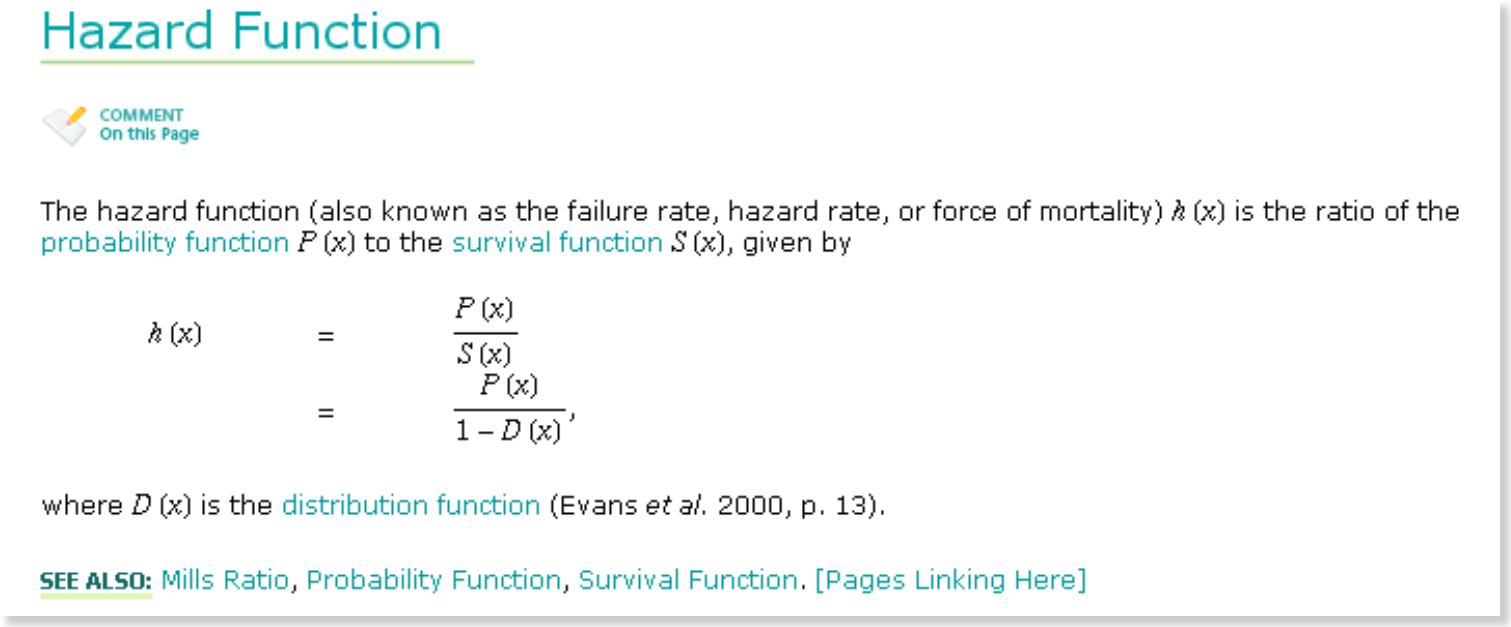
#5 2D Menus

- In 2D menus, choices are laid out in a 2D fashion
  - Good overview
  - Allow rapid selection (no need to scroll)



#6 Embedded Menus

- Embedded menu is a form of menu where the list of menu items will be displayed within the list of information that is being displayed
  - an alternative to explicit menus
  - imagine that all "data" could be menu "choices"



Hazard Function

COMMENT
On this Page

The hazard function (also known as the failure rate, hazard rate, or force of mortality) $h(x)$ is the ratio of the probability function $P(x)$ to the survival function $S(x)$, given by

$$h(x) = \frac{P(x)}{S(x)} = \frac{P(x)}{1 - D(x)},$$

where $D(x)$ is the distribution function (Evans *et al.* 2000, p. 13).

SEE ALSO: Mills Ratio, Probability Function, Survival Function. [Pages Linking Here]

Example: the highlighted text with a hotlink

#6 Embedded Menus

- Graphical embedded menu

GIS (Geographical information system): not necessary text

Today's Topics

- Menu selection: making choices
  - Single menus
  - **Multiple menus**
  - Menu contents
- Form fill-in for data entry
- Dialog boxes: combination of menus and forms

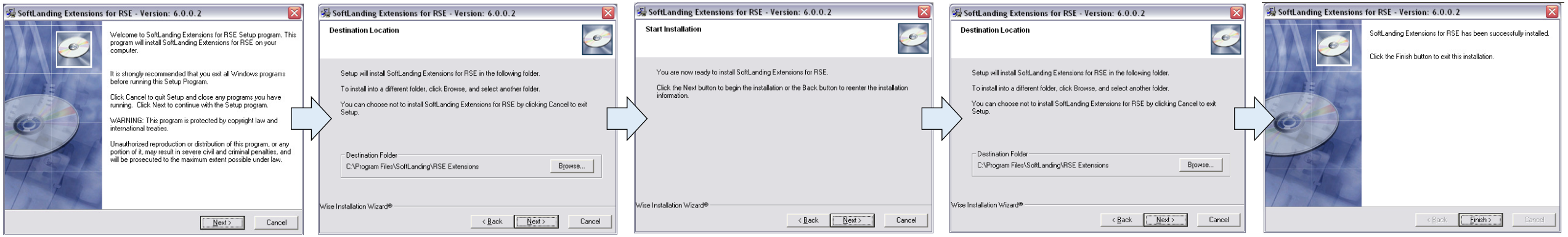
Combination of Multiple Menus

Strategies to combine multiple menus

1. Linear Menus
2. Simultaneous Menus
3. Tree-structured menus

#1 Linear Menus

- Guides the user in choosing a list of actions in a particular sequence appearing one after the other
  - E.g., ordering a pizza, software installation, …
- Effective for novice users performing simple tasks



(screen 1) (screen 2) (screen 3) (screen 4) (screen 5)

Good example: installation wizard

#2 Simultaneous Menus

- Present multiple active menus at the same time and allow users to enter choices in any order
  - Benefits: effective for many users, including expert users
  - Drawback: consume screen space

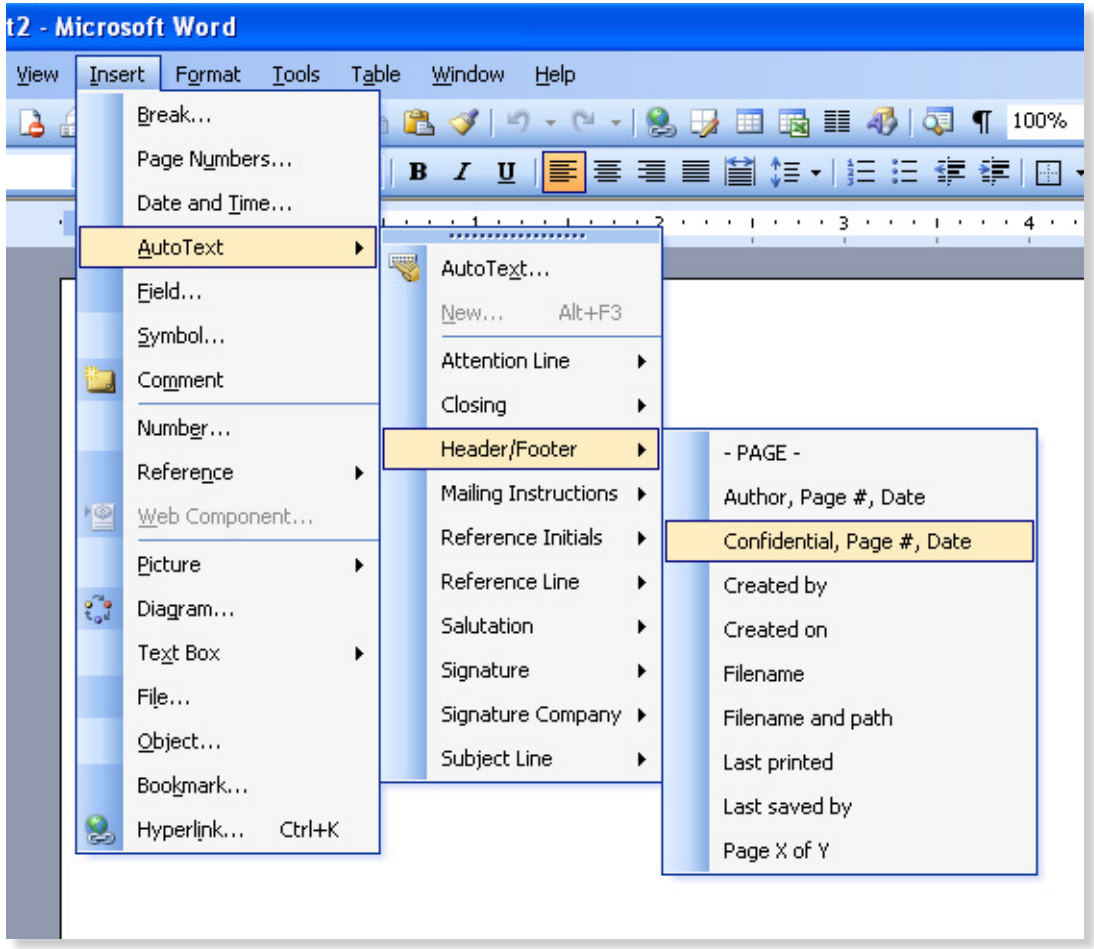
Select Flight for Thu, Jan 19

8 flight options: 1 - 8

Airline	Departure Time	Arrival Time	Total Travel Time	Roundtrip Price includes taxes and fees
Air China Intl Flight 976	9:30am Singapore, Singapore (SIN)	3:30pm Beijing, China (PEK)	6hrs - Nonstop	$995 per person Select
China Southern Airlines Flight 352 / 3161	8:35am Singapore, Singapore (SIN)	5:10pm Beijing, China (PEK)	8hrs 35min - 1 Stop Change planes in Guangzhou, China (CAN)	$1,519 per person Select
China Southern Airlines Flight 352 Air China Intl Flight 1340	8:35am Singapore, Singapore (SIN)	5:15pm Beijing, China (PEK)	8hrs 40min - 1 Stop Change planes in Guangzhou, China (CAN)	$1,519 per person Select
China Eastern Airlines Flight 544 / 5155	12:55am Singapore, Singapore (SIN)	9:55am Beijing, China (PEK)	9hrs - 1 Stop Change planes in Shanghai Pu Dong, China (PVG)	$1,519 per person Select

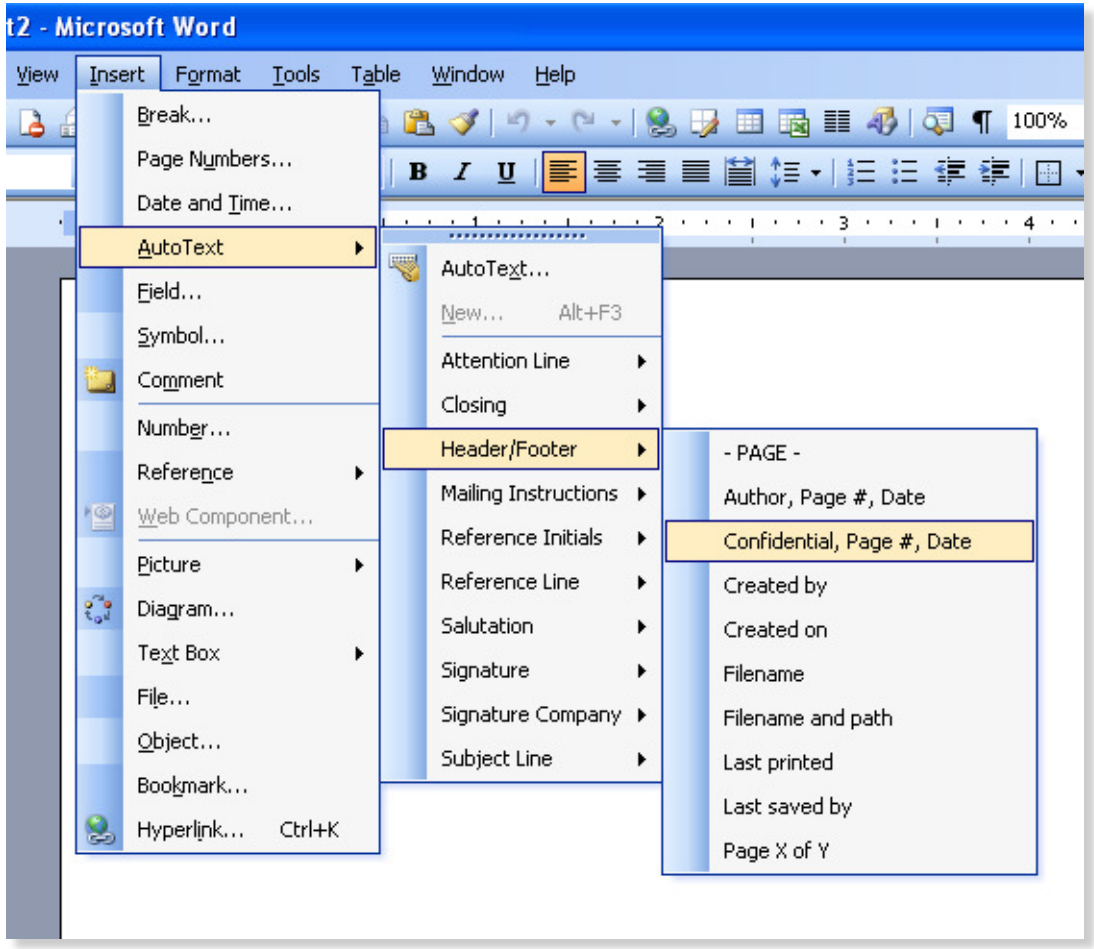
#3 Tree-structured Menus

- Tree structured menus are sequence of menus depends on the choices made by the user
- Allows only one way to reach each menu item
- Designers can form categories of similar items to create a tree structure



#3 Tree-structured Menus

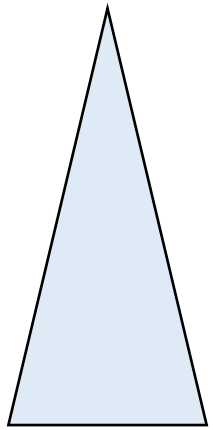
- Advantages
  - Identification of the menu items is easy
  - Expanding menus maintain the full context of each choice
  - Save screen space
- Disadvantages
  - Bad designs can quickly confuse and slow down users
  - Grouping the menu choices may be complex



#3 Tree-structured Menus: Terminology

- Depth – number of levels of a tree
- Breadth – number of items per level

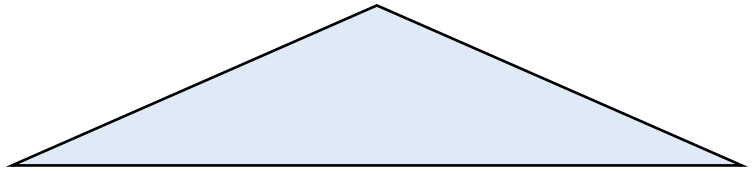
Narrow-and-Deep



Lots of sub-menus
Few choices (items) in each menu

Depth is large, Breadth is small

Broad-and-Shallow

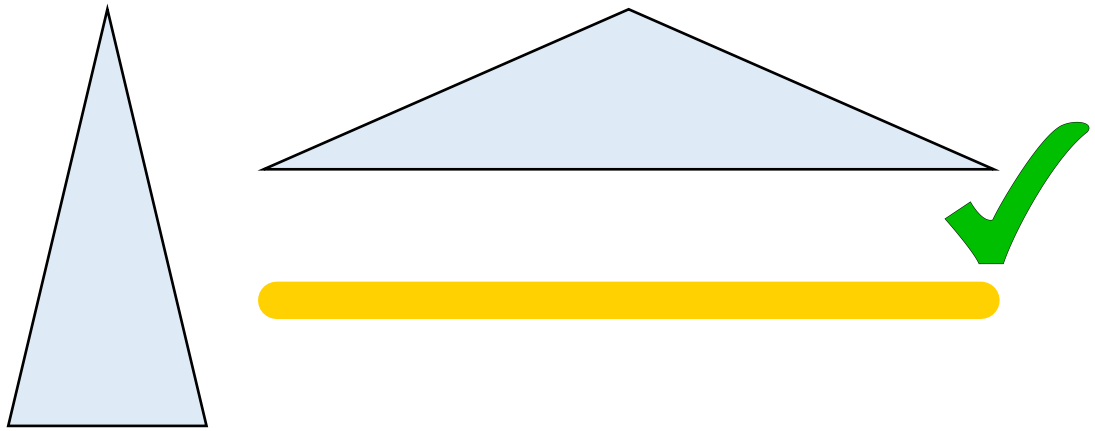


Few sub-menus
Many choices (items) in each menu

Depth is small, Breadth is large

#3 Tree-structured Menus: Depth/Breadth Tradeoff

- Kiger'84, Chin'88, Salvendy'96
  - Suggest if Depth > 3 then users is more likely to get "lost" when navigating the menu
  - Also found that response time and errors increase as depth increases
- Shneiderman'87
  - Showed that "stressed" users made 97% more mistakes in deep-tree menus than shallow-tree ones
    - Get lost
    - Afraid of making a wrong choice previously



#3 Tree-structured Menus: Depth/Breadth Tradeoff

- Time, *T*, to find an item at a given menu level can be modeled by equation:

$$T = k + c * \log b$$

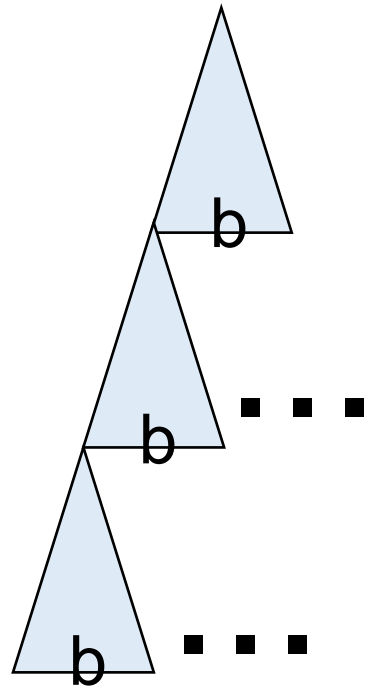
  where *k* and *c* are empirically determined constants and *b* is the number of items at that level (breadth).

- Depth, i.e., the number of menu levels is: $D = \log_b N$

  where *N* is the total number of items (on leaves) in the entire tree.

- Estimated overall time to find an item: total time = $D * T$
- Example: Given *N=4096* and *b=16*, we have *D=3*

$$\textit{Then, total time} = 3 * (k + c \log 16)$$



T. K. Landauer and D. W. Nachbar. *Selection from alphabetic and numeric menu trees using a touch screen: breadth, depth, and width*. ACM SIGCHI Bulletin, 1985

Today's Topics

- Menu selection: making choices
  - Single menus
  - Multiple menus
  - **Menu contents**
- Form fill-in for data entry
- Dialog boxes: combination of menus and forms

Menu Contents

Guidelines to create and organize menu contents

- Use task semantics to organize menus (single, linear sequence, tree structure, acyclic and cyclic networks)
- Prefer broad–shallow to narrow–deep
- Show position by graphics, numbers, or titles
- Use items as titles for subtrees
- Group items meaningfully
- Sequence items meaningfully
- Use brief items, begin with the keyword
- Use consistent grammar, layout, terminology
- Allow type ahead, jump ahead, or other shortcuts
- Enable jumps to previous and main menu
- Consider online help; novel selection mechanisms; and optimal response time, display rate, screen size

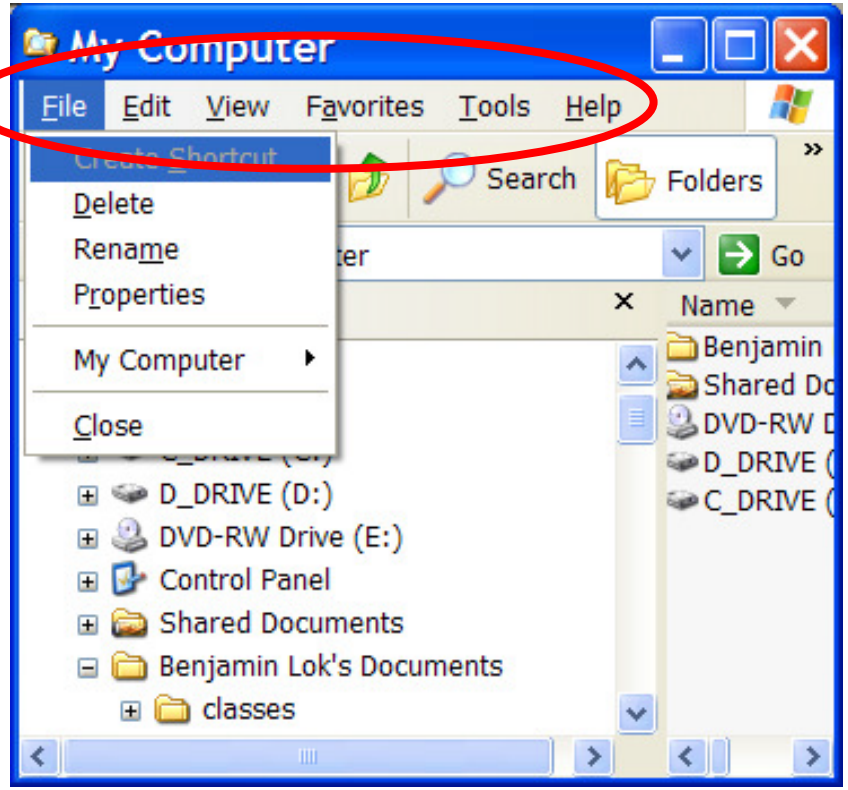
Menu Contents

Four issues about menu contents

1. Task-related grouping in tree structure
2. Item presentation sequence/order
3. Menu layouts
4. Fast movement Through Menus

#1 Task-related Grouping in Tree Structure

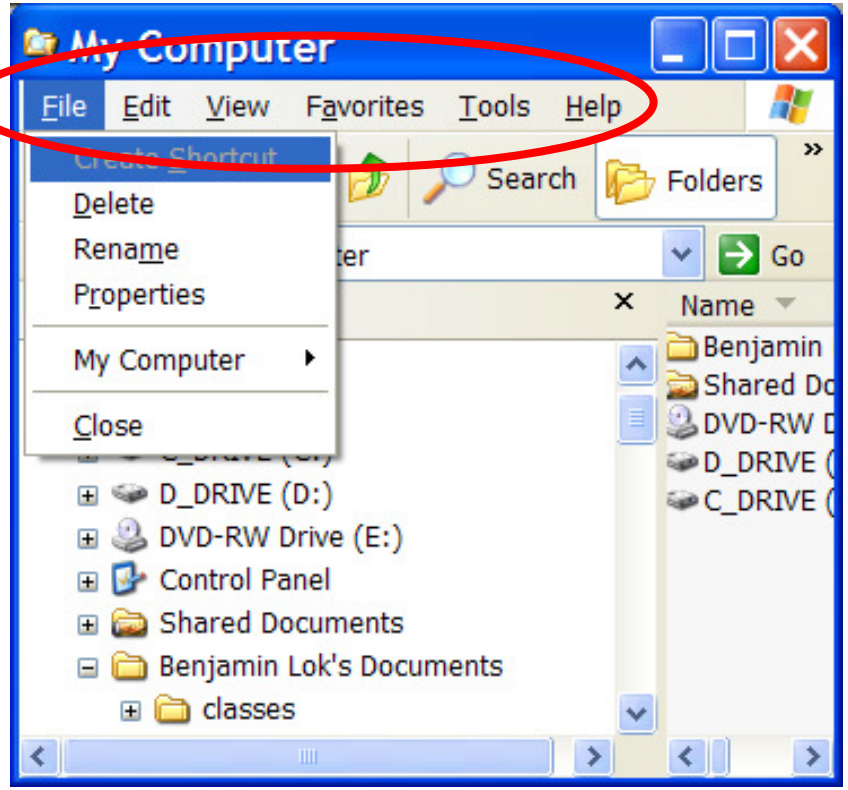
- How should we group menu items?
  - Logical groups – countries, states, cities
  - Covers all possibilities – alphabets, #s
- Make sure items are non-overlapping
  - Use categories that are unambiguous when breaking down choices
  - For example:
    - Event vs. Entertainments (ambiguous)
    - Sports vs. Concert (unambiguous)



#1 Task-related Grouping in Tree Structure

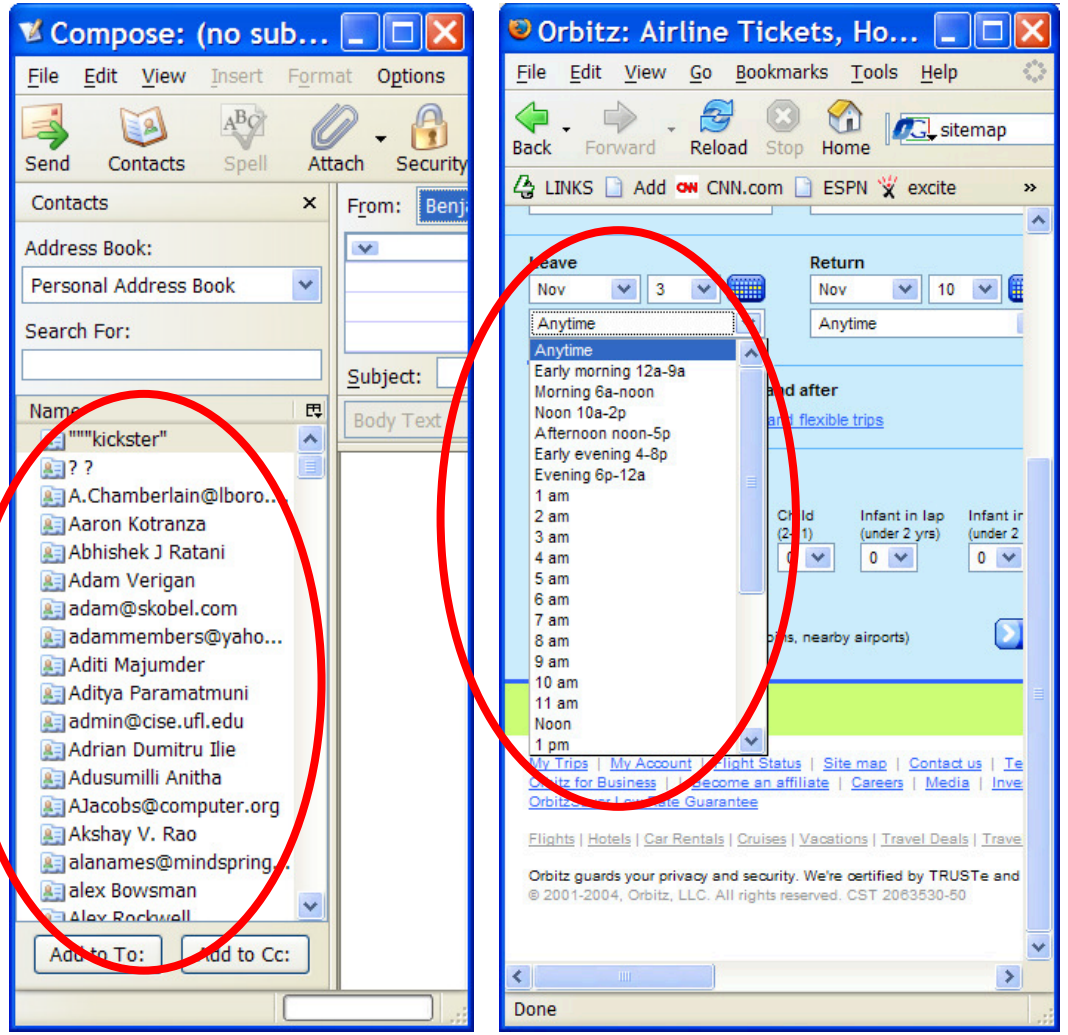
- Use familiar but distinct terminology
  - 6 AM to 6 PM is better than “Daytime”
- Get real user feedback after initial design
  - Do testing . . especially if you are designing for a domain you are not an expert in.

If you are making a medical system…
The terminology used?



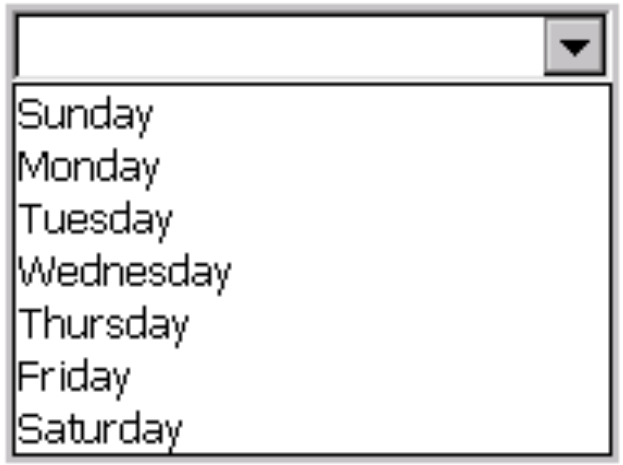
#2 Item Presentation Sequence

- Natural methods should be used if they exist
  - Time (days of week, etc.)
  - Numeric ordering
  - Physical properties (small, medium, large)
- Otherwise try:
  - Alphabetic (ex. contact list)
  - Grouping of Related Items
  - Frequent Items First
  - Important Items First

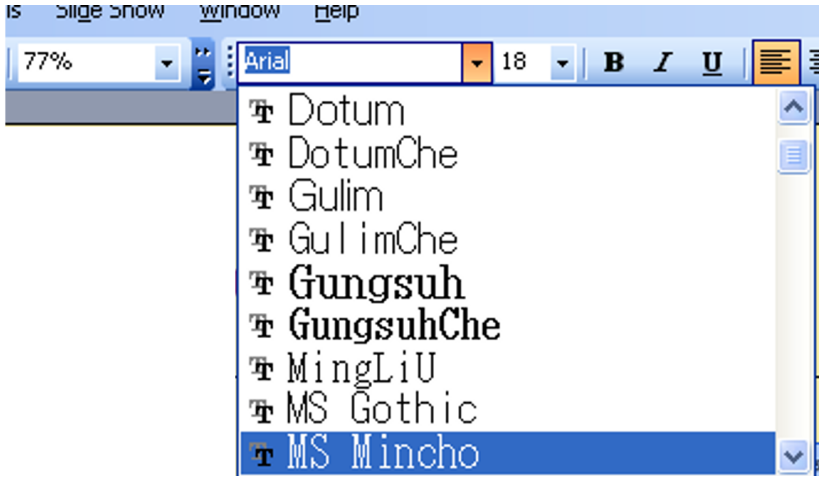


#2 Item Presentation Sequence

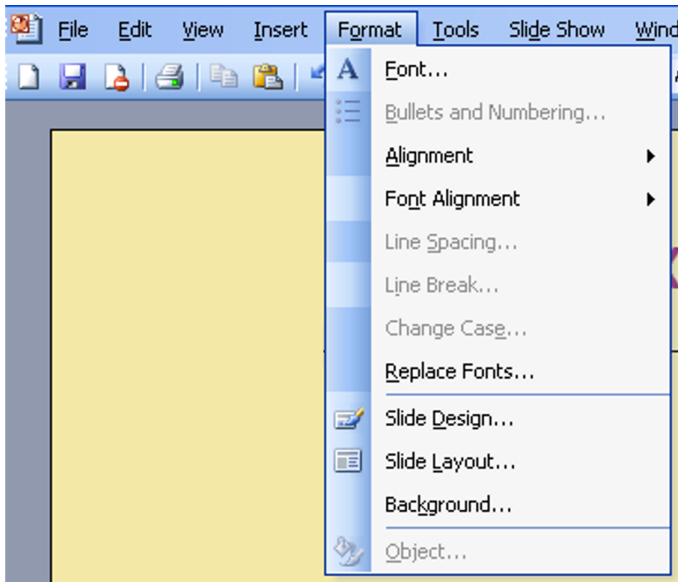
- Example ways to present menu items



Selections ordered by days of the week (**natural**)



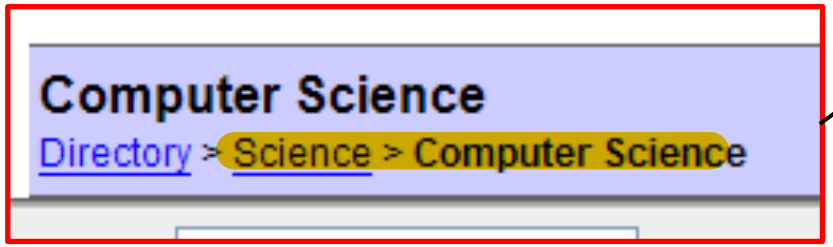
Font names are **alphabetical**

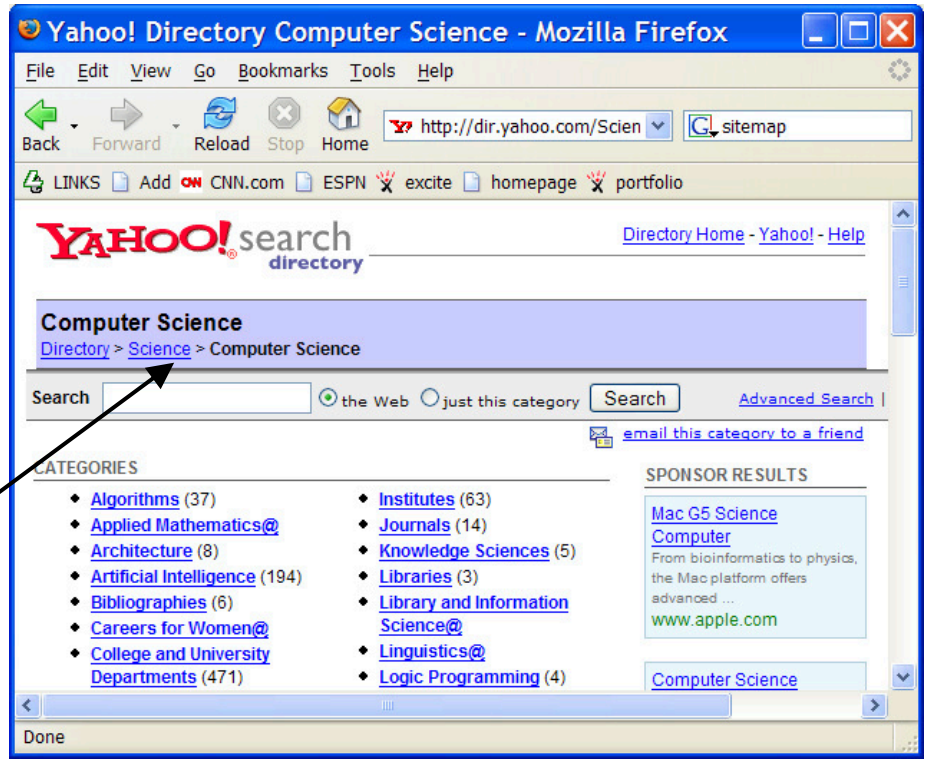


Format menu has “Font” first . . most used item. (**frequency**)

#3 Menu Layout

- Titles
  - Use descriptive terms, as opposed to vague terms
  - Use high level selection as a title for lower level menus (reassuring users; more confidence)
  - Avoid placing items at different locations in multiple menus (Teitelbaum ’83).





#3 Menu Layout

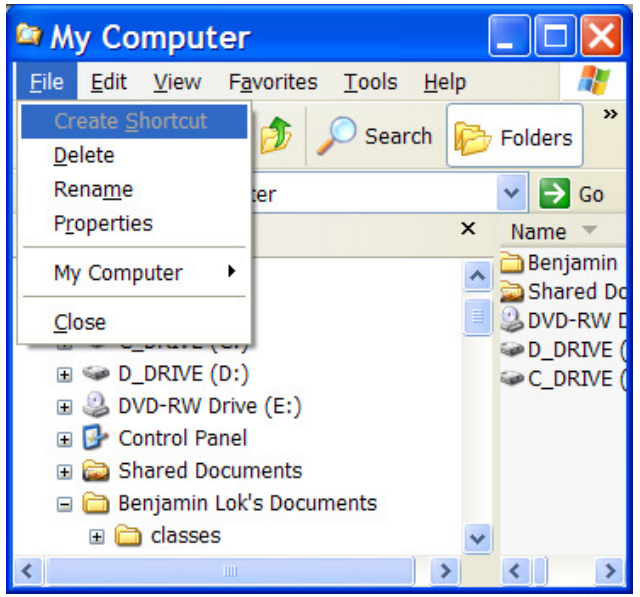
- Phrasing and Formating
  - Use familiar and consistent terminology:
    - Bad Example: Purge and Delete in Outlook is confusing
  - Ensure items are distinct from one another
    - Bad Example : tours to countryside; tours to parks; leisure tours; …
  - Use consistent and concise phrasing
    - Review the collection of items
      - Good: Animal, Vegetable, Mineral
      - Bad: Information on Animals, Vegetables choices, Mineral types
  - Bring the keyword to the foreground (first word, bold, verb, etc.)
    - Example: Size of type vs. Set type size

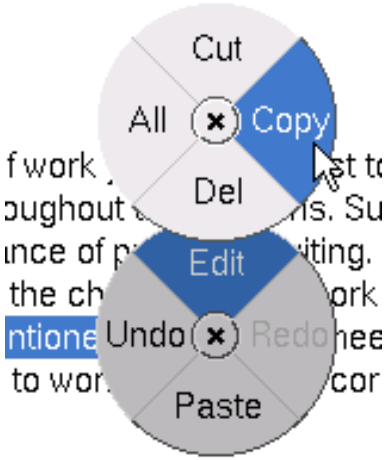
#3 Menu Layout

- Graphic Layout and Design
  - Screen size considerations
  - Bandwidth/latency
  - Layout Guidelines
    - Titles are left justified or centered
    - Items are left justified
    - Consistent numbering and lettering (easier to scan up and down)
    - Instructions (consistent and non-invasive)
    - Status reports – show users (Position markers) where they are in the menu hierarchy (consistent location) – see below

#4 Fast Movement Through Menus

- Keyboard shortcuts
  - Evolution for novices is natural
  - Faster vs. hand to mouse, move, and select
  - Use clear mnemonic choices
- Pie menus
  - Mouse ahead by relying on muscle memory to reproduce the angular displacement

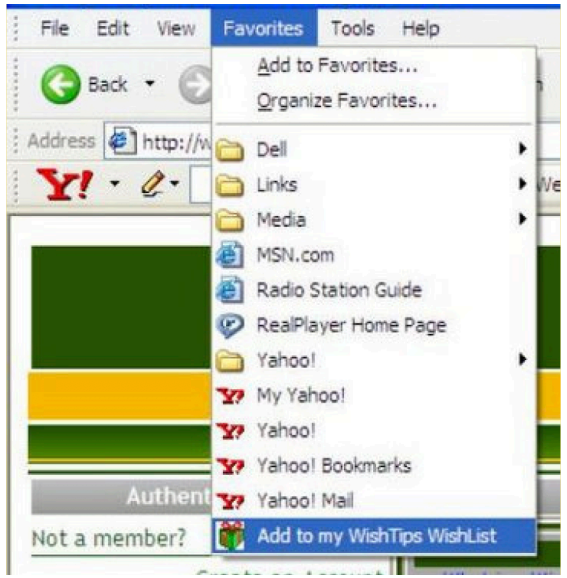


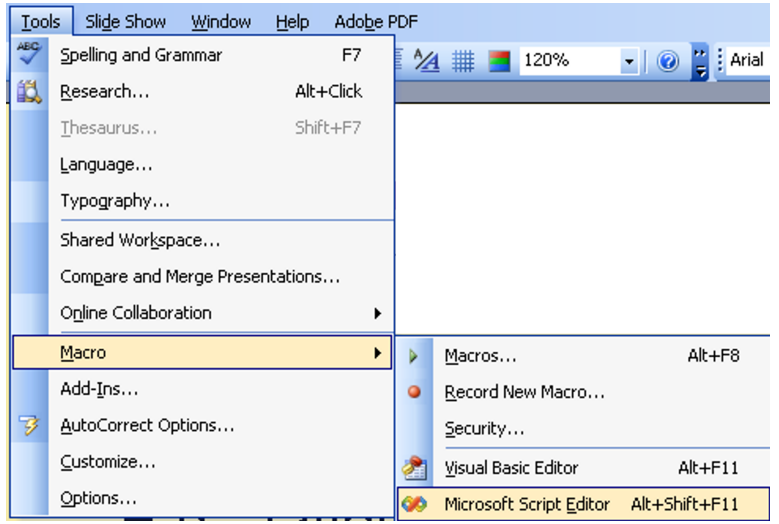


ALT-F to bring the menu
Then, follow by d, m, r or c

#4 Fast Movement Through Menus

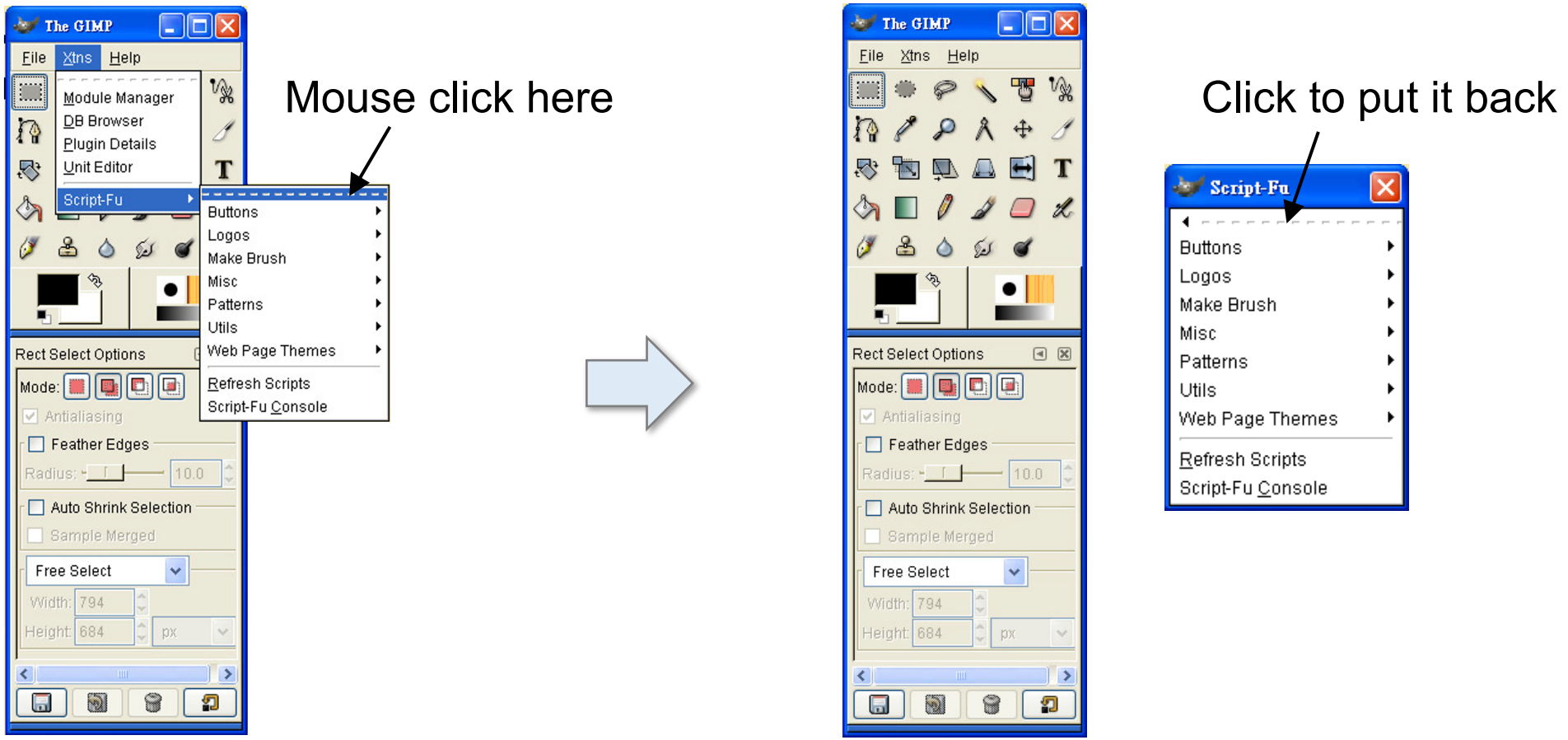
- Bookmarks
  - User can customize
  - Could require hierarchies
  - E.g., favorite in Internet
- Menu Macros
  - Record actions, and create a new toolbar button
  - Style sheets in word processors
  - Even programmable





#4 Fast Movement Through Menus

- Tear off menus (like adaptive menus)
  - When needing a low-level menu multiple times, separate it from the main menu

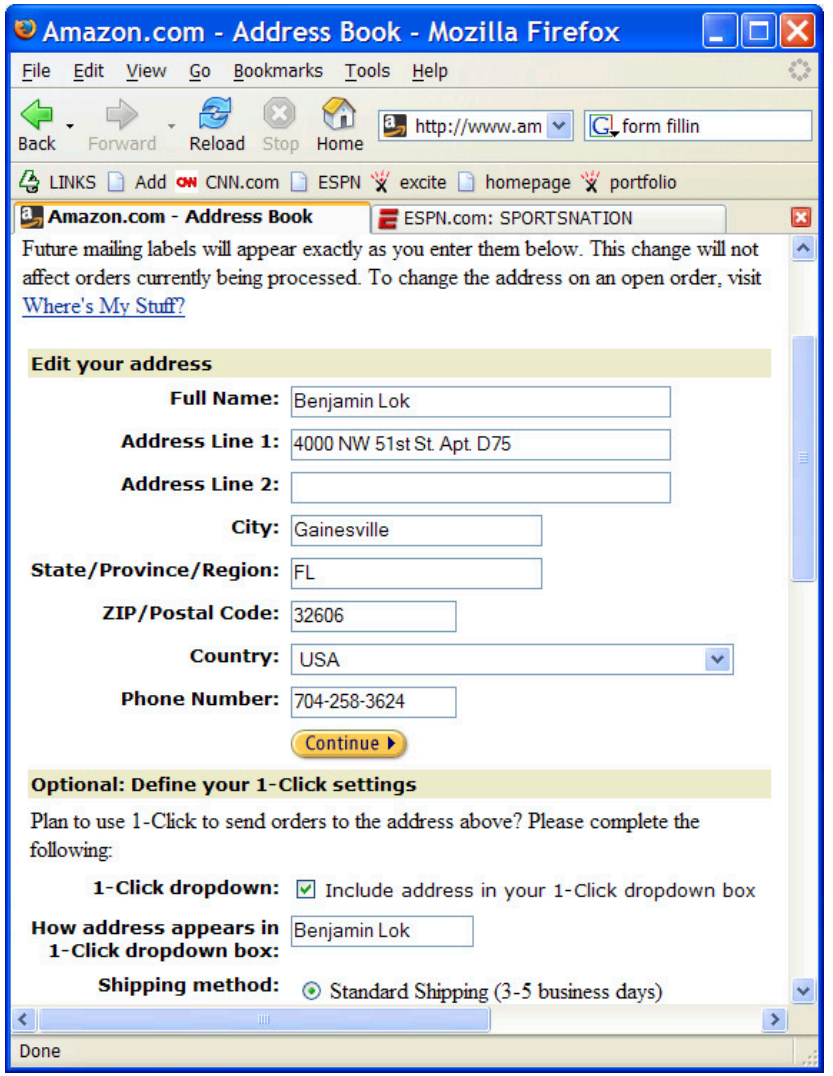


Today's Topics

- Menu selection: making choices
  - Single menus
  - Multiple menus
  - Menu contents
- **Form fill-in for data entry**
- Dialog boxes: combination of menus and forms

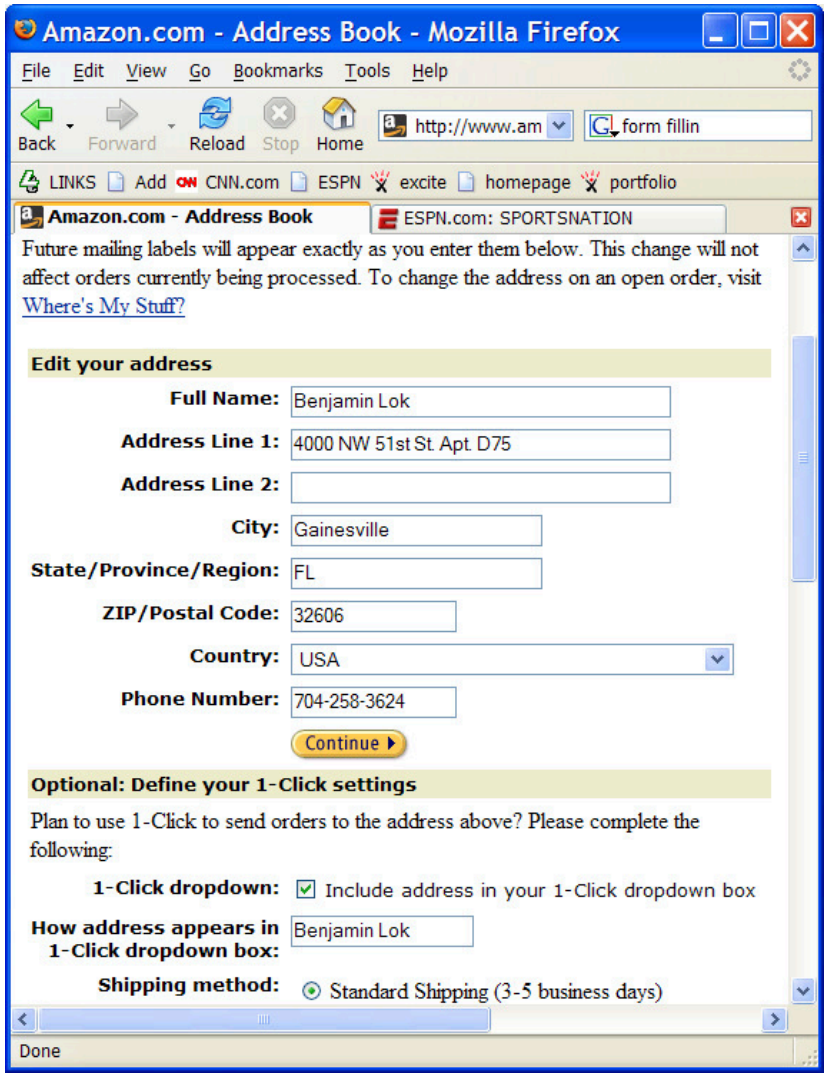
Data Entry: Menus vs. Form Fill-in

- Menus usually choose from a list
- But some tasks (data entry) are better via other inputs, e.g., keyboard
- Form Fill-in
  - Confidence, natural; resembles familiar paper forms
  - Standard interface for complex searches, e.g., the web



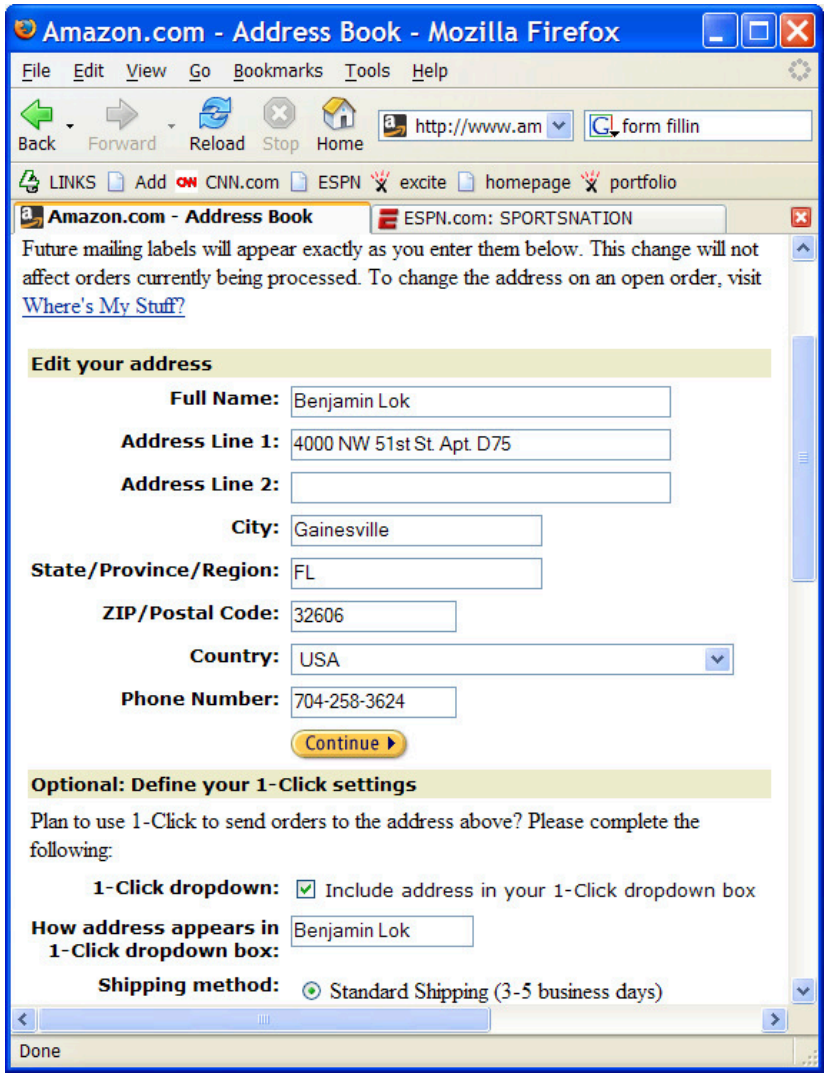
Data Entry with Form Fill-in

- Appropriate when many fields of data must be entered:
  - Full complement of information is visible to user
  - Display resembles familiar paper forms
  - Few instructions are required for many types of entries
- Users must be familiar with:
  - Keyboards
  - Use of TAB key or mouse to move the cursor
  - Error correction methods
  - Field-label meanings
  - Permissible field contents



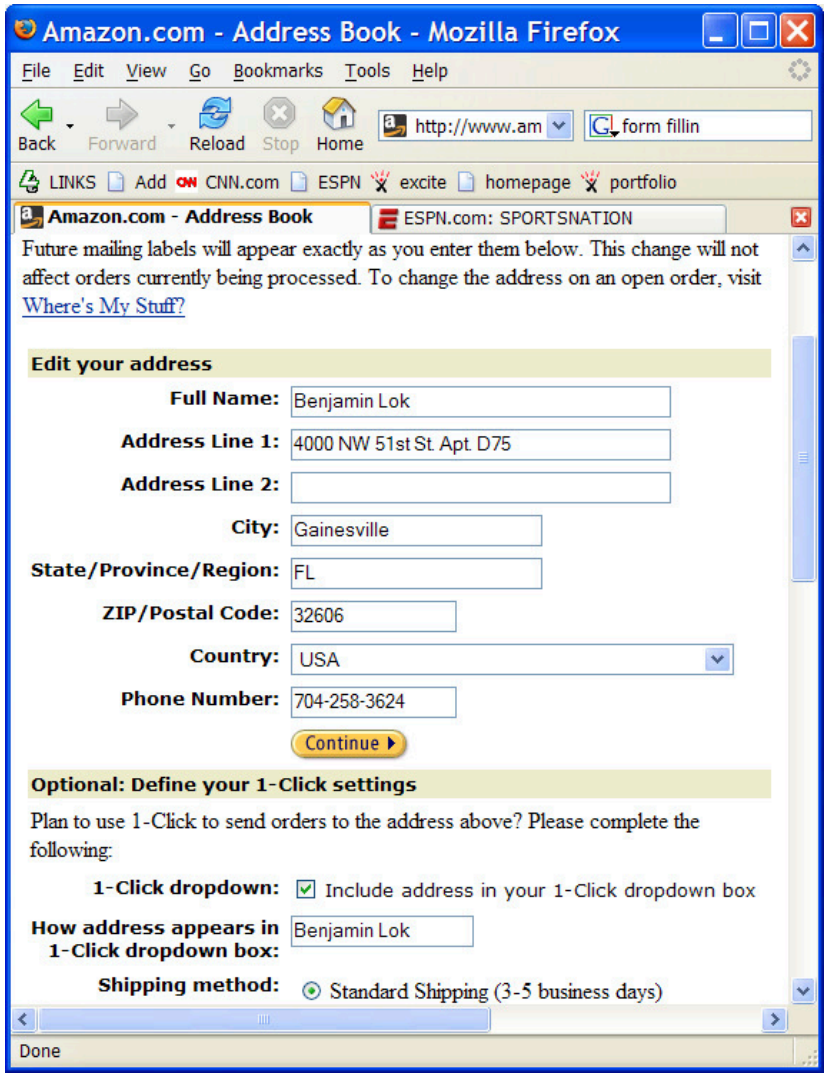
Form Fill-in Design Guidelines

- Meaningful title
- Consistent terminology and abbreviations
- Comprehensible instructions
- Logical grouping and sequencing of fields
- Visually appealing & clear layout of the form
- Familiar field labels
- Visible space and boundaries for data-entry fields



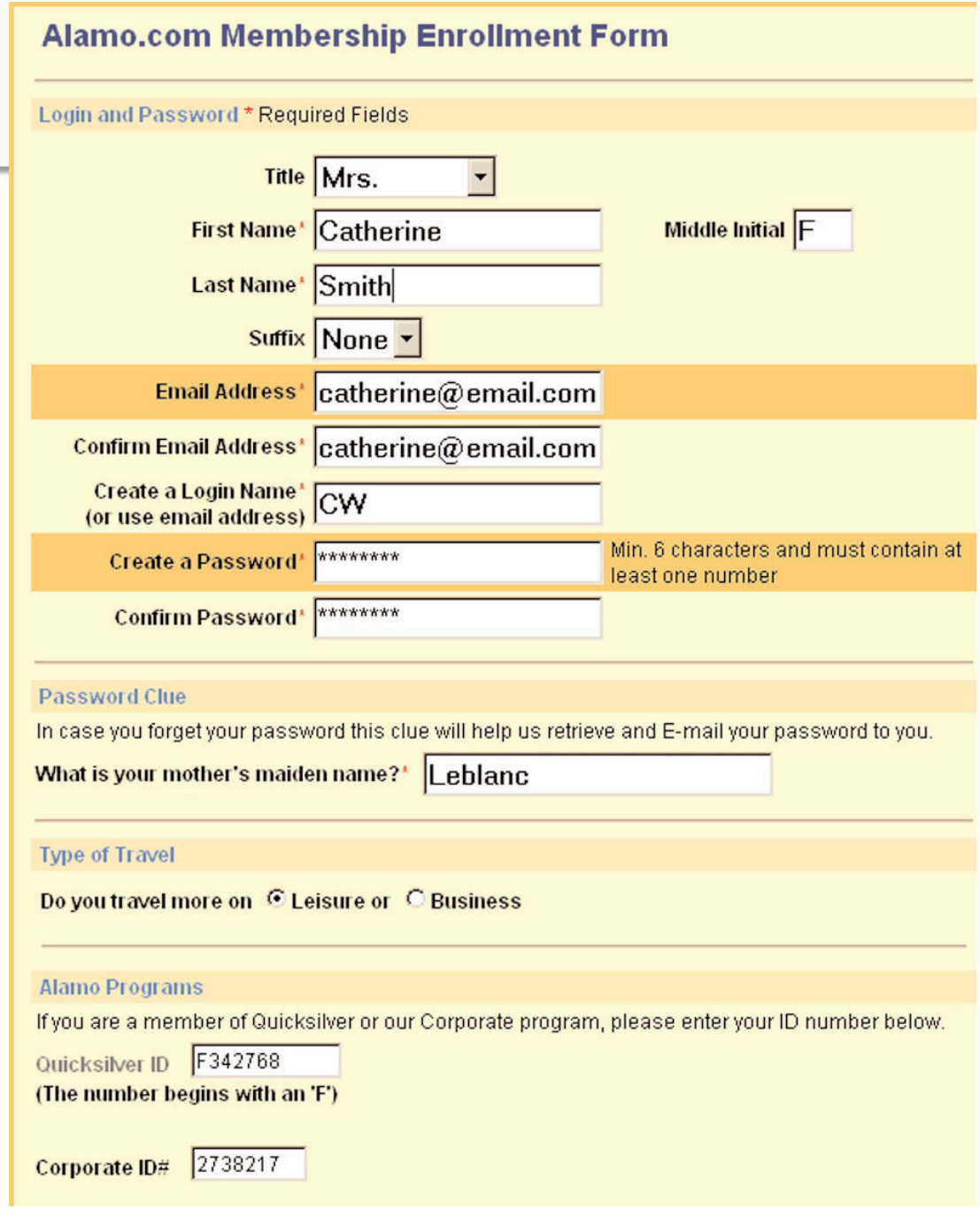
Form Fill-in Design Guidelines

- Convenient cursor movement
- Error prevention
- Error messages for unacceptable values
- Error correction for individual characters and entire fields
- Optional/Required fields clearly marked
- Explanatory messages for fields
- Completion signal



Good example

Note fields required has a “*” by them.



Alamo.com Membership Enrollment Form

Login and Password * Required Fields

Title: Mrs.

First Name*: Catherine

Middle Initial: F

Last Name*: Smith

Suffix: None

Email Address*: catherine@email.com

Confirm Email Address*: catherine@email.com

Create a Login Name* (or use email address): CW

Create a Password*: ********

Min. 6 characters and must contain at least one number

Confirm Password*: ********

Password Clue

In case you forget your password this clue will help us retrieve and E-mail your password to you.

What is your mother's maiden name?*: Leblanc

Type of Travel

Do you travel more on (•) Leisure or ( ) Business

Alamo Programs

If you are a member of Quicksilver or our Corporate program, please enter your ID number below.

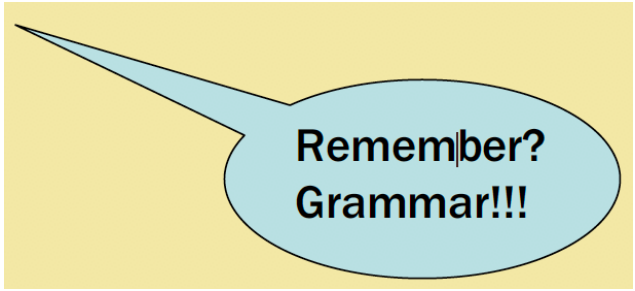
Quicksilver ID: F342768

(The number begins with an 'F')

Corporate ID#: 2738217

Field Format

- Format-specific field, should provide some indications! Hence, clear and avoid errors.
  - Telephone numbers
    (_ _ _) - _ _ _ - _ _ _ _ or _ _ _ - _ _ _ - _ _ _ _ or _ _ _ _ - _ _ _ _
  - ID Numbers
  - Times: _ _ : _ _ AM/PM
  - Dates: DD/MM/YYYY MM/DD/YYYY
  - Dollar amounts (or other currency)
    _ _ _ _ . 0 0 or _ _ _ _ . _ _ or _ , _ _ _ , _ _ _ . 00



Bad Example

Apartmental Location Service Form

Please fill in the information belw and we'll help you find the apartment of your dreams.

Name:

Current Address (street, city, state, zip) :

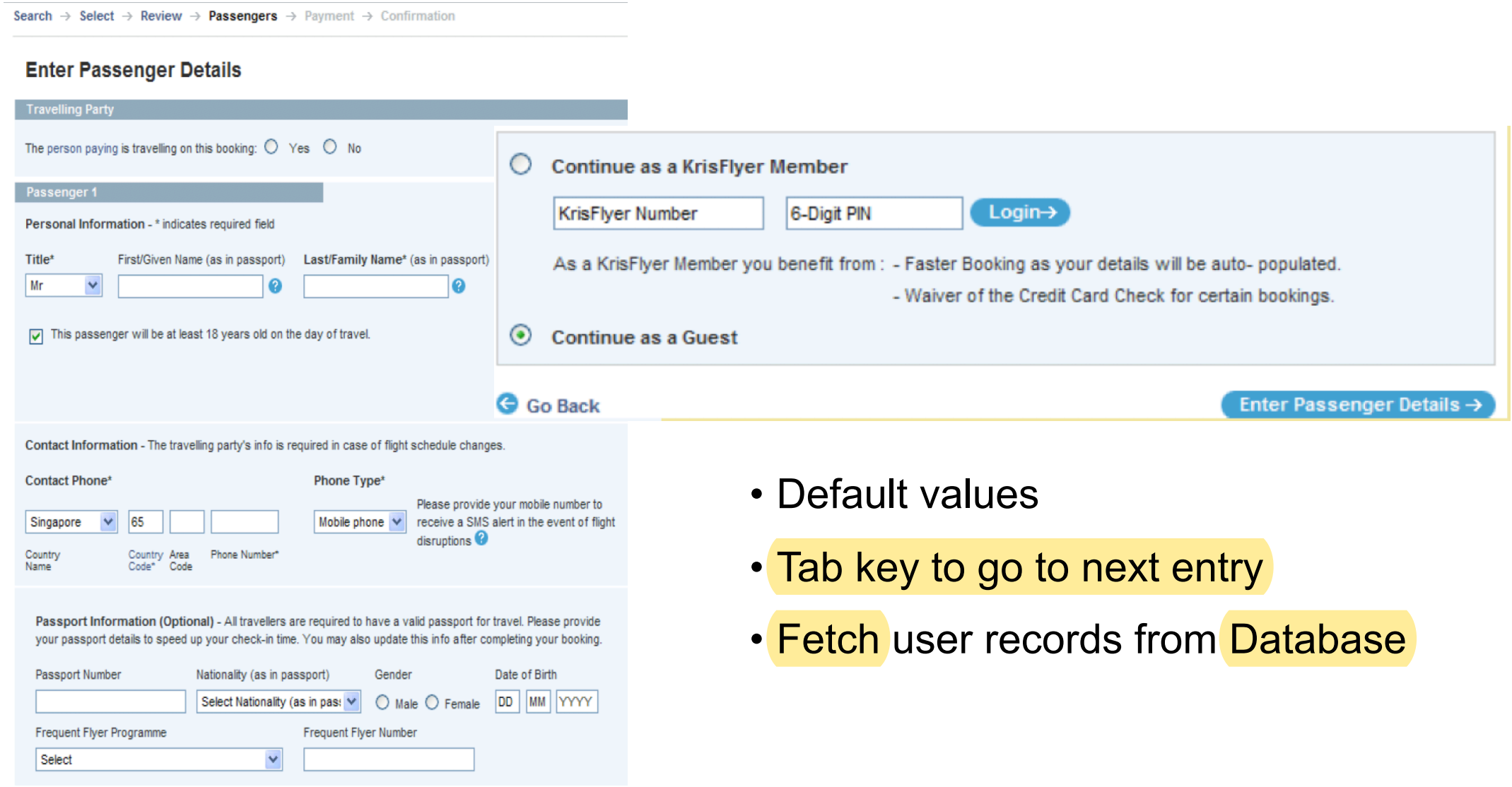
Email:

Phone (with area code):

When do you want to move in ?

- Address fill-in is not very rigid.
- What is the phone number format?
- Last question is unclear, maybe a date (or time of day?) If so, what is the date format?

More efficiency in Form Fill-in



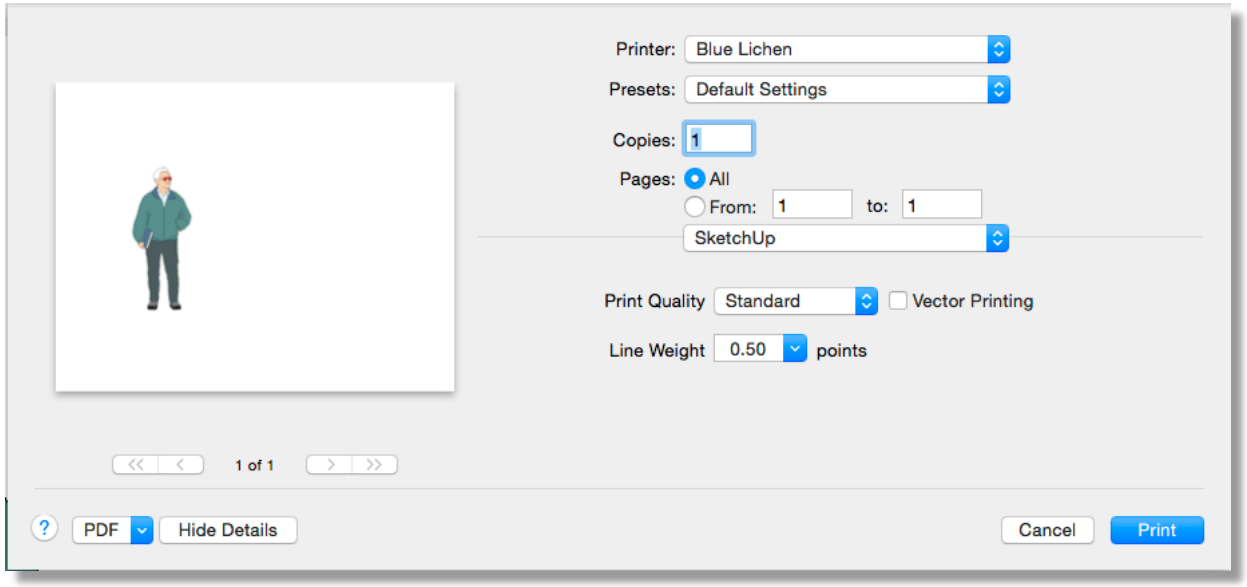
- Default values
- Tab key to go to next entry
- Fetch user records from Database

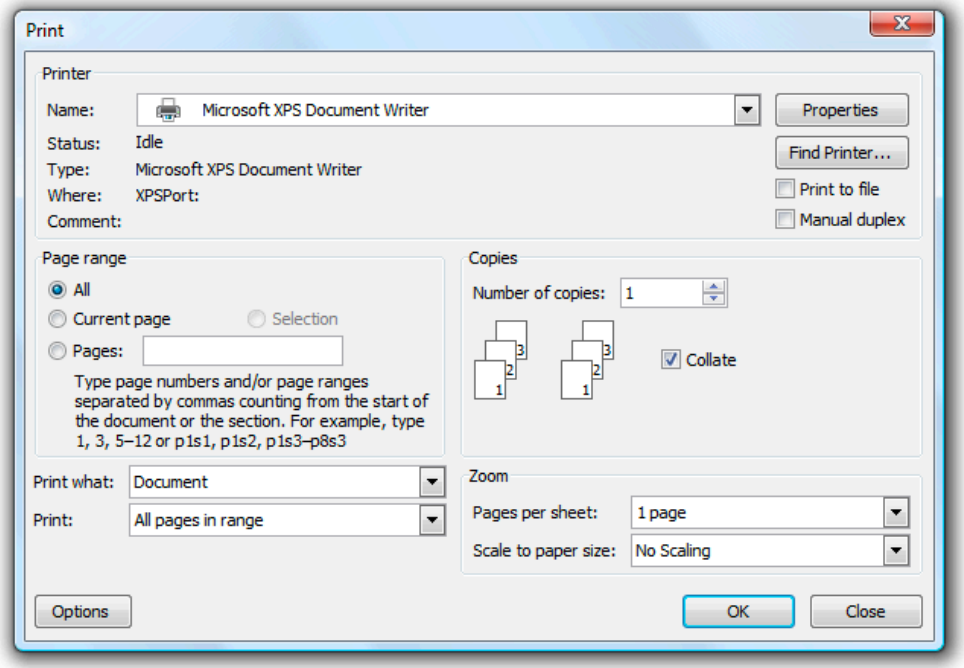
Today's Topics

- Menu selection: making choices
  - Single menus
  - Multiple menus
  - Menu contents
- Form fill-in for data entry
- **Dialog boxes: combination of menus and forms**

Dialog Boxes

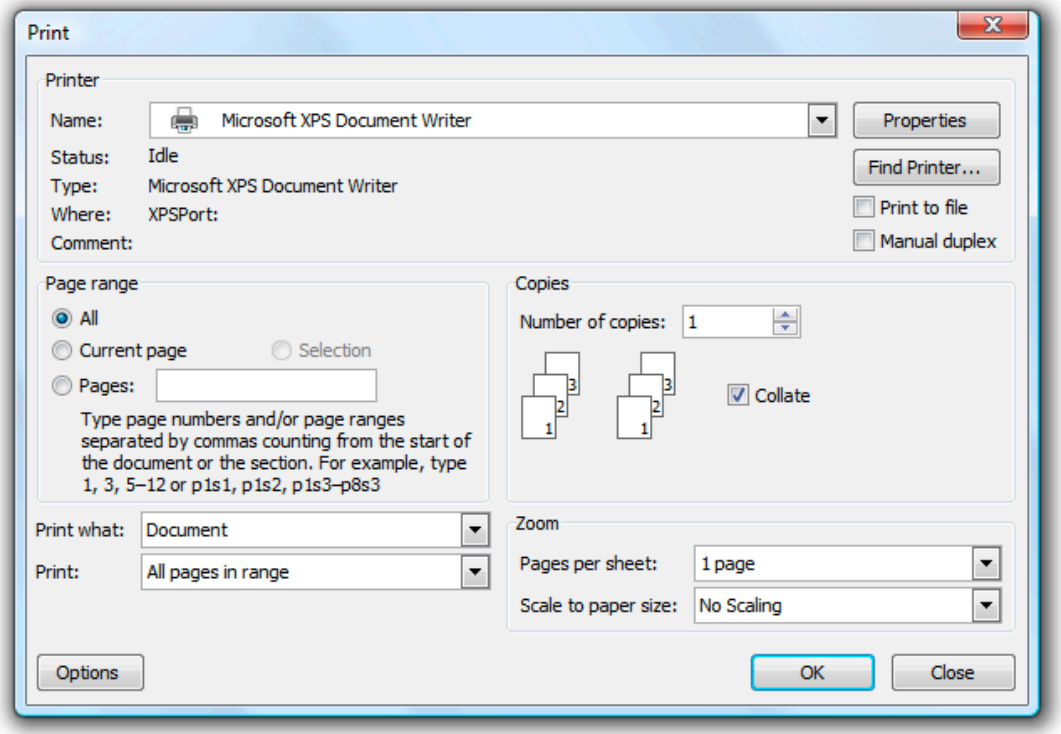
- Graphical control element in the form of a small window that communicates information to the user and prompts them for a response
  - Combination of menu and form fill-in techniques
  - Good for important tasks or events where limited data is needed





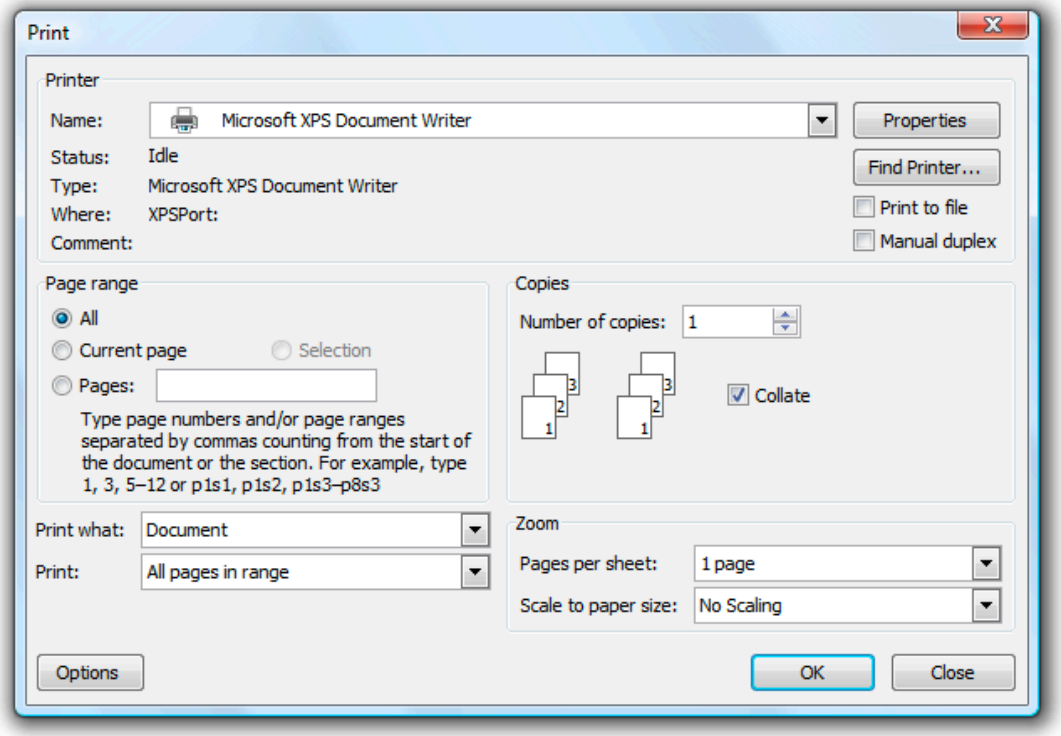
Dialog Boxes

- Internal layout guidelines
  - Meaningful title, consistent style
  - Top-left to bottom-right sequencing
  - Clustering and emphasis
  - Consistent layouts (margins, grid, white space, lines, boxes)
  - Consistent terminology, fonts, capitalization, justification
  - Standard buttons (OK, Cancel)



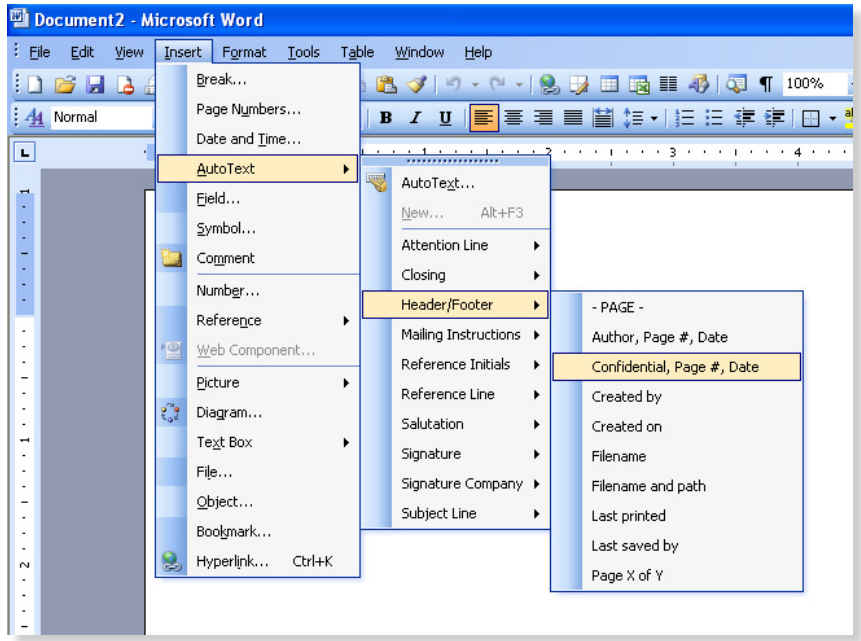
Dialog Boxes

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



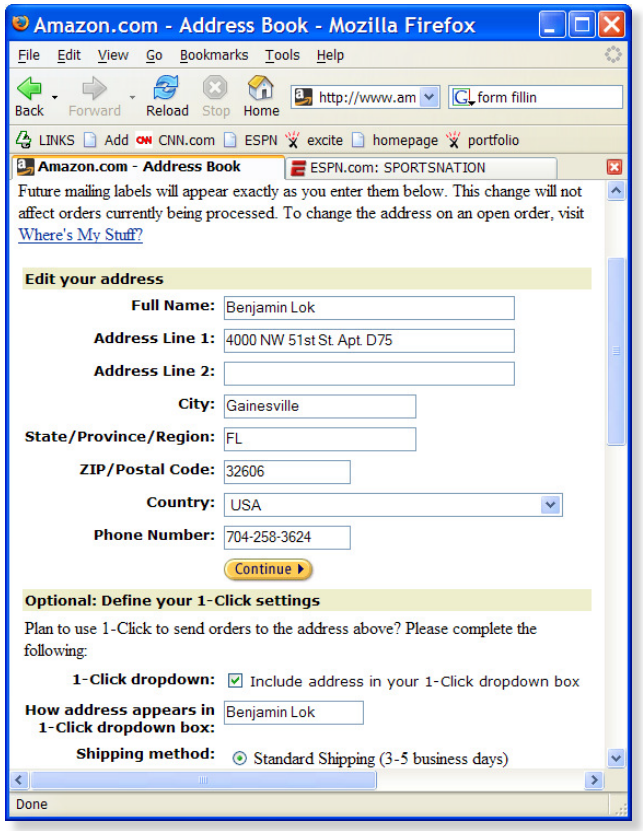
Summary

Menu selection

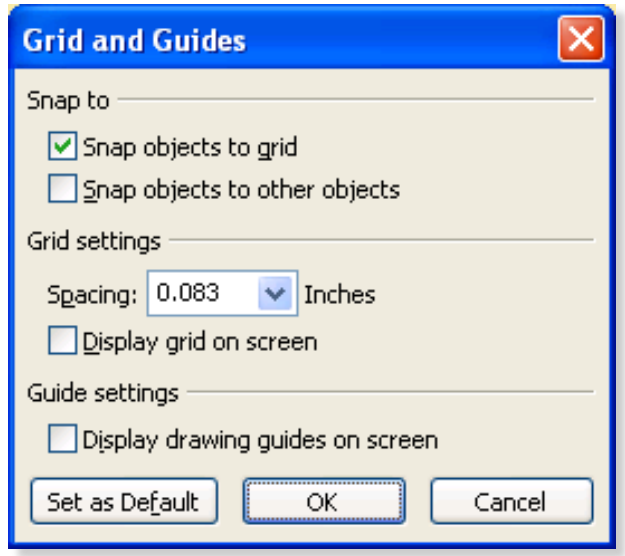


- Single menus
- Multiple menus
- Menu contents

Form fill-in



Dialog boxes



Coming Up

Next Monday: **UI Design Methods**

– Instructed by *Leong Hwee Teo*

– 13:30 - 15:00 by e-learning