



# User Interface Design

# Objectives

- Distinguish between different types of computer users and design considerations for each.
- Identify several important human engineering factors and guidelines and incorporate them into a design of a user interface.
- Integrate output and input design into an overall user interface that establishes the dialogue between users and computer.
- Understand role of operating systems, web browsers, and other technologies for user interface design.
- Apply appropriate user interface strategies to an information system. Use a state transition diagram to plan and coordinate a user interface.
- Describe how prototyping can be used to design a user interface.

# System User Classifications

**Expert User** is an experienced computer user

- Spends considerable time using specific application programs.
- Use of a computer is usually considered non-discretionary.
- In the mainframe computing era, this was called a *dedicated user*.

**Novice User** is a less experienced computer user

- Uses computer on a less frequent, or even occasional, basis.
- Use of a computer may be viewed as discretionary (although this is becoming less and less true).
- Sometimes called a *casual user*.

# Interface Problems

According to Galitz, the following problems result in confusion, panic, frustration, boredom, misuse, abandonment, and other undesirable consequences.

- Excessive use of computer jargon and acronyms
- Non obvious or less-than-intuitive design
- Inability to distinguish between alternative actions (“what do I do next?”)
- Inconsistent problem-solving approaches
- Design inconsistency

# Commandments of User Interface Design

- Understand your users and their tasks.
- Involve the user in interface design.
- Test the system on actual users.
- Practice iterative design.

# Human Engineering Guidelines

- The user should always be aware of what to do next
  - Tell user what the system expects right now.
  - Tell user that data has been entered correctly.
  - Tell user that data has not been entered correctly.
  - Explain reason for a delay in processing.
  - Tell user a task was completed or not completed.
- Format screen so instructions and messages always appear in same general display area.
- Display messages and instructions long enough so user can read them.

# Human Engineering Guidelines (continued)

- Use display attributes sparingly.
- Default values should be specified.
- Anticipate errors users might make.
- Users should not be allowed to proceed without correcting an error.
- If user does something that could be catastrophic, the keyboard should be locked to prevent any further input, and an instruction to call the analyst or technical support should be displayed.

# Guidelines for dialogue Tone and Terminology

**Dialogue** is the overall flow of screens and messages for an application

- **Tone:**
  - Use simple, grammatically correct sentences.
  - Don't be funny or cute!
  - Don't be condescending.
- **Terminology**
  - Don't use computer jargon.
  - Avoid most abbreviations.
  - Use simple terms.
  - Be consistent in your use of terminology.
  - Carefully phrase instructions—use appropriate action verbs.



# User Interface Technology

- Operating Systems and Web Browsers
  - GUI
  - Windows, Macintosh, UNIX, Linux, Palm OS, Windows CE
  - Growing importance of platform independence
- Display Monitor
  - Regular PC monitors
  - Non-GUI terminals
  - Growing importance of devices such as handhelds

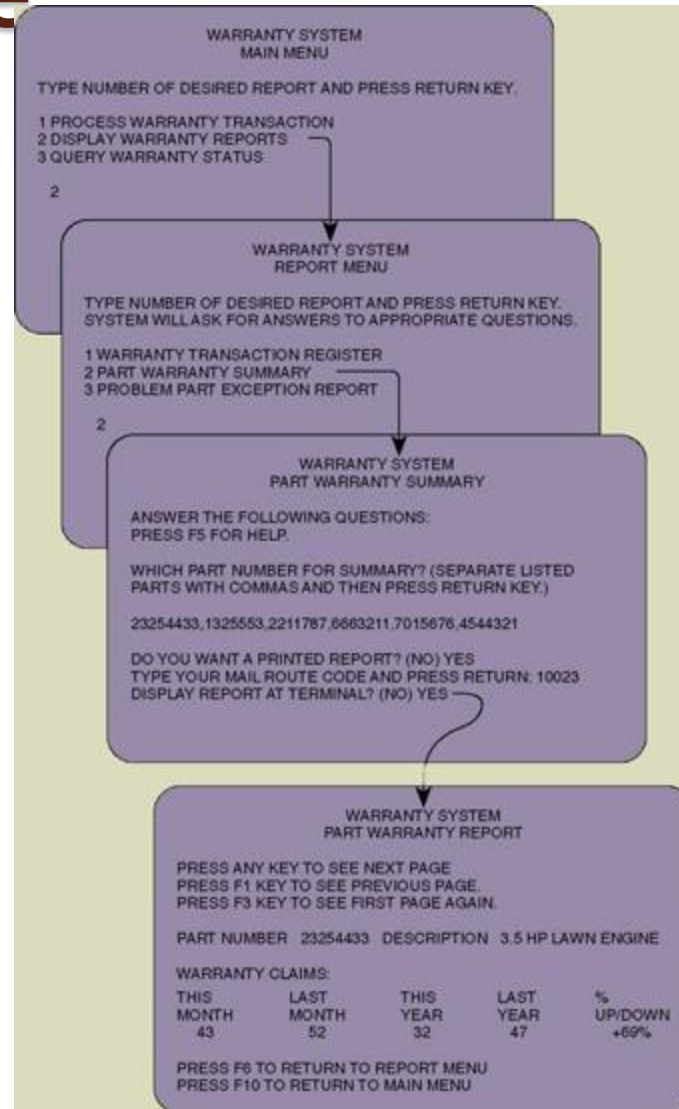
**Paging** – Display complete screen of characters at a time.

**Scrolling** – Display information up or down a screen one line at a time.
- Keyboards and Pointers
  - Mouse
  - Pens

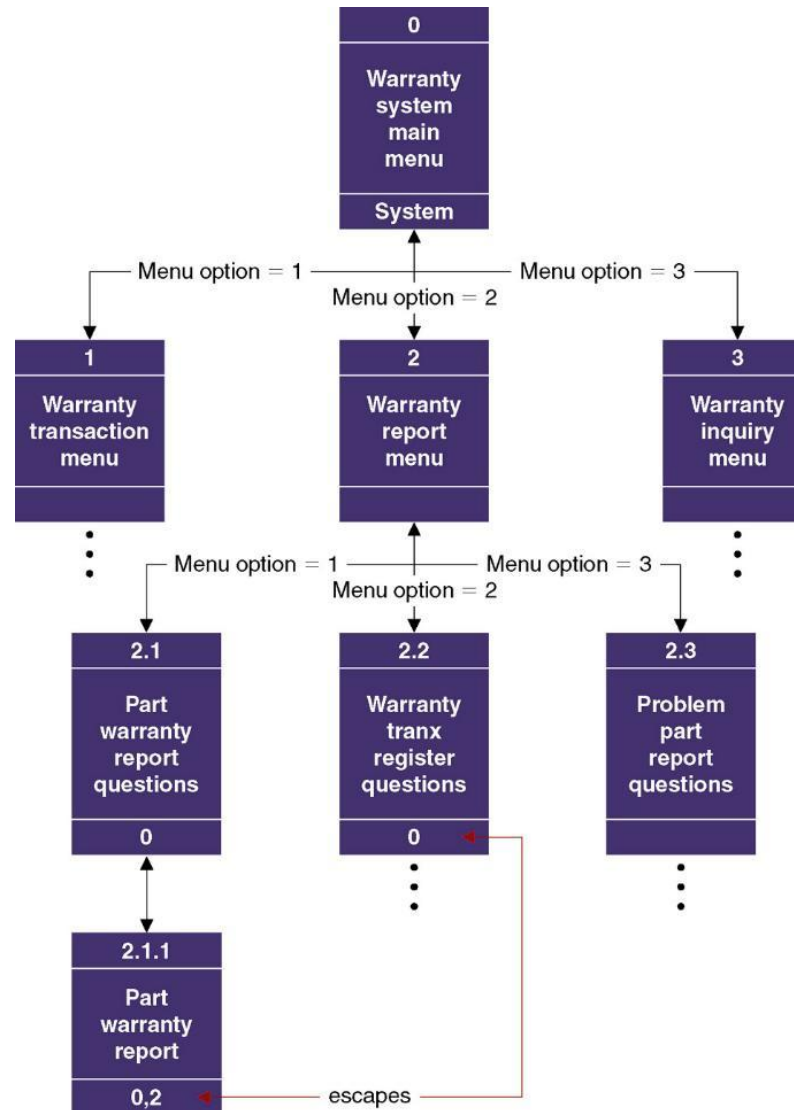
# Graphical User Interfaces Styles and Considerations

- Windows and frames
- Menu-driven interfaces
  - Pull-down and cascading menus
  - Tear-off and pop-up menus
  - Toolbar and iconic menus
  - Hypertext and hyperlink menus
- Instruction-driven interfaces
  - Language-based syntax
  - Mnemonic syntax
  - Natural language syntax
- Question-answer dialogue

# A Classical Hierarchical Menu Dialogue



# Sample Dialogue Chart

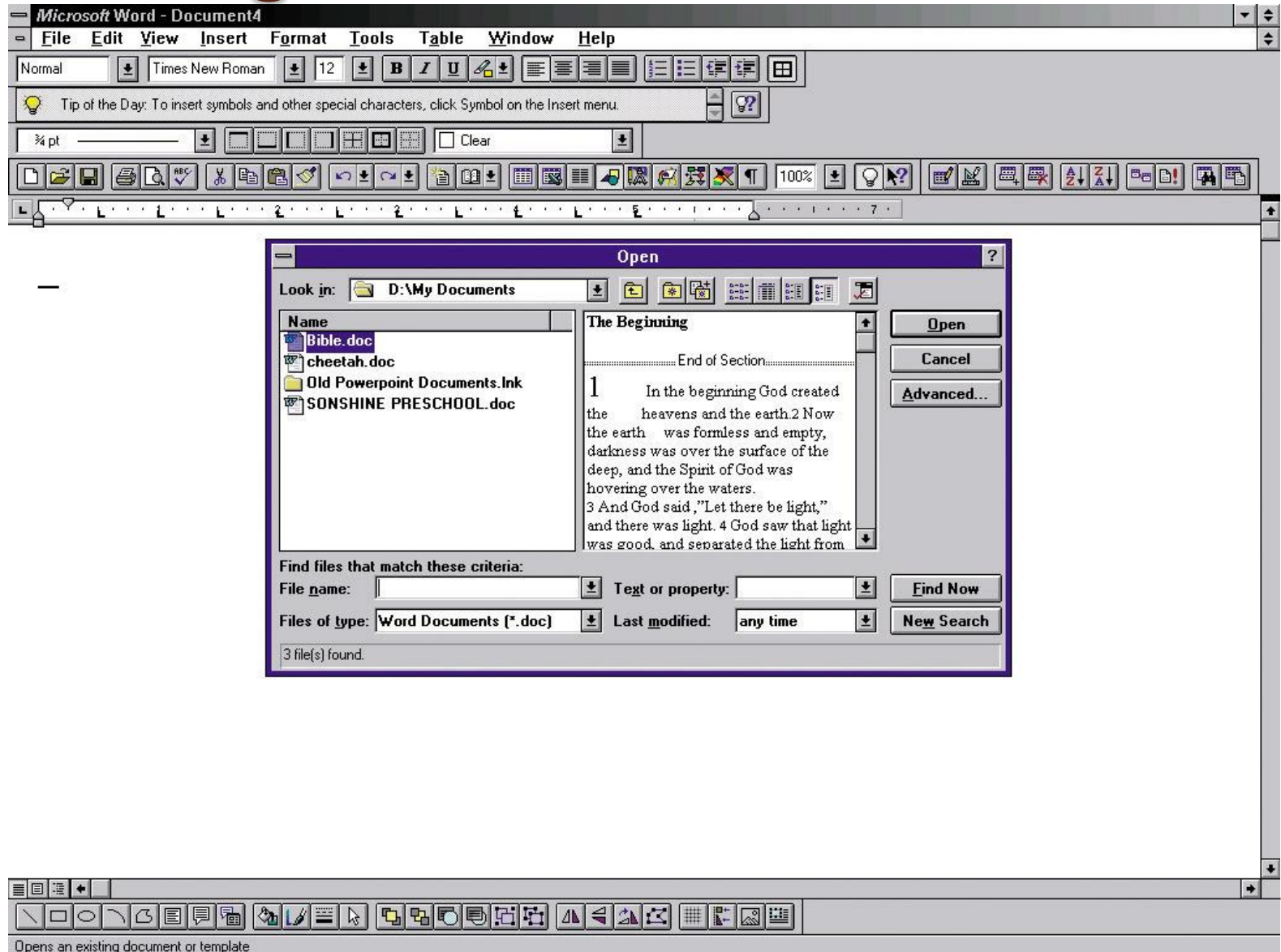


The screenshot displays the Microsoft Excel interface with the 'Insert' menu open. The menu items are: Cells..., Rows, Columns, Worksheet, Chart, Macro, Page Break, Function..., Name (with a right-pointing arrow), Note..., Picture..., Map..., and Object... (with a right-pointing arrow). Annotations with leader lines point to specific features:

- menu bar**: Points to the 'Insert' menu header.
- Cascading menu**: Points to the 'Name' menu item, which has a right-pointing arrow.
- Ellipses indicates dialogue box**: Points to the 'Object...' menu item, which has a right-pointing arrow.
- Pull-down menu**: Points to the 'Chart' menu item.

The spreadsheet grid shows columns A through L and rows 1 through 35. The status bar at the bottom indicates 'Inserts chart using ChartWizard'.

# Dialogue Box





# Pop-Up Menus

Microsoft Excel - Fall 99

File Edit View Insert Format Tools Data Window Help

Arial 10 B I U

F14 MF 1.30-2.20

	A	B	C	D	E	F	G	H	I	J	K	L	N	O	P
1	<b>Fall 99 Schedule of Classes</b>														
2	Subject	Course	Inst Type	Div	Sec	Days & Times	Evening Exam?	Final Exam?	Limit	Building	Room	Seats			
3	CPT	091	Exp	1	1	arrange hours	no	no	999	NA	NA	NA			
4	CPT	092	Exp	1	1	arrange hours	no	no	999	NA	NA	NA			
5	CPT	093	Exp	1	1	arrange hours	no	no	999	NA	NA	NA			
6	CPT	094	Exp	1	1	arrange hours	no	no	999	NA	NA	NA			
7	CPT	095	Exp	1	1	arrange hours	no	no	999	NA	NA	NA			
8	CPT	101	Prim	1	1	TTh 9.30-10.20 wks 1-8	no	no	88	CIVL	1144	100			
9	CPT	107A	Lab	1	1	Th 2.30-3.20	no	no	10	SCHL	230	10			
10	CPT	125	Sec	1	1	T 1.30-2.20	no	no	60	MSEE	B012	96			
11	CPT	125L	Lab	1	1	Th 11.30-1.20	no	no	20	PHYS	116	24			
12	CPT	125L	Lab	2	1	Th 1.30-3.20	no	no	20	PHYS	116	24			
13	CPT	125L	Lab	3	1	Th 3.30-5.20	no	no	20	PHYS	116	24			
14	CPT	135	Prim	1	1	MF 1.30-2.20	yes	yes	167	RHPH	172	196			
15	CPT	135	Prim	2	1	MF 4.30-5.20	yes	yes	167	EE	170	172			
16	CPT	135	Prim	3	1	MF 7.30-8.20	yes	yes	166	PHYS	114	273			
113	CPT	255L	Lab	2	1	W 9.30-11.20	no	no	22	KNOY	228	24			
114	CPT	255L	Lab	3	1	W 1.30-3.20	no	no	22	KNOY	228	24			
115	CPT	255L	Lab	4	1	W 3.30-5.20	no	no	22	KNOY	228	24			
116	CPT	255L	Lab	5	1	Th 7.30-9.20	no	no	22	KNOY	228	24			
117	CPT	255L	Lab	6	1	Th 9.30-11.20	no	no	0	KNOY	228	24			
118	CPT	267	Prim	1	1	WF 12.30-1.20	yes	yes	38	KNOY	B035	42			
119	CPT	267L	Lab	1	1	Th 7.30-9.20	no	no	19	PHYS	116	24			
120	CPT	267L	Lab	2	1	Th 9.30-11.20	no	no	19	PHYS	116	24			
121	CPT	280	Prim	1	1	TTh 9.00-10.15	no	yes	94	SC	239	96			
122	CPT	280J	Pso	1	1	W 7.30-8.20	no	no	32	KNOY	B035	42			
123	CPT	280J	Pso	2	1	W 9.30-10.20	no	no	31	KNOY	B035	42			
124	CPT	280J	Pso	3	1	W 10.30-11.20	no	no	31	KNOY	B035	42			
125	CPT	299	Ind	1	1	arrange hours	no	no	999	NA	NA	NA			
126	CPT	305	Prim	1	1	MW 1.30-2.20	no	yes	24	KNOY	B035	42			

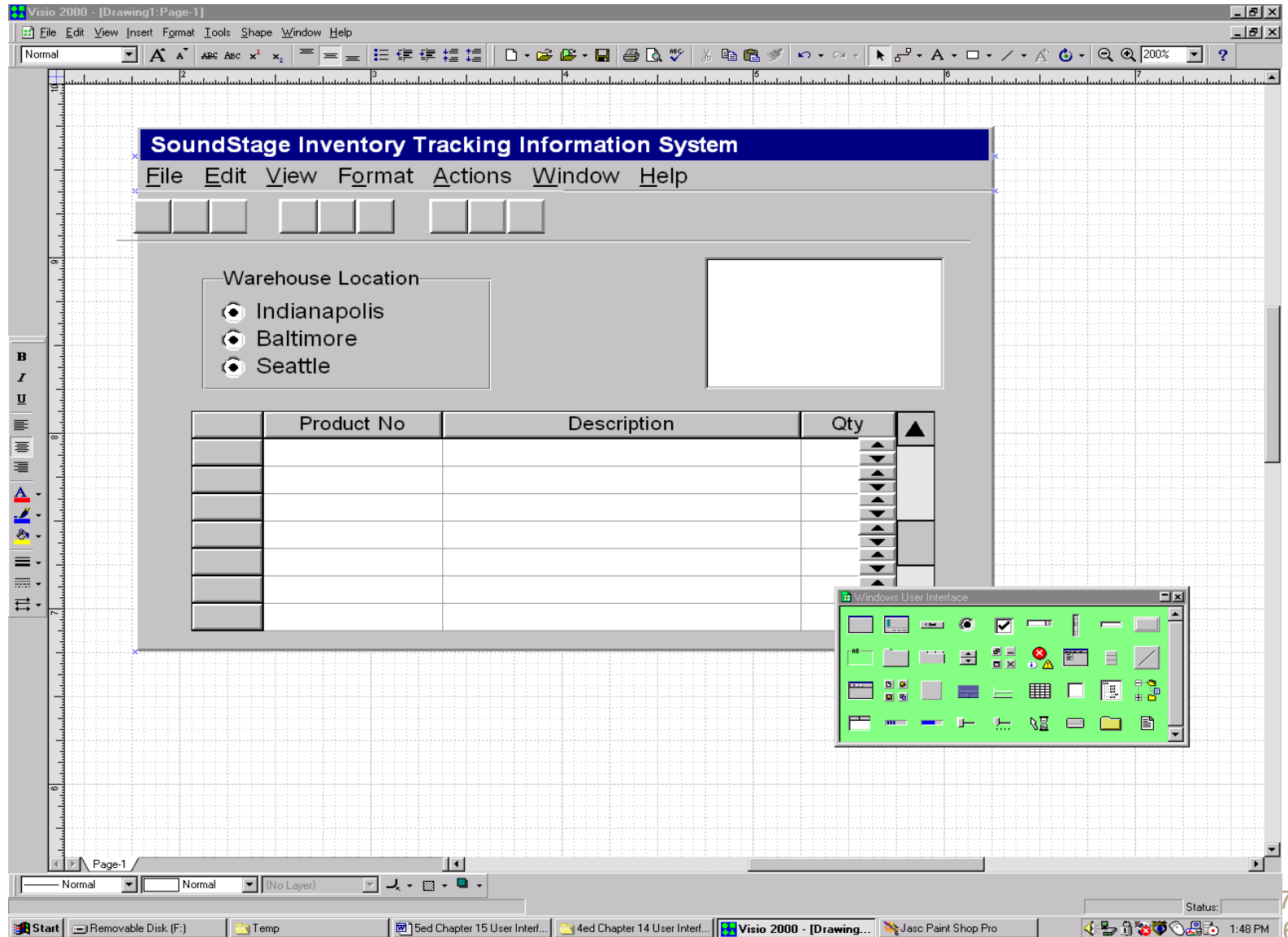
by Course / by Instructor / by Room /

Ready

Start Removable Disk (F:) Temp 5ed Chapter 15 User Interf... 4ed Chapter 14 User Interf... Microsoft Excel - Fall ... Jasc Paint Shop Pro

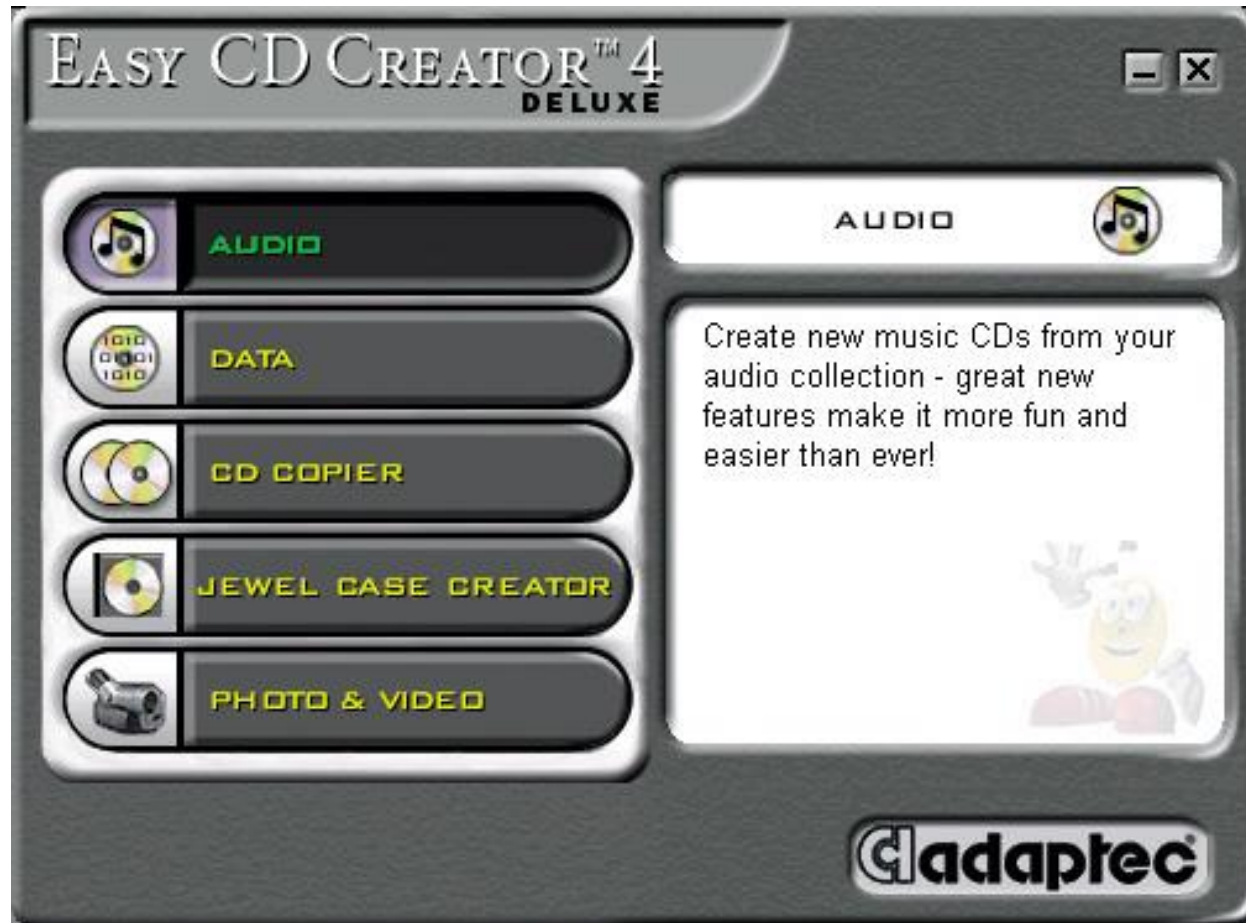
NUM 1:17 PM

# Tool Bars

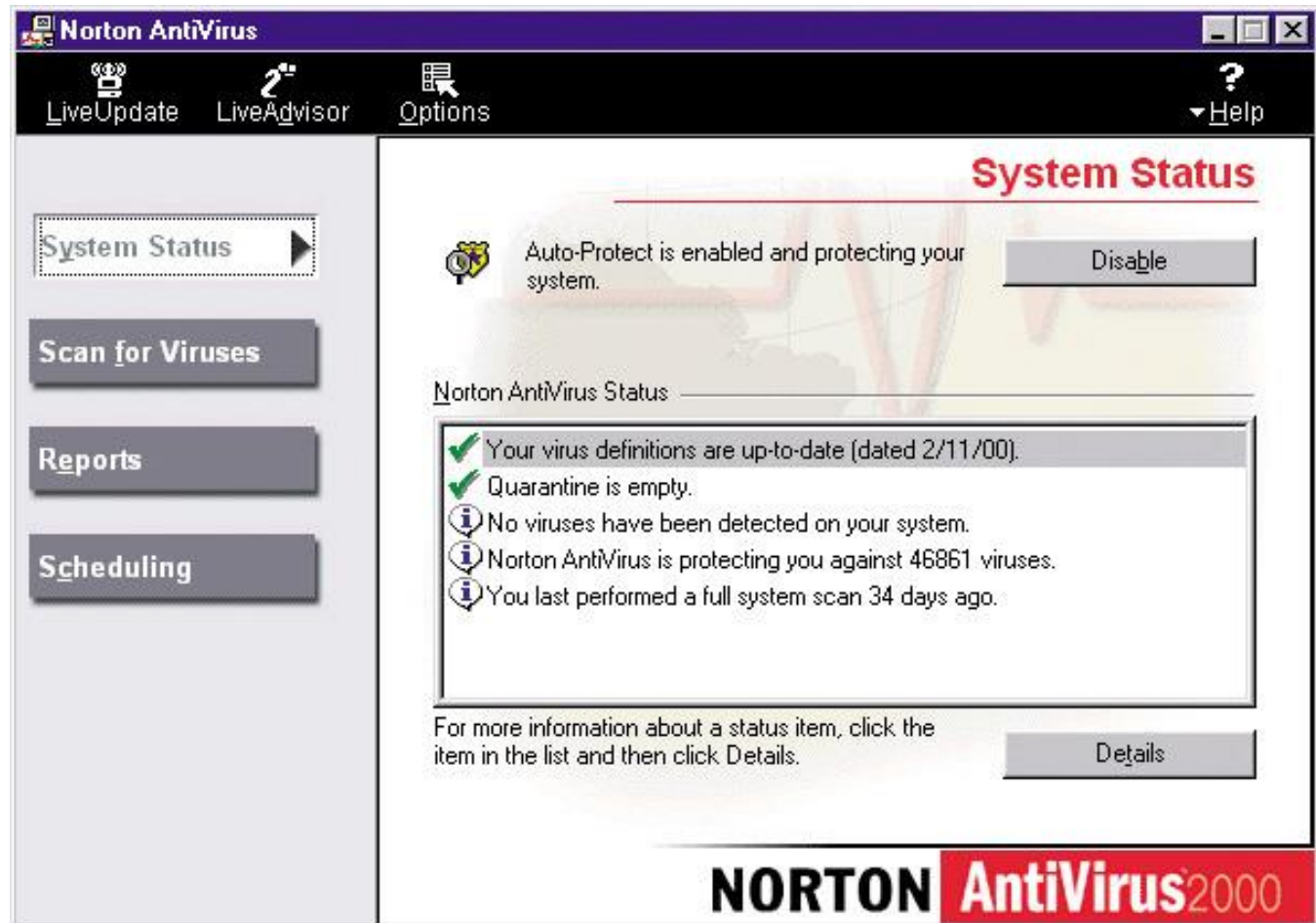




# Iconic Menus



# Consumer-Style Interface



# Hybrid Windows/Web Interface

**Quicken 2000 Home & Business - QDATA - [Investing]**

File Edit Finance Banking Investing Household Taxes Planning Business Reports Help

Quicken 2000 home & business back online calc print action

**Investing Center** How Do I

**My Finances**

- Accounts
- Reminders
- Calendar

**Banking**

- Register
- Sched. Txns

**Investing**

**Household**

**Taxes**

**Planning**

- Savings Goals

**Business**

**Reports & Graphs**

**Activities**

- Enter a [new investment](#)
- [Rebalance](#) my portfolio
- Estimate my [capital gains](#)
- Get my [transactions online](#)
- [Research](#) a stock or mutual fund
- Get [online quotes](#) and news
- Download [historical prices](#)
- Set up to [export my portfolio](#)
- [Chart](#) multiple securities

**Questions**

- [What should my asset allocation be?](#)
- [How should I invest my money?](#)
- [How are my investments doing?](#)

**Investment Accounts** Daily

Info	Account	Mkt Value	MktVal Chg	%
Total		0.00		

**OBSERVATIONS**

You have not set up any investment accounts in Quicken. Use EasyStep [Investment Account Setup](#) to get started!

**ACTIONS**

- [Add](#) an investment
- [Use One Step Update](#) to download all of your financial data
- [View my full portfolio](#)

**Watch List**

Symbol	Price	Chg
--------	-------	-----

**OBSERVATIONS**

You can use the Watch List to track the prices of stocks and mutual funds you are interested in. [Learn how](#) to get started.

**ACTIONS**

- [Edit](#) my watch list
- [Get online quotes and news](#)
- [Research](#) a stock or mutual fund
- [Set](#) a price alert

**Asset Allocation Monitor** 2/20/00

**OBSERVATIONS**

You have not set up any investment accounts in Quicken. Use EasyStep [Investment Account Setup](#) to get started!

**ACTIONS**

- [Learn](#) about asset allocation

**Returns By Security** 1/00 - 2/00

**OBSERVATIONS**

You have not set up any investment accounts in Quicken. Use EasyStep [Investment Account Setup](#) to get started!

**ACTIONS**

- [Select](#) accounts & securities to include
- [View my full portfolio](#)

Summary 2/18/00 Alerts What's my car worth?

# Instruction-Driven Interfaces

- **Language-based syntax** is built around a widely accepted command language that can be used to invoke actions
  - SQL
- **Mnemonic syntax** is built around commands defined for custom information systems.
  - Commands unique to that system and meaningful to user
- **Natural language syntax** allows users to enter questions and command in their native language

# Instruction-Driven Interface

Microsoft Access - Sales by Category : Select Query

File Edit View Insert Query Tools Window Help

SELECT DISTINCTROW Categories.CategoryID, Categories.CategoryName, Products.ProductName, Sum([Order Details Extended].ExtendedPrice) AS ProductSales  
 FROM Categories INNER JOIN [Products INNER JOIN [Orders INNER JOIN [Order Details Extended] ON Orders.OrderID = [Order Details Extended].OrderID] ON Products.ProductID = [Order Details Extended].ProductID ON Categories.CategoryID = Products.CategoryID  
 WHERE ((([Orders.OrderDate] Between #1/1/94# And #12/31/94#))  
 GROUP BY Categories.CategoryID, Categories.CategoryName, Products.ProductName;

Microsoft Access - Sales by Category : Select Query

File Edit View Insert Query Tools Window Help

Categories: CategoryID, CategoryName, Description, Picture  
 Products: ProductID, ProductName, SupplierID, CategoryID  
 Order Details Extended: OrderID, ProductID, ProductName, UnitPrice  
 Orders: OrderID, CustomerID, EmployeeID, OrderDate

Field:	CategoryID	CategoryName	ProductName	ProductSales: Exter	OrderDate			
Table:	Categories	Categories	Products	Order Details Extern	Orders			
Total:	Group By	Group By	Group By	Sum	Where			
Sort:								
Show:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Criteria:					Between #1/1/94# An			
or:								

Ready

Ready CAPS

# Special Considerations for User Interface Design

- Internal Controls – Authentication and Authorization
  - User ID and Password
  - Privileges assigned to roles
  - Web certificates
- Online Help
  - Growing use of HTML for help systems
  - Help authoring packages
  - Tool tips
  - Help wizards
  - Agents – reusable software object that can operate across different applications and networks.



# Authentication Log-in Screen and Error Screen

**Security Authorization**



Welcome to the  
***Soundstage  
Entertainment  
Club***

Warning: This computer program is protected by copyright law and international treaties. Unauthorized reproduction or distribution of this program, or any portion of it, may result in civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.

User ID Information:

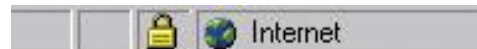
User ID:

Password:

**Security Authorization Failure** [X]

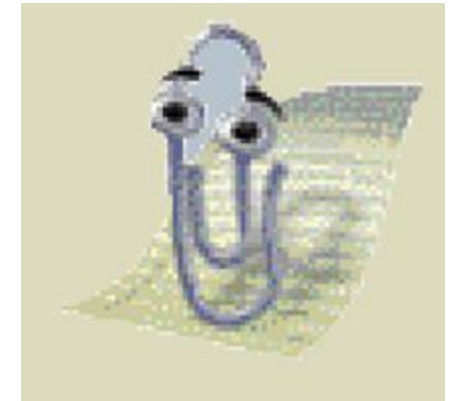
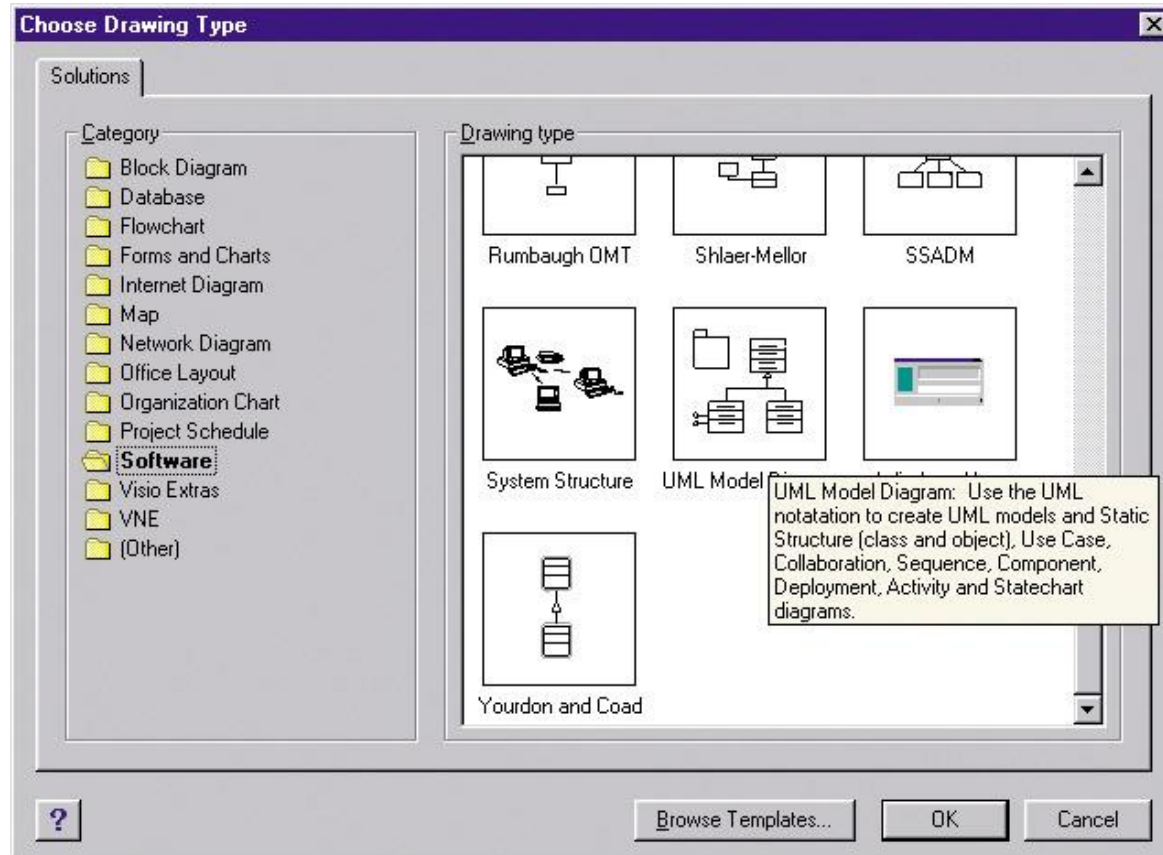
 Unknown User ID or incorrect password. Please try again.

# Server Security Certificate





# Help Tool Tip, Help Agent, and Natural Language Processing



## What would you like to do?

- Change the default chart type
- Troubleshoot charts
- Change the display of chart labels, data tables, legends, gridlines, or axes
- Change the view of a 3-D chart
- Change chart labels, titles, and other text
- Change the way data is plotted

How do I customize the X-Axis on my chart

Options

Search

# Help Wizard

**Create New Account**

Choose the type of account to create.

<b>Banking &amp; Cash</b>	<b>Investments</b>	<b>Home &amp; Business</b>
<input type="radio"/> Checking	<input type="radio"/> Brokerage	<input type="radio"/> House (with or w/o Mortgage)
<input type="radio"/> Savings	<input type="radio"/> IRA or Keogh	<input type="radio"/> Vehicle (with or w/o Loan)
<input checked="" type="radio"/> Credit Card	<input type="radio"/> 401(k)	<input type="radio"/> Asset
<input type="radio"/> Money Market	<input type="radio"/> Dividend Reinvestment Plan	<input type="radio"/> Liability
<input type="radio"/> Cash	<input type="radio"/> Other Investment	<input type="radio"/> Invoices / Receivables
		<input type="radio"/> Bills / Payables

■ If you are trying to set up a security such as a stock or bond, probably choose Brokerage. Click help for more information.

**Credit Card Account Setup**

EasyStep Summary

**Account Information**

Account Name: Credit Card

Description: My New Credit Card

Balance: 3.00 as of 2/21/00

Financial Institution: Ashburn Bank

**Online Information**

☐ Enable Online Account Access

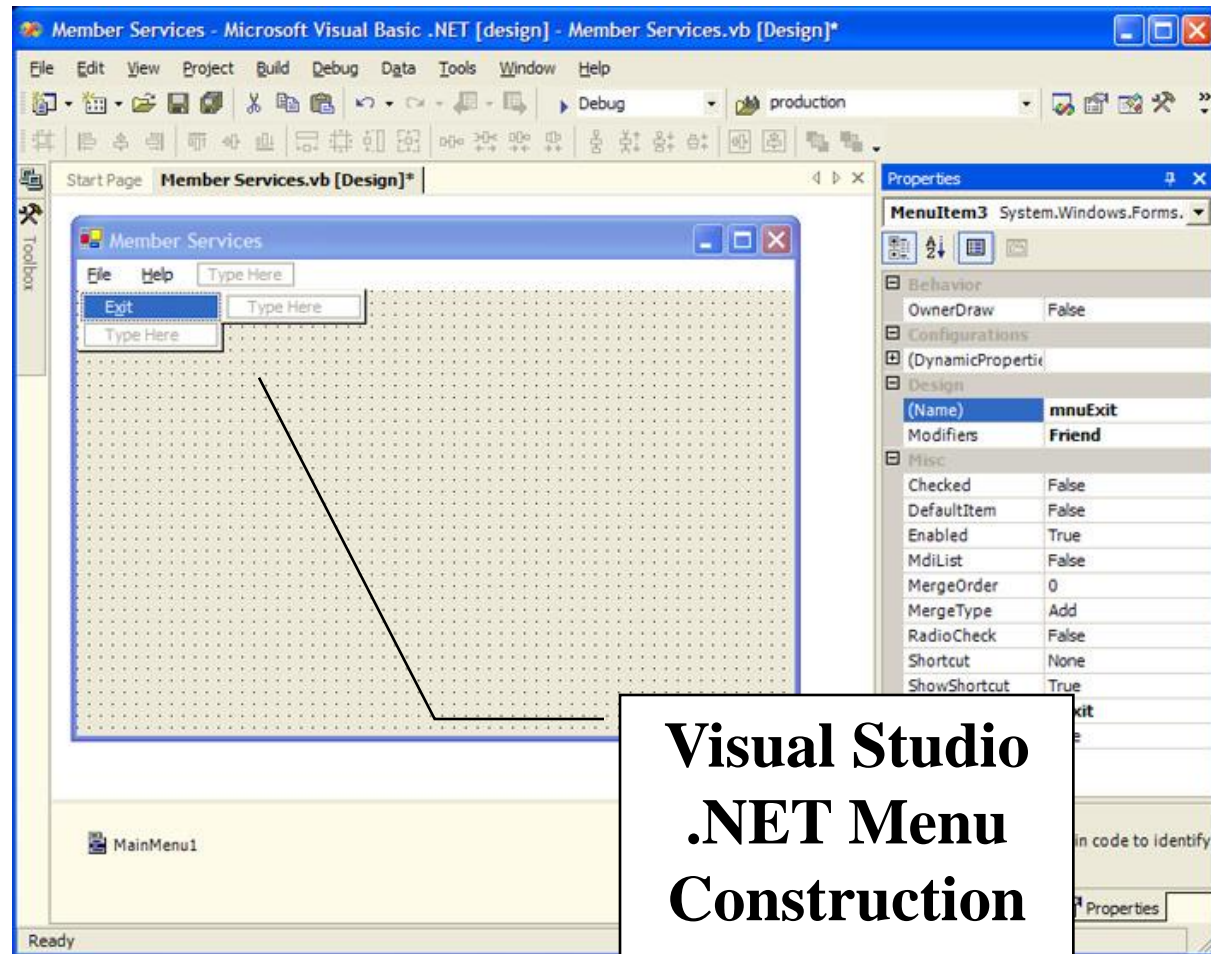
**Optional Information**

Credit Limit, if Applicable: 5,000.00

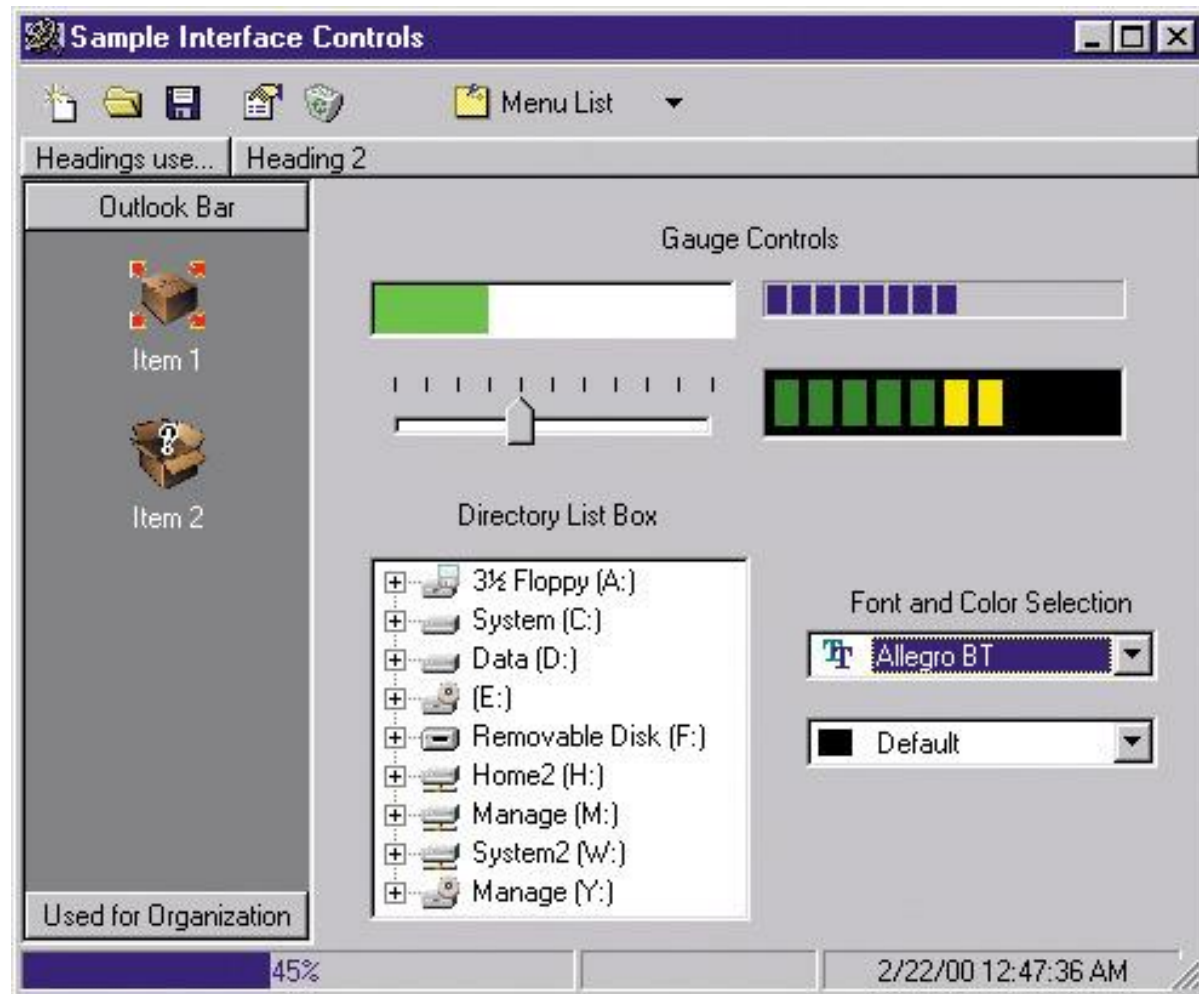
Additional Information:  Tax Info:

# Automated Tools for User Interface Design & Prototyping

- Microsoft Access
- CASE Tools
- Visual Studio
- Excel
- Visio



# Additional User Interface Controls in Visual Basic



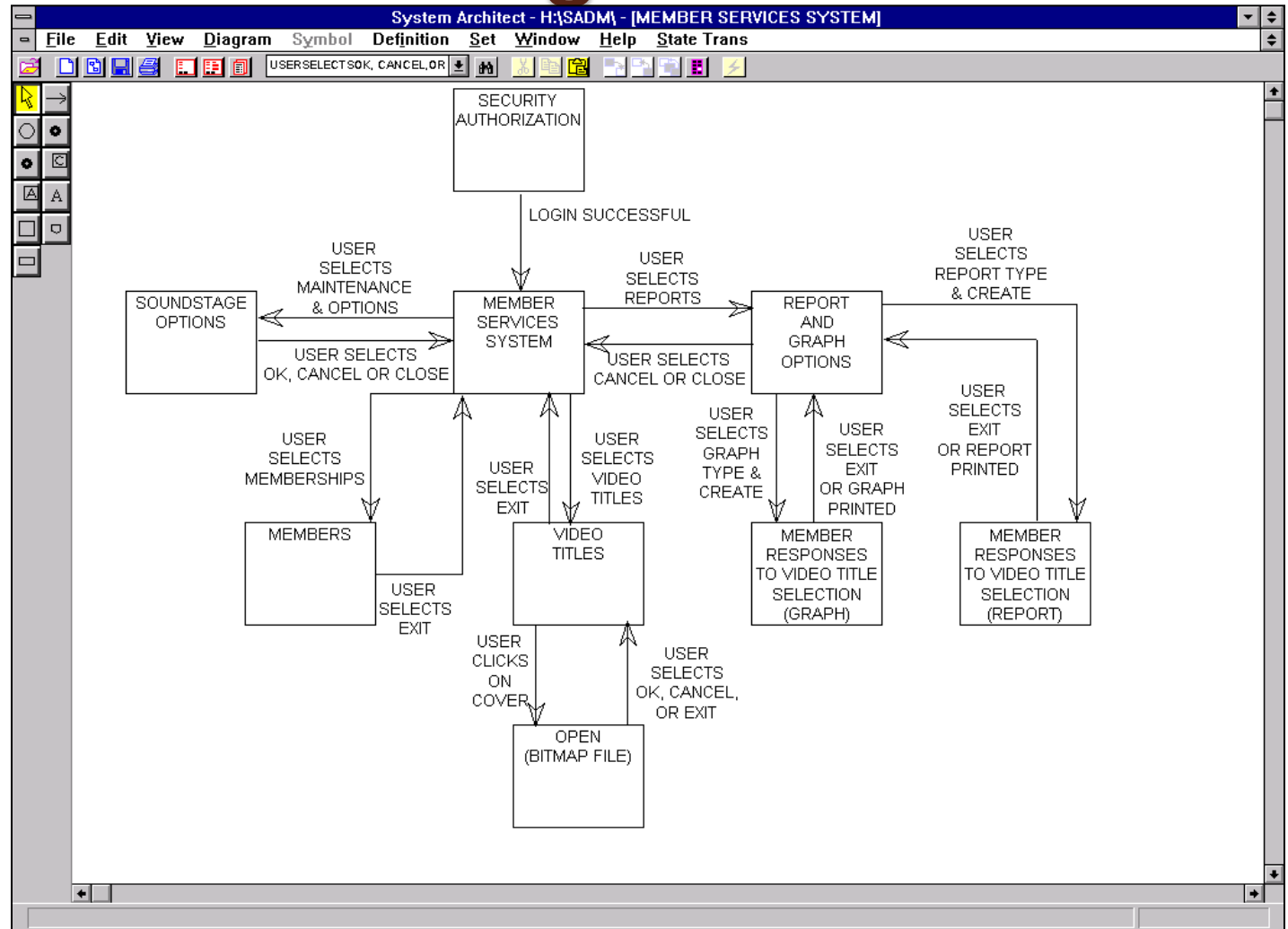
# The User Interface Design Process

1. Chart the user interface dialogue.

**State Transition Diagram**— a tool used to depict the sequence and variation of screens that can occur during a user session.

2. Prototype the dialogue and user interface.
3. Obtain user feedback.
  - Exercising (or testing) the user interface
4. If necessary return to step 1 or 2

# SoundStage Partial State Transition Diagram

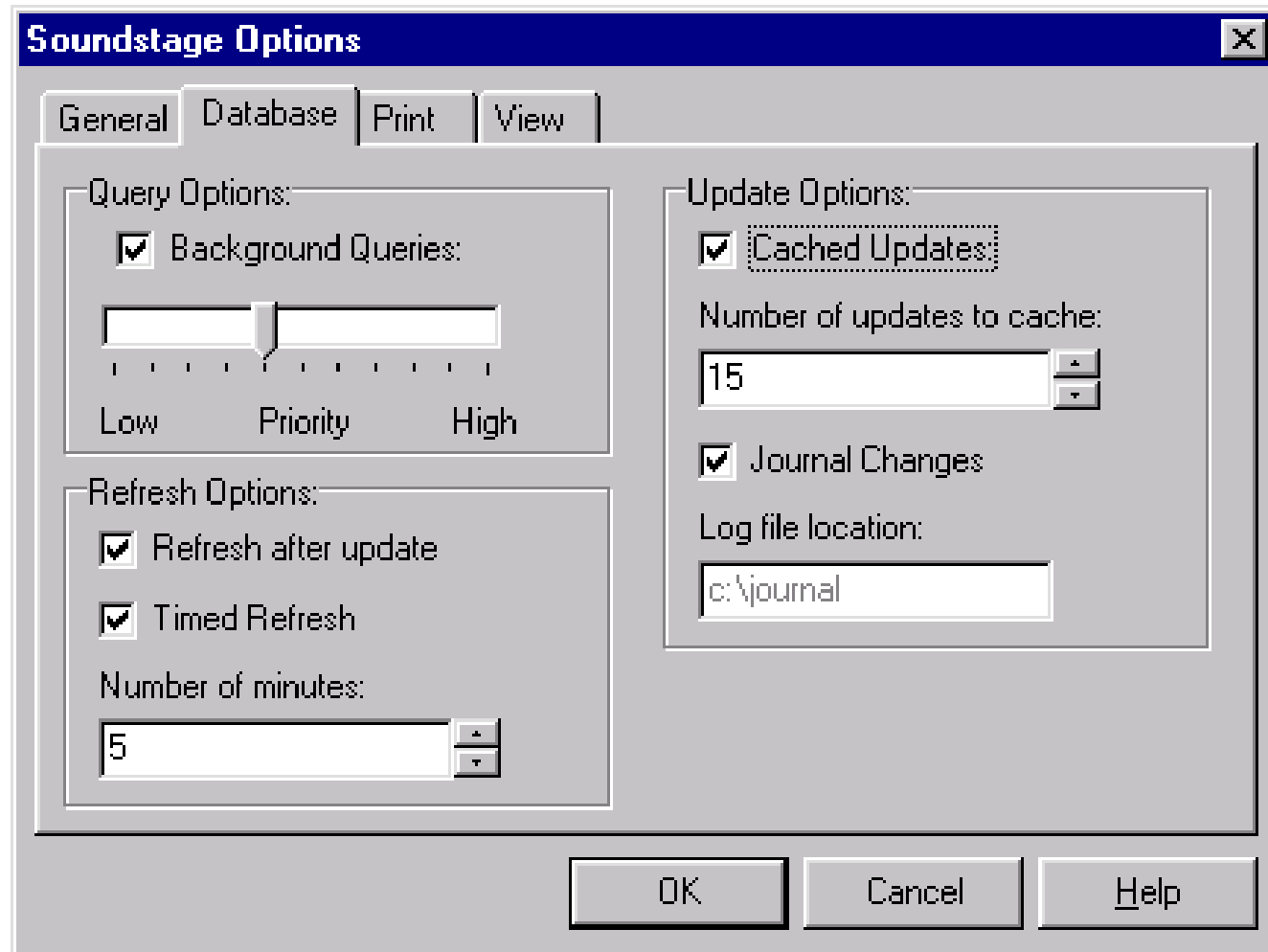




# SoundStage Main Menu



# SoundStage Options and Preferences Screen



The image shows a Windows-style dialog box titled "Soundstage Options". It has four tabs: "General", "Database", "Print", and "View". The "General" tab is selected. The dialog is divided into two main sections. The left section contains "Query Options" and "Refresh Options". "Query Options" has a checked checkbox for "Background Queries" and a slider set to "Priority" between "Low" and "High". "Refresh Options" has two checked checkboxes: "Refresh after update" and "Timed Refresh", followed by a text box for "Number of minutes" containing the value "5". The right section contains "Update Options" with a checked checkbox for "Cached Updates", a text box for "Number of updates to cache" containing "15", a checked checkbox for "Journal Changes", and a text box for "Log file location" containing "c:\journal". At the bottom are "OK", "Cancel", and "Help" buttons.

**Soundstage Options**

General Database Print View

**Query Options:**

- ☒ Background Queries:
- Slider: Low Priority High

**Refresh Options:**

- ☒ Refresh after update
- ☒ Timed Refresh
- Number of minutes: 5

**Update Options:**

- ☒ Cached Updates
- Number of updates to cache: 15
- ☒ Journal Changes
- Log file location: c:\journal

OK Cancel Help



# SoundStage Report Customization dialogue Screen

**Report and Graph Options** [?] [X]

Reports | Graphs

Report Type:

Pre-defined Reports:  
Member Selection Summary ▼

☐ Custom Report

Custom Report Name:  
[Text Box] [Design]

Header Options:

<input checked="" type="checkbox"/> Current Date	<input type="checkbox"/> User Name
<input checked="" type="checkbox"/> Current Time	<input checked="" type="checkbox"/> Report Name
<input type="checkbox"/> Page Numbers	<input type="checkbox"/> Number of Records

Entertainment Categories:

<input type="checkbox"/> Audio
<input checked="" type="checkbox"/> Game
<input checked="" type="checkbox"/> Video
<input type="checkbox"/> All

Summary Information:

<input checked="" type="checkbox"/> Show Summations
<input checked="" type="checkbox"/> Show Maximums
<input type="checkbox"/> Show Minimums

[Cancel] [Create]

# Revision Questions

1. Why should the system users be involved in the process of designing user interfaces?
2. Who are expert users? Why are they called expert?
3. Why can some user interfaces cause users to feel confused, panicky, or frustrated?
4. What does it mean to test the system on actual users?
5. What should we do to ensure the system users are aware of what to do in the system?
6. How should the interfaces handle errors?
7. What are some factors that should be considered in terms of the terminology used in computer dialogues?
8. Why are Web browsers becoming more important when designing applications?
9. Explain paging and scrolling.
10. What should we consider when we design function keys for our applications?
11. Why are pens used in applications?
12. What is the relationship between windows and frames?
13. What are characteristics of a pop-up menu?
14. What are steps of the user interface design process?
15. What is the tool used to facilitate the charting of the dialogue?