User Interface Design

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WILEY

Objective

- Understand the principles of user interface (UI) design
- Understand the process of user interface design
- To design the user interface structure & standard
- Understand the principles and techniques for
  - navigation design
  - input design
  - output design
- Be able to design a user interface

Systems Analysis and Design: SDLC

1 Planning: Preliminary Investigation / Scope Analysis
2 Analysis
- Problem Analysis
- Requirement Analysis
- Logical modeling / design
- Decision Analysis

3 Design
- System Architecture: network model, H/W & S/W specification, security
- Plan: Testing, Conversion (data & system), Training
- IS Application: Class & Object, GUI (I/O)

4 Implementation
5 Maintenance: Operation & Support

Analysis

1 Information (what)
2 Requirement Specification
3 Diagram
- Functional analysis: Use Case Diagram
- Structural analysis: Class Diagram
- Specification: Contract

Design

1 Technology (how)
2 Design Specification
- Architecture, Interface, Data&Process

3 Diagram
- Behavior model
  - Interaction Diagram State Diagram
- Activity Diagram
- (Specification perspective) Class Diagram

Contents

- Introduction
- Principles for UI Design
- UI Design Process
- Navigation Design
- Input Design
- Output Design

1. Introduction

- User interface defines how the system will interact with external entities
- System interfaces define how systems exchange information with other systems
- Navigation mechanism provides the way for users to tell the system what to do
- Input mechanism defines the way the system captures information
- Output mechanism defines the way the system provides information to users or other systems
- Graphical user interface (GUI) is the most common type of interfaces

Interface Problem

Interface problems result in confusion, panic (ตื่นตระหนก), frustration (คับข้องใจ), boredom, misuse, abandonment, and other undesirable consequences

Causes

- 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

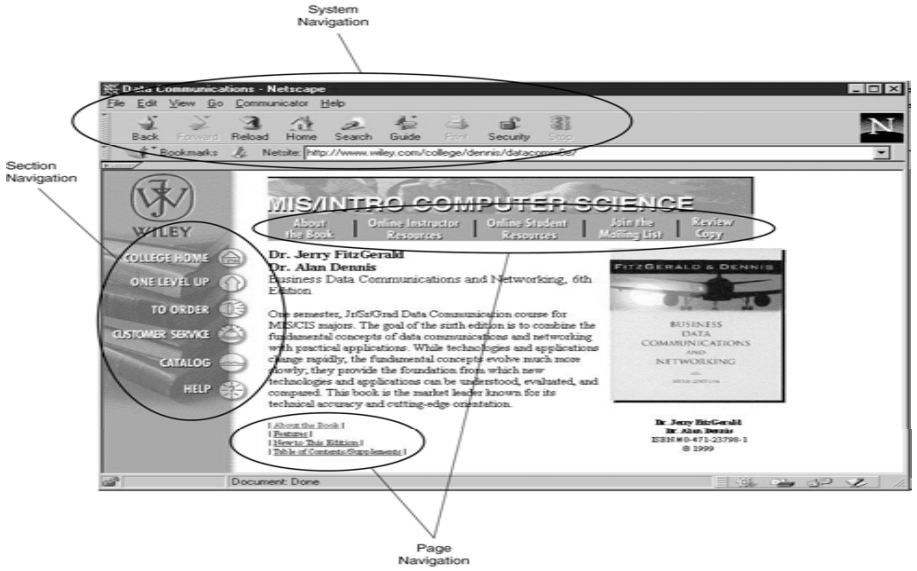
2. Principles for User Interface Design

- Layout
- Content Awareness
- Aesthetics (สุนทรียภาพ)
- User Experience
- Consistency
- Minimal User Effort

2.1 Layout Concept

- The screen is often divided into three boxes
  1 Navigation area (top)
  2 Status area (bottom)
  3 Work area (middle)
- Areas and information should minimize user movement from one to another

Layout Example



Layout Example

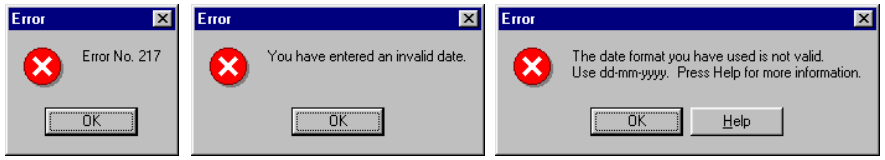
2.2 Content Awareness

- 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

Human Engineering Guidelines

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

Which error message is most helpful?



- Is this a helpful warning?

2.3 Aesthetics

- Interface design for pleasing the eye
- 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
  - Avoid using all capital letters
- Colors and patterns should be used carefully

2.4 User Experience

- Usability concept
  - Easy to use / learn / understand / useful
- Consider adding shortcuts for the expert

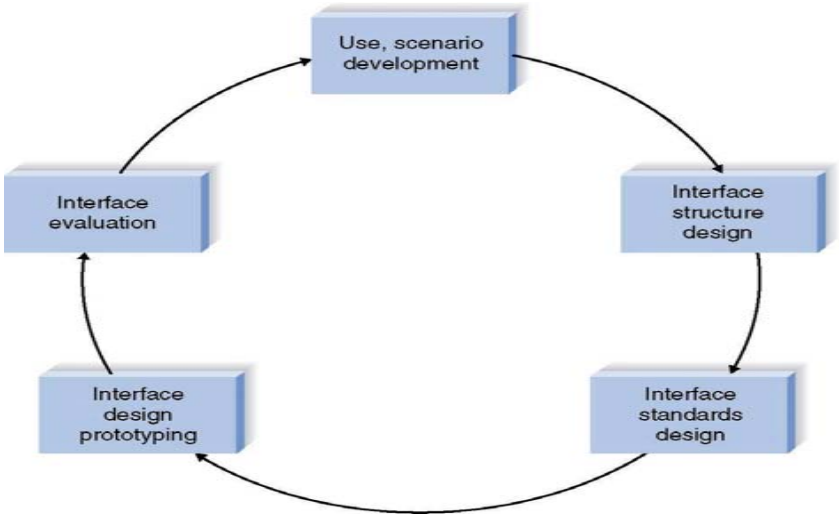
2.5 Consistency

- Enables users to predict what will happen
- Reduces learning curve

2.6 Minimize Effort

- Three clicks rule for getting information
- Minimal User Input
  - Try to design systems so that users do not have to make unnecessary key presses or mouse clicks
    - Use codes and abbreviations
    - Select from a list
    - Edit incorrect values rather than retype them
    - Provide information that can be derived automatically
    - Use defaults
    - Use accelerator keys for menus

3. User Interface Design Process



1 Use Scenario Development
- Outline the steps to perform tasks

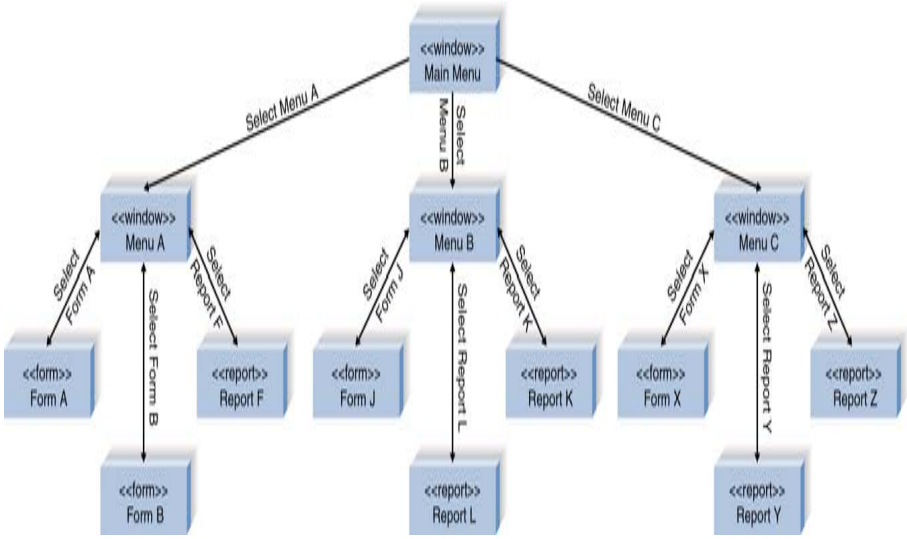
2 Interface Structure Design
- Show dialog chart
- Shows how all screens, forms, and reports are related

3 Interface Standards Design
- Basic design elements for screen, form, and report

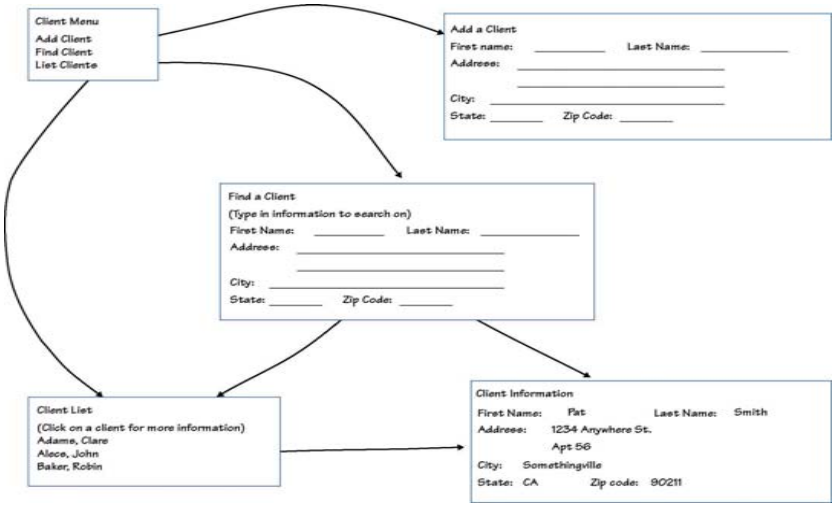
4 Interface Design Prototyping
- A simulation of screen, form, or report using paper, storyboard, etc.

5 Interface Evaluation
- To improve the interface design before the system is complete

Dialog Chart (apply for your project)



Storyboard Example



User Manual

- Is the last step for user interface design process
  - To document the procedures, screens, forms, reports, and dialogues
- Given a well-designed user interface, a well written user manual, and adequate training, the user should be able to access and utilise the system with little or no additional help

Whitten

4. Navigation Design

Basic Principles

- Assume users
  - have not read the manual
  - have not attended the training
  - do not have external help
- All controls should be clear, understandable, and placed in an intuitive way on the screen
- Type of navigation control: language, menu, icons

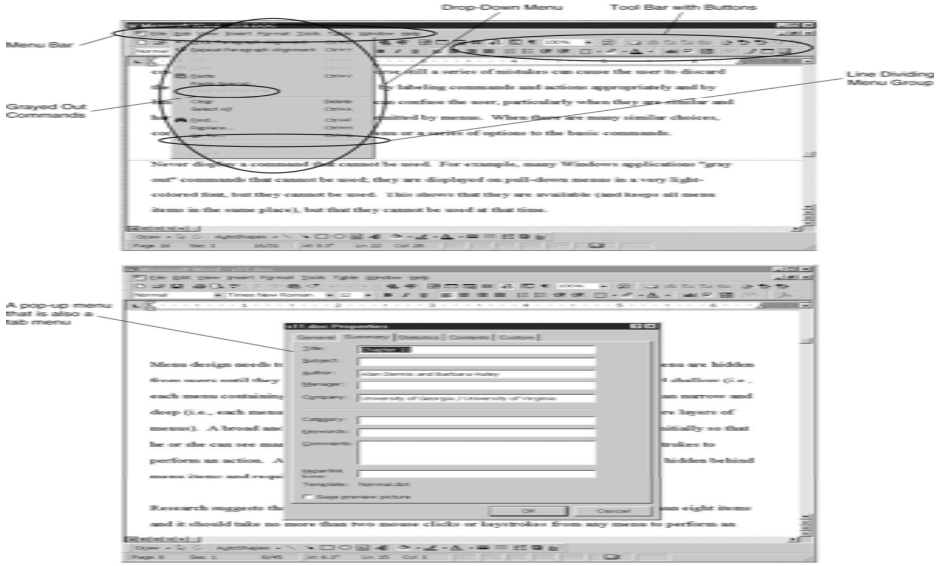
Basic Principles

- Prevent mistakes
  - Limit choices
  - Never display commands that cannot be used
  - Confirm actions that are difficult or impossible to undo
- Simplify recover from mistakes
- Use consistent grammar order

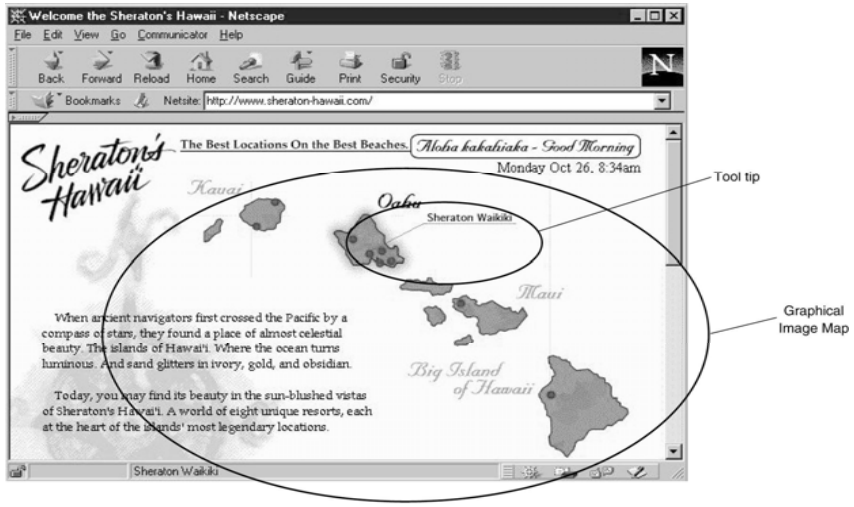
Type of Menu

Type of Menu	*When Would You Use Each of These Menu Types?*
1 Menu bar 2 Drop-down menu /Cascade menu 3 Pop-up menu 4 Tab menu 5 Toolbar 6 Image map	

Common Type of Menu



Example of an Image Map



Message Tips

- Should be clear, concise, and complete
- Should be grammatically correct and free of jargon and abbreviations
- Avoid negatives and humor
- Type of messages

Types of Messages	*When Would You Use Each of These Message Types?*
1 Error message 2 Confirmation message 3 Acknowledgment message 4 Delay message 5 Help message	

5. Input Design

- The goal is to simply and easily capture accurate information for the system
  - Capture data at the source → reduce duplicate work, processing time, cost & error
- Reflect the nature of the inputs
  - Batch vs. Online
- Find ways to simplify their collections
  - Source data automation
  - Minimize keystrokes

Online vs. 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
- Remote batch processing

Source Data Automation

- Can be obtained by using the following technologies
  - bar code readers
  - optical character recognition
  - magnetic stripe readers
  - smart cards
  - Biometric

Bar Code

- How can internet be used for source data automation?

Minimize Keystroke

- Never ask for information that can be obtained in another way
- List selection is more efficient than entering information
- Use default values where possible

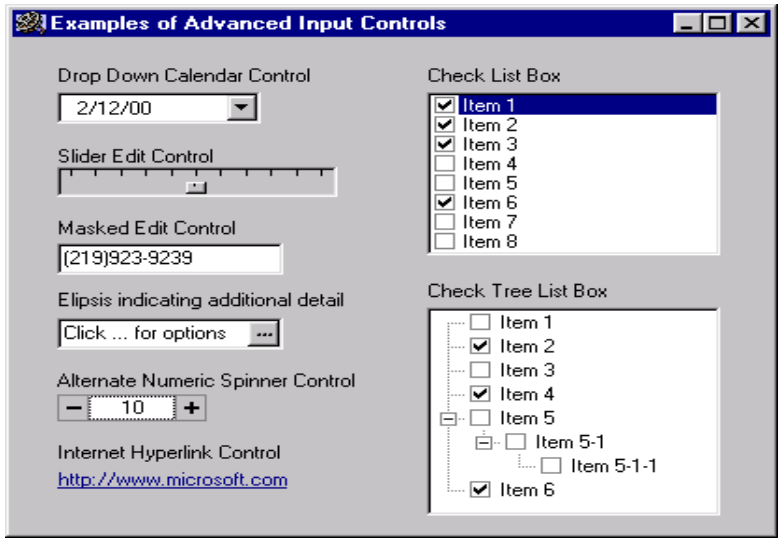
Type of Inputs

- Text
- Numbers
- Selection boxes

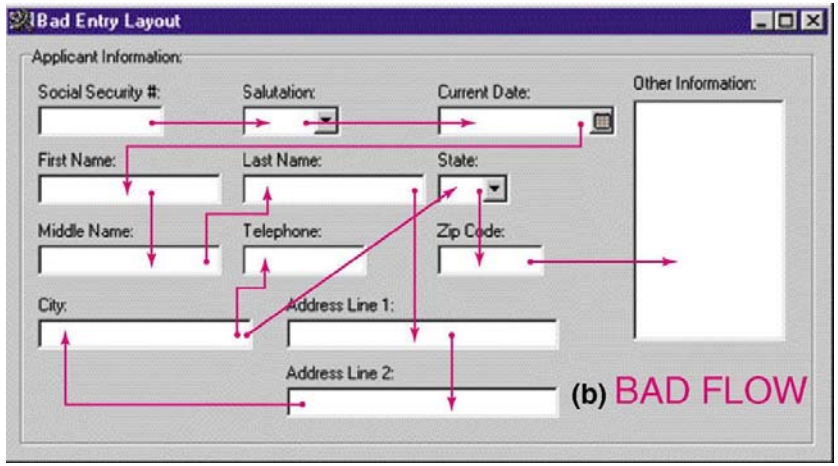
Types of Boxes	*When Would You Use Each of These Box Types?*
1 Text box 2 Check box 3 Radio button 4 On-screen list box 5 Drop-down list box 6 Combo box 7 Slider	

Type of Input Boxes

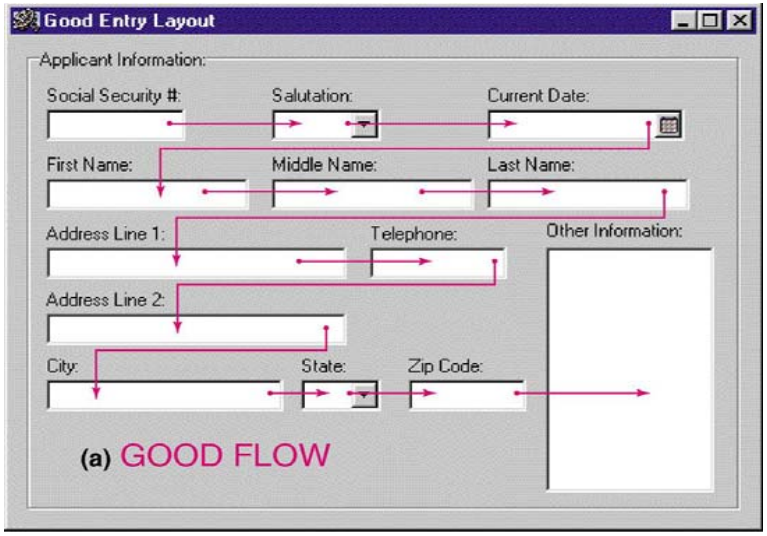
Advanced GUI Components



Bad Flow in a Form



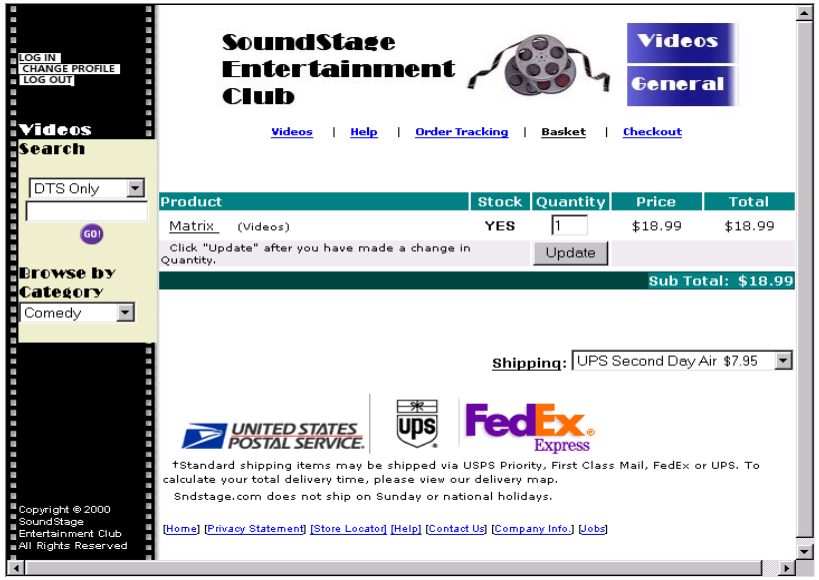
Good Flow in a Form



Type of Input Validation

Types of Validation	*When Would You Use Each of These Validation Methods?*
1 Completeness check 2 Format check 3 Range check 4 Check digit check 5 Consistency check 6 Database checks	

Input Prototype for Web Interface



6. Output Design

- Understand report usage
  - Frequency / Real-time or batch reports
- Manage information load
  - All needed information
- Type of reports

Type of Reports	*When Would You Use Each of These Report Types?*
Detail / Summary / Exception Reports Internal / External Outputs Turnaround Document Graphs	

Internal Output

- For owners and users within an organization
  - Detailed reports

SoundStage Entertainment Club Detailed

PRODUCTS ORDERED ON 1/25/2000

P.O. Number	Product Number	Product Type	Quantity In Stock	Quantity On Order
112312	102774	Merchandise	232	43
	232322	Title	23	43
	232332	Title	2	3
121212	222332	Merchandise	115	132
	546566	Title	667	1
	232554	Title	11,234	343
	200992	Title	54,321	1
232323	1212343	Title	1,324	11
	3434434	Merchandise	6,561	55
	4343434	Merchandise	112	111
	3434344	Title	3	232

Return to Summary | Close

Summary Report

SoundStage Entertainment Club Summary

PRODUCT SALES SUMMARY
AS OF 1/25/2000

Product Type	Product Category	Current Month's Unit Sales	Current Year Unit Sales
Merchandise	Clothing	784	4,312
	Media Accessory	541	2,079
	Total:	1,325	6,391
Title	Audio	667	20,439
	Game Title	11,234	12,445
	Video Title	54,321	998,872
	Total:	66,222	1,031,756

View Additional Reports | Close

Exception Report

SoundStage Entertainment Club Exception

DELINQUENT MEMBER ACCOUNTS AS OF 1/25/2000

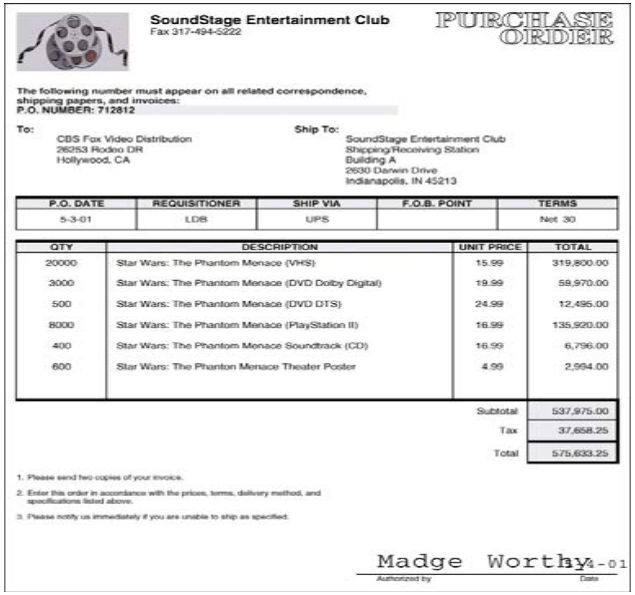
Number	Name	Area Code	Phone	Balance Due
112312	Joe Dunn	323	459-6565	$ 58.56
112121	Bob Fischer	232	878-4554	$ 1.56
323232	Mary Slatter	234	136-5445	$ 789.36
121212	Harold Martin	561	895-4784	$ 45.63
232112	Kevin Dittman	623	985-5587	$ 29.95
232321	Rick Carlina	787	985-5548	$ 15.22
767676	Barb Kitts	454	966-5586	$ 7.56
232323	Kenny Bum	454	789-5589	$ 11.00

Return to Summary | Close

External Output

- External outputs leave an organization
  - Intended for customers, suppliers, partners, or regulatory agencies
- Turnaround documents are external outputs that eventually re-enter the system as inputs
  - Most “bills” and invoices include a stub to be returned by the customer with payment

External Document



SoundStage Entertainment Club
Fax 317-494-5222

PURCHASE ORDER

The following number must appear on all related correspondence, shipping papers, and invoices:
P.O. NUMBER: 712812

To:
CBS Fox Video Distribution
26253 Rodeo DR
Hollywood, CA

Ship To:
SoundStage Entertainment Club
Shipping/Receiving Station
Building A
2630 Darwin Drive
Indianapolis, IN 45213

P.O. DATE	REQUISITIONER	SHIP VIA	F.O.B. POINT	TERMS
5-3-01	LDB	UPS		Net 30

QTY	DESCRIPTION	UNIT PRICE	TOTAL
20000	Star Wars: The Phantom Menace (VHS)	15.99	319,800.00
3000	Star Wars: The Phantom Menace (DVD Dolby Digital)	19.99	59,970.00
500	Star Wars: The Phantom Menace (DVD DTS)	24.99	12,495.00
8000	Star Wars: The Phantom Menace (PlayStation II)	16.99	135,920.00
400	Star Wars: The Phantom Menace Soundtrack (CD)	16.99	6,796.00
600	Star Wars: The Phanton Menace Theater Poster	4.99	2,994.00
		Subtotal	537,975.00
		Tax	37,658.25
		Total	575,633.25

1. Please send two copies of your invoice.
2. Enter this order in accordance with the prices, terms, delivery method, and specifications listed above.
3. Please notify us immediately if you are unable to ship as specified.

Madge Worthy 4-01
Authorized by Date

Turnaround Document

SoundStage Entertainment Club
2630 Darwin Drive - Bldg B
Indianapolis, IN 45213
317 496 0998 fax 317 494 0999

Invoice No. 301231

INVOICE

Customer
Name KATRINA SMITH
Address 3019 DURAC DR
City LITTLE ROCK State AR ZIP 42653
Phone 502-430-4545

Due Date 2/24/01
Order No. 346910
Payment Amt

Detach and return top portion with payment

Qty	Description	Unit Price	TOTAL
1	EAGLES HELL FREEZES OVER (DVD DD)	$19.99	$19.99
1	THE GRAMMY BOX (CD) ***COUNTS AS 3 CREDITS	$21.99	$21.99
1	GONE WITH THE WIND DIRECTORS CUT (DVD DS)	$17.99	$17.99
1	SIXTH SENSE (VHS)	FREE SS CR	$0.00
1	A BUG'S LIFE (VHS)	FREE SS CR	$0.00
1	NASCAR 2000 (VHS) *** CLOSEOUT (NO SS CR)	$9.99	$9.99
	10 SOUNDSTAGE CREDITS WERE USED TO PAY FOR PART OF THIS PURCHASE		
	WE APPRECIATE THE FINE MANNER IN WHICH YOU HAVE PAID ON YOUR ACCOUNT. IN APPRECIATION WE HAVE ADDED 7 SOUNDSTAGE CREDITS TO YOUR ACCOUNT		
	YOU CAN EARN 7 CREDITS BY PAYING THIS INVOICE BY THE DUE DATE		
		SubTotal	$69.96
		Shipping & Handling	$7.00
		Taxes	$2.95
		TOTAL	$79.91

Payment Details
Cash
Check
Credit Card
Name
CC #
Expires

Office Use Only

Please return top portion invoice with payment. Make checks payable to: SoundStage Entertainment Club.

RETURN TOP PORTION WITH PAYMENT

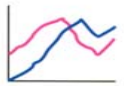
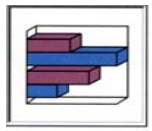
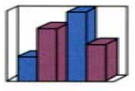
Output Implementation Method

1 Printed output
- Tabular output presents information in columns
- Zoned output places text and numbers into designated "areas"

2 Screen output
- Graphic output is the use of pictorial charts to convey information in ways that demonstrate trends and relationships that cannot be easily seen in tabular formats

3 Point-of-sale terminals
4 Multimedia
5 E-mail
6 Hyperlinks
7 Microfilm

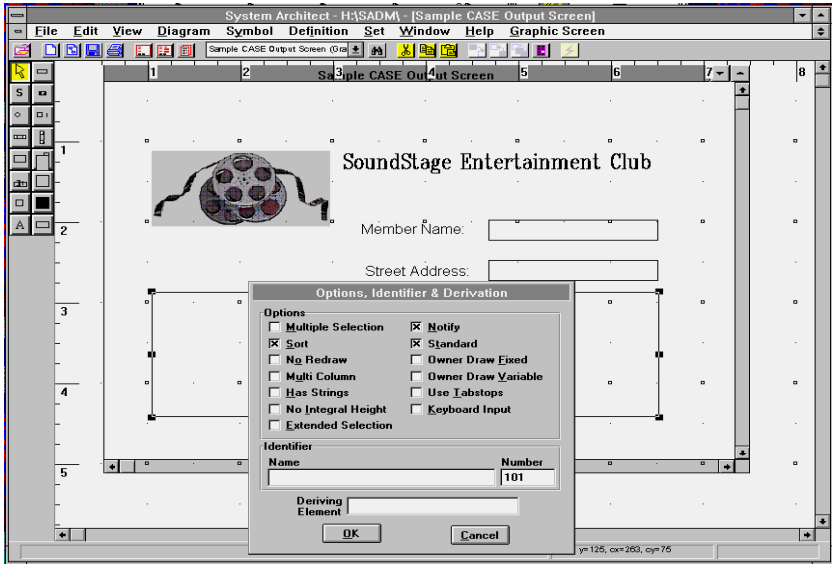
Graph

	Sample	Selection Criteria
Line Chart		**Line charts** show one or more series of data over a period of time. They are useful for summarizing and showing data at regular intervals. Each line represents one series or category of data.
Area Chart		**Area charts** are similar to line charts except that the focus is on the area under the line. That area is useful for summarizing and showing the change in data over time. Each line represents one series or category of data.
Bar Chart		**Bar chart** are useful for comparing series or categories of data. Each bar represents one series or category of data.
Column Chart		**Column charts** are similar to bar charts except that the bars are vertical. Also, a series of column charts may be used to compare the same categories at different times or time intervals. Each bar represents one series or category of data.

Graph (concluded)

	Sample	Selection Criteria
Pie Chart		**Pie charts** show the relationship of parts to a whole. They are useful for summarizing percentages of a whole within a single series of data. Each slice represents one item in that series of data.
Donut Chart		**Donut charts** are similar to pie charts except that they can show multiple series or categories of data, each as its own concentric ring. Within each ring, a slice of that ring represents one item in that series of data.

Output Design with a Modern CASE Tool



Output Design Guideline

1 Outputs should be simple to read and interpret.
- Every output must have a title / time and date
- Fields and columns should be clearly labeled
- Reports should include legends for all abbreviations
- Information should never have to be manually edited
- Information should be balanced across the page or screen
- Provide for easy navigation within information
- Avoid computer jargon and most error messages

2 The timing of outputs is important

3 The distribution of outputs must be sufficient to assist all relevant users

4 Outputs must be acceptable to the system users who will receive them

Tabular Report Design Principles

- Page size
- Page orientation: portrait, landscape
- Page/ column heading
- Heading alignment (left, right, center)
- Column spacing
- Format
- Control breaks
- End of report

Consider

- Under what conditions would you be most likely to replace reports on paper with ones delivered electronically? When might you NOT want to make the change?

Summary

- User interface design for usability
- Principles for good interface design: layout, content, aesthetics, user experience, consistency, and minimum user effort
- The design process focuses on user actions, diagramming the structure, standards, prototyping, and evaluation
- Navigation design for simple use the system
- Input design
- Output design

Question and Answer

Quiz

1 The fundamental part of the user interface that permits the system to capture information is the input mechanism.

2 The user interface design principle that places an emphasis on the ease of use and the ease of learning the interface is user experience.

3 Using a diskette to represent saving a file is an example of an interface icon.

4 Storyboard is the prototyping technique that is least expensive, but provides the least amount of detail.

5 Novice and expert users are both usually most concerned with “ease of use” of a new system.

6 The navigation design principle that results in the provision of an “undo” button is simplify recovery from mistakes .

7 The type of menu that often contains multiple word menu items and that may display cascading menus is called a drop-down menu.

8 A confirmation message is used when the user selects a potentially dangerous choice, such as deleting a file.

9 A check box is a selection box that permits the user to select only one item from a mutually exclusive list.

10 A consistency check ensures that combinations of data are valid, for example, does the zip code of an address correspond to the city.

11 The overall flow of screens and messages is called a _____.

12 _____menus use pictures to represent menu options in the main body of the window.

13 _____is a type of data entry that remains the most common form of input.

14 A(n) _____is a pointing device used in conjunction with graphical user interfaces. It has made it easy to navigate on-line forms and click on commands and input options.

Team Assignment

- Design your project
  - Input Design
  - Output Design
  - User Interface Design