

CH12. Design Activities

- User Interface-

School of Computer Science
Prof. Euijong Lee

Other Design Activities

❖ Data Layer Design

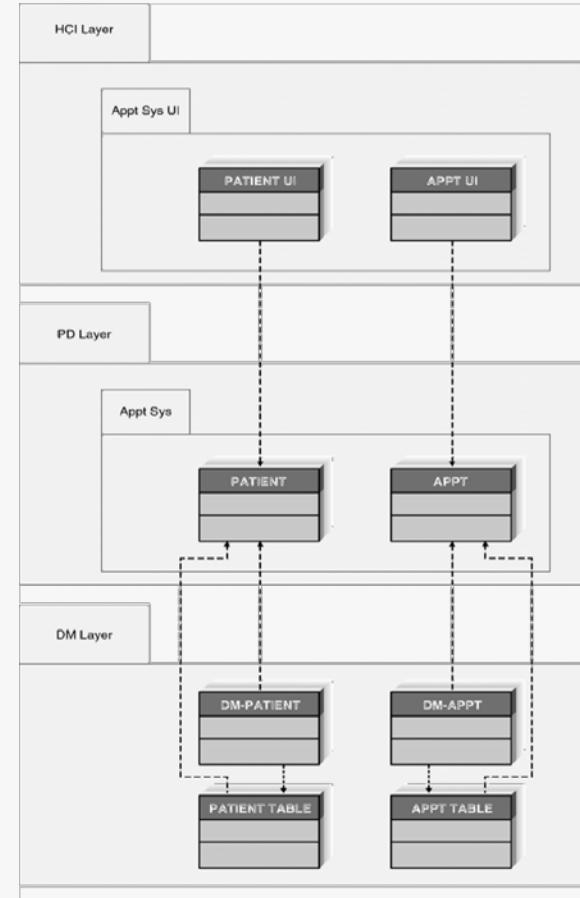
- From domain object to data, and then to DB table schema

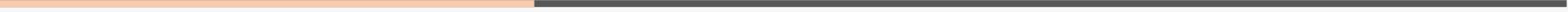
❖ User Interface Design

- Window navigation
- Standard interface design

❖ Physical Architecturing

- Hardware platform architecture
- Deployment diagram



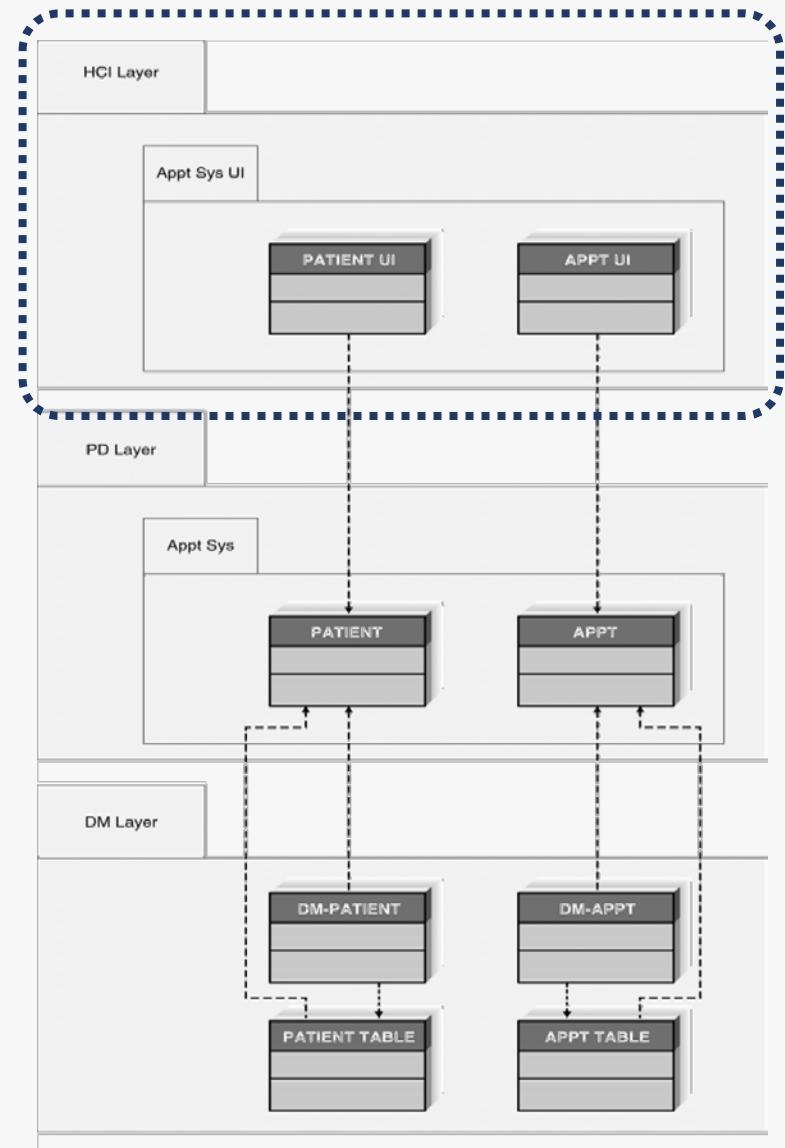


User Interface Design



Packaging HCI Layer

❖ Appointment System



Importance of UI

HavenWorks.com A-Z Search News by Date NewsStand Global US

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American News USA News. United States of America News.

Democratic News: 2010 TV: US - AK - AL - AR - AZ - CA - CO - CT - DE - FL - GA - HI - IA - ID - IL - IN - KS - KY - LA - MA - MD - ME - MI - MN - MO - MS - MT - NC - ND - NE - NH - NJ - NM - NV - NY - OH - OK - OR - PA - RI - SC - SD - TN - TX - UT - VA - VT - WA - WI - WV - WY

Republican News: Atwater Politics Republican DEBT: \$8 Trillion? 9 Trillion over 3 Republi \$10.35 Trillion Debt under Republican Bush by himself?

Two Santa Clauses or How The Republican Party Has Conned America for Thirty Years.

HavenWorks.com+A-Z

DEM 2010 TV

OBAMA TV

WHITE HOUSE TV

'News' Media Politics

Jay Rosen Glenn Greenwald PBS.org/moyers

John McCain - Government - SEC Money Accounting Arizona

Despite McCain's Comments, Senate GOP Not Offering Detailed Budget. ... On Thursday, House Republicans did wind up offering the frame of an alternative budget -- but then they were widely panned for not releasing a more detailed alternative to the Democratic proposals. ... "That's what made an exchange Sunday with [Arizona Republican Senator] Sen. John McCain, R-Ariz., on NBC's "Meet the Press," intriguing."

DAVID GREGORY: "Do you think Republicans should provide a detailed budget alternative?"

McCAIN: "Yes." "With numbers?"

McCAIN: "Yes." "Will that happen in the Senate?"

McCAIN: "We're working on it, working very hard on it."

So -- are they? ... "Actually, no." -By Rick Klein ABCNEWS.com

Right-Wing TV Bias

MEDIA BIAS: 2 to 1 in favor of Republicans

U. S. A. 20090330

Politics

John McCain - Government - SEC Money Accounting Arizona

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TV

W R L D 20090331

Terrorism

Pakistani Police Military Political Religious History Soviet Afghanistan India

Insurgent Threat Shifts in Pakistan: Assault on Police Academy Indicates Risk Has Moved Beyond Tribal Areas. ... "The brazen occupation of a Pakistani police academy Monday by heavily armed gunmen near the eastern mega-city of Lahore (Pakistan) was the latest indication that Islamist terrorism, once confined to Pakistan's northwest tribal belt, now threatens political stability nationwide." ... "The precisely orchestrated assault by a squad of young men, which left at least 11 people dead and took security forces nearly eight hours to quell, was also a likely sign that Islamist militant groups in Punjab province, once tolerated and even supported by the Pakistani state to fight in India and Afghanistan, have turned openly against the government." ... "Pakistan has been an incubator for Islamist militant groups for the past several decades. Until recently, they were focused on external conflicts, especially the dispute over Indian Kashmir, the Soviet occupation of Afghanistan during the 1980s and the presence of [United States] U.S.-led forces in Afghanistan since the fall of the Taliban in late 2001." ... "In the past several years, extremist groups along the Afghan border have turned inward, spreading violence and religious fanaticism among the ethnic Pashtun populace in Pakistan's northwest. Pakistan has tried to contain the problem through a combination of military offensives and political negotiations, which are underway in several conflicted border districts." - By Pamela Constable with contributions by Aoun Sahi -WashingtonPost

INTELLIGENCE

IRAQ NEWS

War Crimes

Law/Legal

Poll

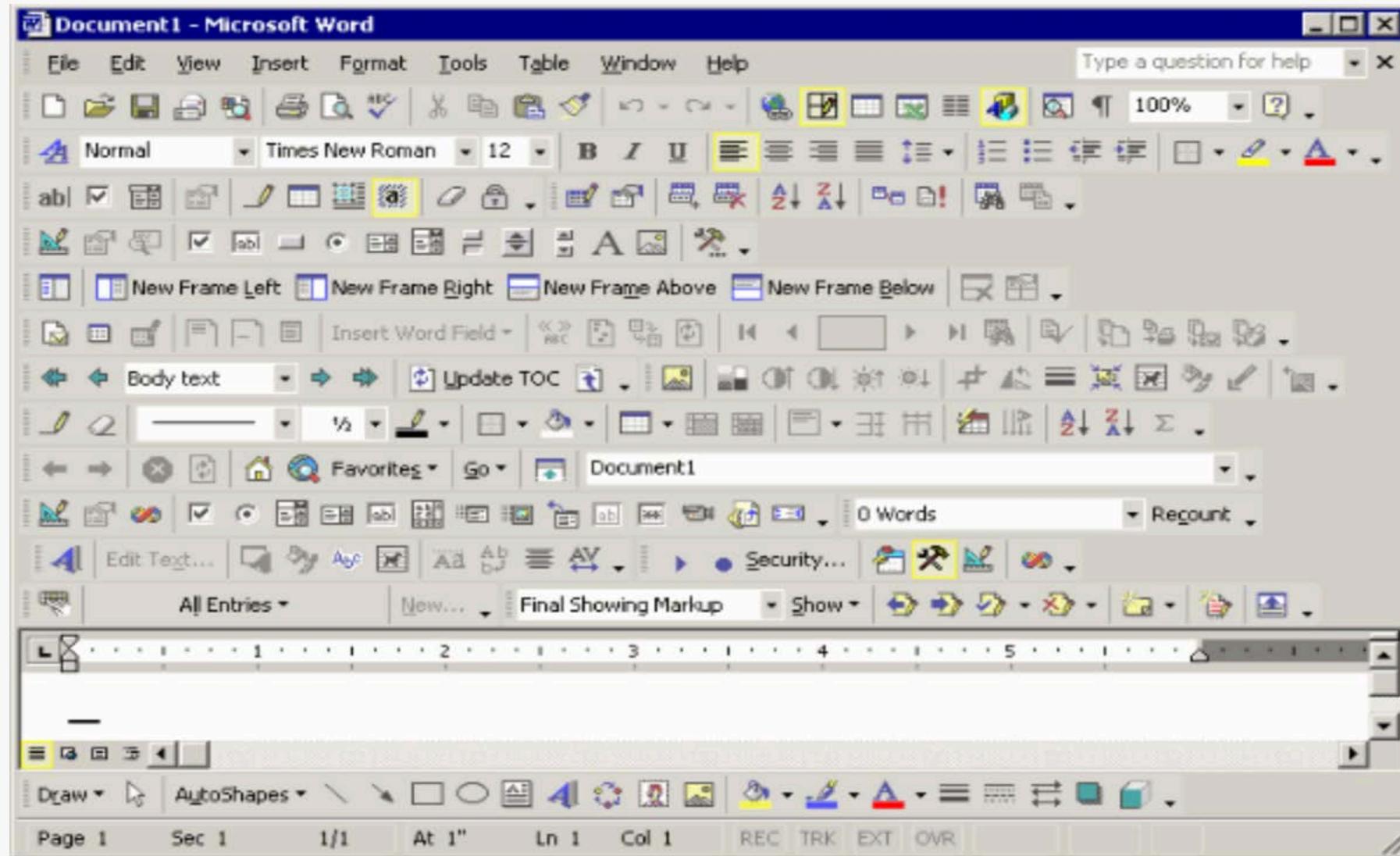
Criminal - Torture

Poll: Most want inquiry into anti-terror tactics. ...

"Even as Americans struggle with two wars and an economy in tatters, a USA TODAY/Gallup Poll finds majorities in favor of investigating some of the thorniest unfinished business from the [Republican President] Bush administration: Whether its tactics in the "war on terror" broke the law." ... "Close to two-thirds of those surveyed said there should be investigations into allegations that the Bush team used torture to interrogate terrorism suspects and its program of wiretapping [United States] U.S. citizens without getting warrants. Almost four in 10 favor criminal investigations and about a quarter want investigations without criminal charges. One-third said they want nothing to be done." ... "Even reversed, Bush policies divide" ... "Even more people want action on alleged attempts by the Bush team to use the Justice Department for



Importance of UI



Introduction

- ❖ **Interface Design** defines how the system will interact with external entities (e.g., customers, users, other systems)
 - **System Interfaces** are machine-machine and are dealt with as part of systems integration
 - **User Interfaces** are human-computer and are the focus of this chapter
- ❖ **Principles for UI design**
- ❖ **The UI design process**
- ❖ **Additional Considerations**



Key Definitions

❖ **Graphical user interface (GUI)**

- is the most common type of interfaces for developing 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



Principles of User Interface Design

- ❖ **Layout of the screen**, form or report
- ❖ **Content Awareness**—how well the user understands the information contained
- ❖ **Aesthetics**—how well does it appeal to the user
- ❖ **User Experience**—is it easy to use?
- ❖ **Consistency**—refers to the similarity of presentation in different areas of the application
- ❖ **Minimal User Effort**—can tasks be accomplished quickly?

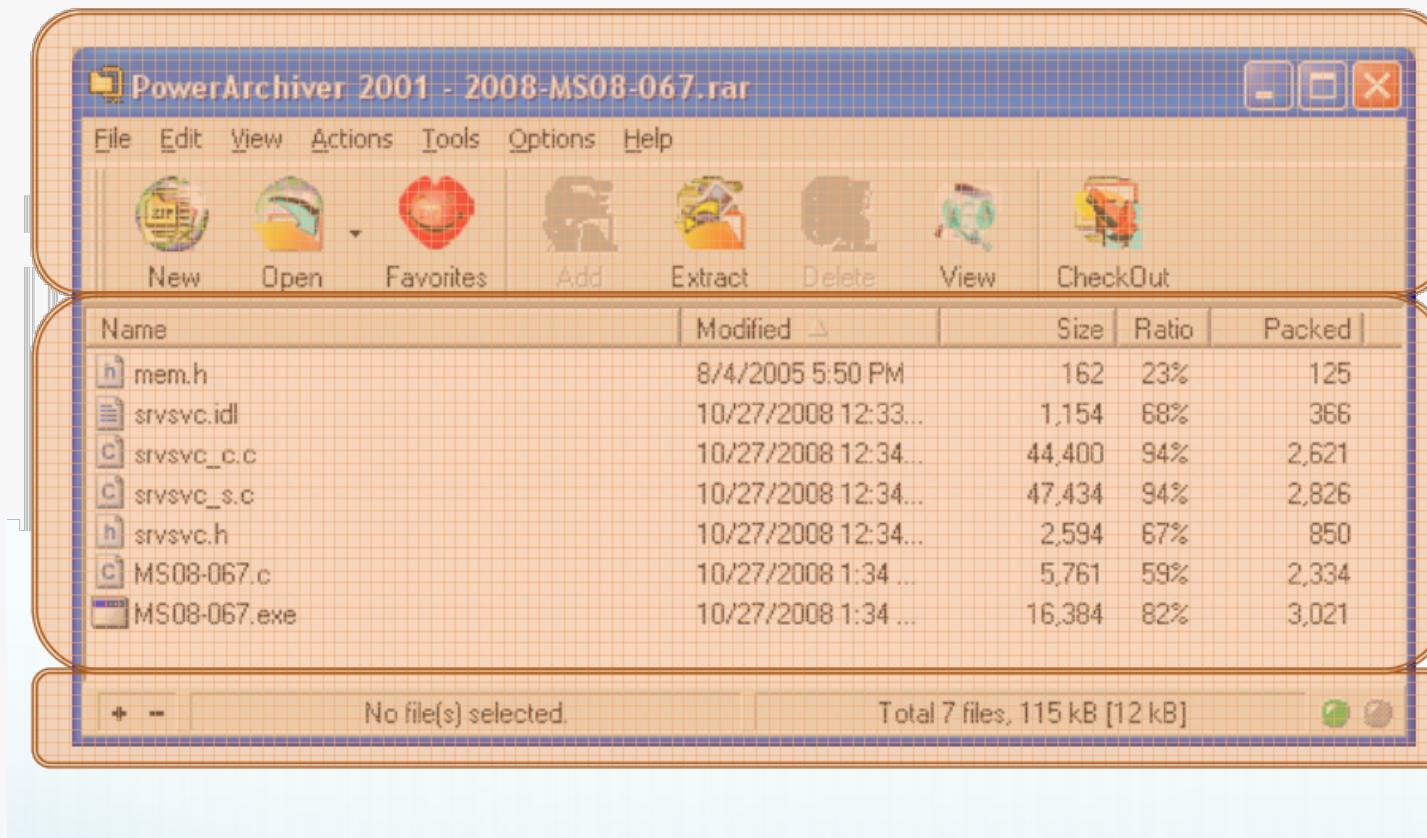


Layout

- ❖ The arrangement of items on the screen
- ❖ 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
- ❖ Like items are grouped into areas
 - Areas can be further subdivided
 - Each area is self-contained
 - Areas should have a natural intuitive flow
 - Users from western nations tend to read from left to right and top to bottom
 - Users from other regions may have different flows



General Layout Example (1)



Navigation Area

Reports & Forms Area

Status Area

General Layout Example (2)

Analysis selection

Import Stationary analysis **Spurious samples** Normality Periodicity Spectral analysis Uncertainty analysis

Signal Analyse another signal

Subsize for reverse arrangement test
 Default Other value 100

Do you want to make the signal stationary?
 Yes No Select

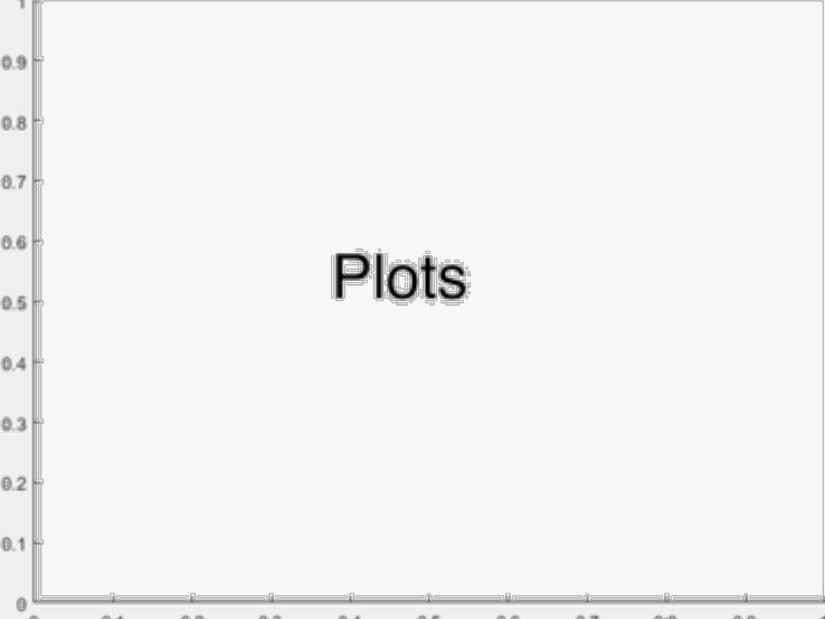
Input

Signal 1 summary

	Value
Stationary	Yes
No. of Spurious Data	4
Normal Distribution	Yes
Periodic	Yes
Peaks Frequency	0.23438
Interval Time (ms)	1056172

Summary

Plot



Plots

Plot checkbox

Results display

Signal Statistics

Signal	Value
1	0.5
2	0.3
3	0.1
4	0.2

Signal statistics



General Layout Example (3)

Patient Information

Patient Name:

First Name:

Last Name:

Address:

Street:

City:

State/Province:

Zip Code/Postal Code:

Home phone:

Office phone:

Cell phone:

Referring Doctor:

First Name:

Last Name:

Street:

City:

State/Province:

Zip Code/Postal Code:

Office phone:

(a) Vertical Flow

Patient Information

Patient Name:

First Name: Last Name:

Street: City: State/Province: Zip Code/Postal Code:

Home Phone: Office Phone: Cell Phone:

Referring Doctor:

First Name: Last Name:

Street: City: State/Province: Zip Code/Postal Code:

Office Phone:

(b) Horizontal Flow

(source: Dennis, Alan, Barbara Haley Wixom, and Roberta M. Roth. Systems analysis and design. John Wiley & Sons.)



Content Awareness

- ❖ Users should always be aware of where they are in the system and what information is being displayed
- ❖ Applies to the interface in general, to each screen, to each area on a screen and to sub-areas as well
- ❖ Include titles on all interfaces
- ❖ Menus should show where the user is and how the user got there
- ❖ All areas should be well defined, logically grouped together and easily discernible visually



Aesthetics

- ❖ Interfaces should be functional, inviting to use, and pleasing to the eye
- ❖ Simple minimalist designs are generally better
- ❖ White space is important to provide separation, but often trade off
- ❖ Acceptable information density is proportional to the user's expertise
 - Novice users prefer lower density (< 50%)
 - Expert users prefer higher density (> 50%)
- ❖ Text design: size, serif vs. sans serif, use of CAPTIALS



Sarif VS Sans serif Source: Glorify

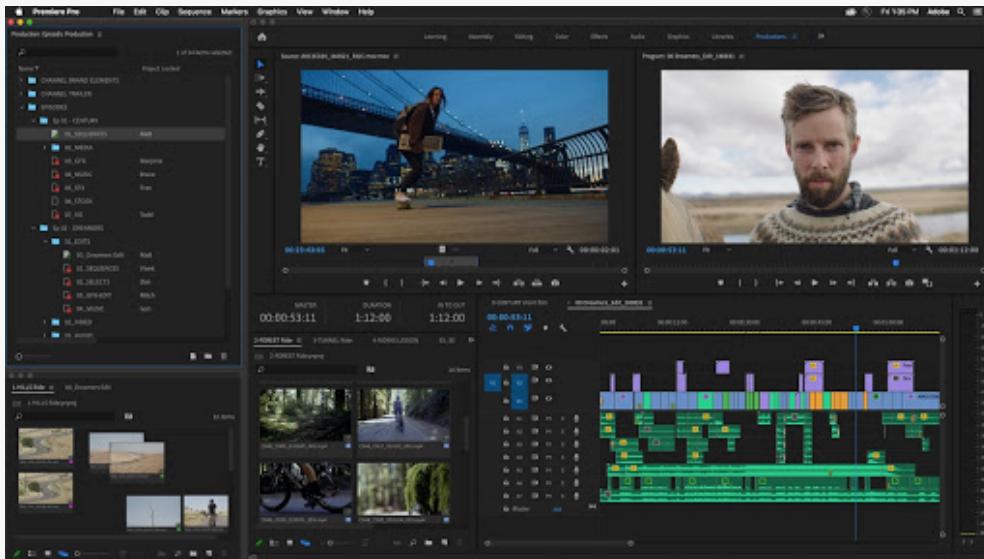
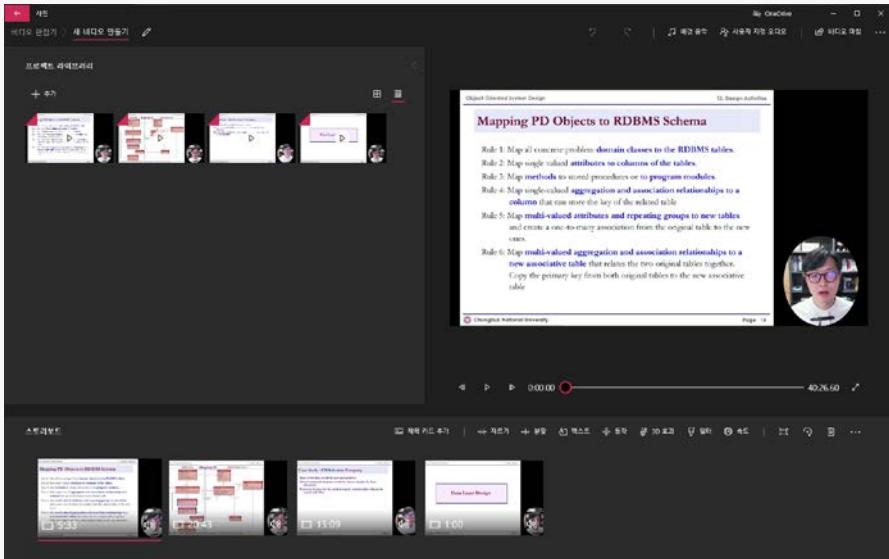
- ❖ Color and patterns (e.g., don't use red on blue)

High Density Example

DEPARTMENT HEAD	DATE	VICE PRESIDENT	DATE	BUDGET REVIEW	DATE	BUDGET OFFICE	DATE
DEAN/DIRECTOR	DATE	FACULTY RECORDS	DATE	CONTRACTS & GRANTS	DATE	PERSONNEL	DATE



User preference – Novice vs Experts



User Experience

❖ Ease of learning

- Significant issue for inexperienced users
- Relevant to systems with a large user population

❖ Ease of use

- Significant issue for expert users
- Most important in specialized systems

❖ Ease of learning and use of use are related

- **Complementary:** lead to similar design decisions
- **Conflicting:** designer must choose whether to satisfy novices or experts



Minimal User Effort

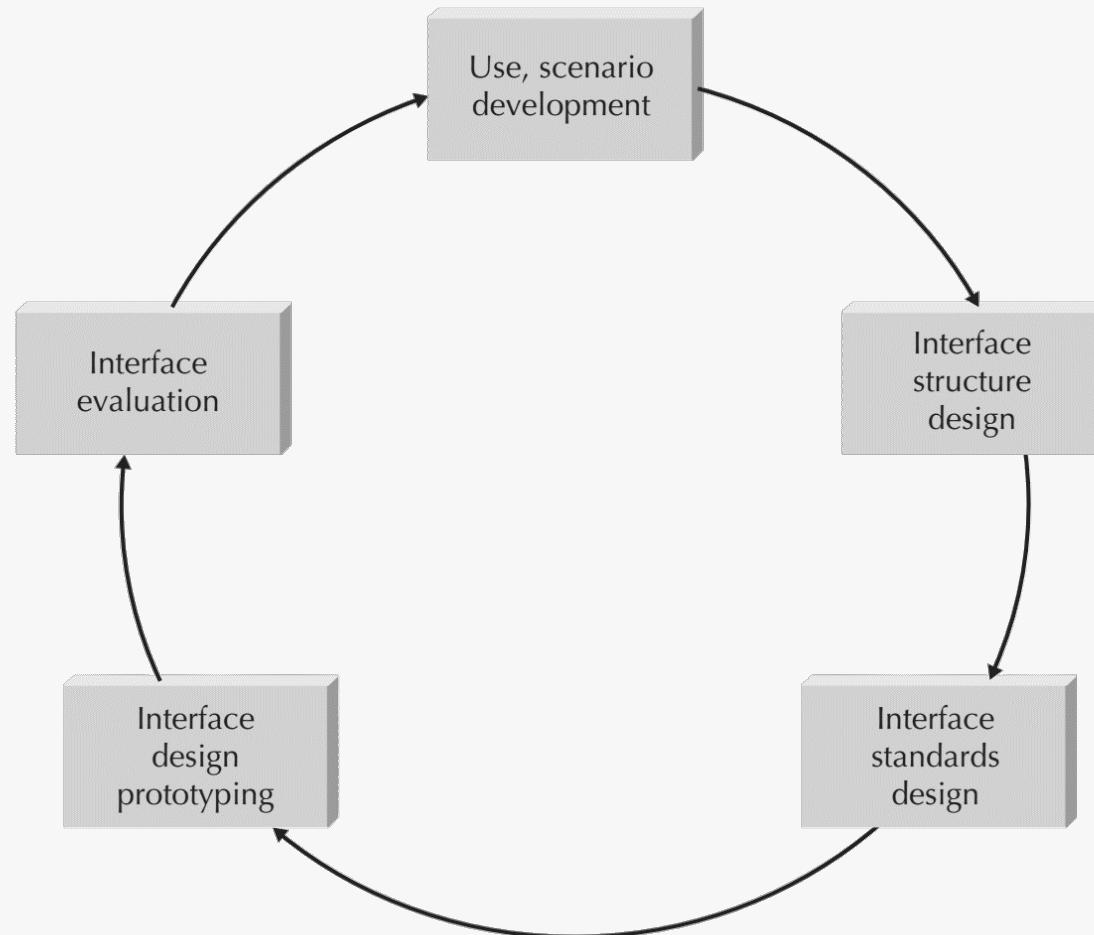
- ❖ The interface should be simple to use
- ❖ Interfaces should be designed to minimize the effort needed to accomplish tasks
 - Users learn how one portion works and immediately apply it to others
- ❖ A common rule is the three-clicks rule
 - Users should be able to go from main menu of a system to the information they want in no more than three mouse



Consistency

- ❖ **Extremely important concept in making the system simple**
 - It allows the users to predict what is going to happen
 - All parts of the system work in the same way
 - Users learn how one portion works and immediately apply it to others
- ❖ **Key areas of consistency are**
 - Navigation controls
 - Terminology—use the same descriptors on forms & reports

User Interface Design Process



(source: Dennis, Alan, Barbara Haley Wixom, and Roberta M. Roth. Systems analysis and design. John wiley & sons.)



Use Scenario Development - ①

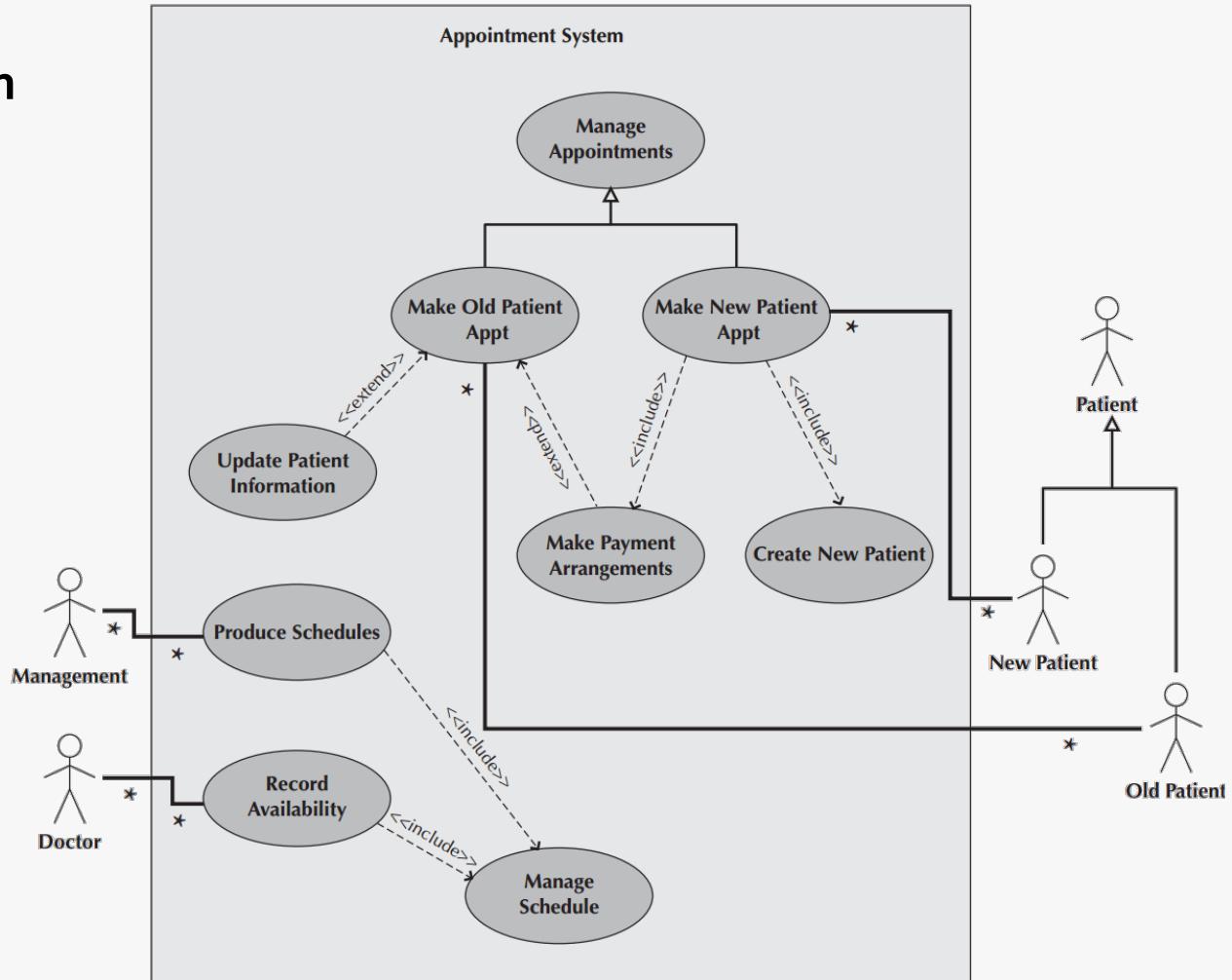
❖ Extremely important in making the system simple

- Use scenarios outline the steps performed by users to accomplish some part of their work
- A use scenario is one path through an essential use case
- Presented in a simple narrative description
- Document the most common cases so interface designs will be easy to use for those situations



Use Scenarios Example (1)

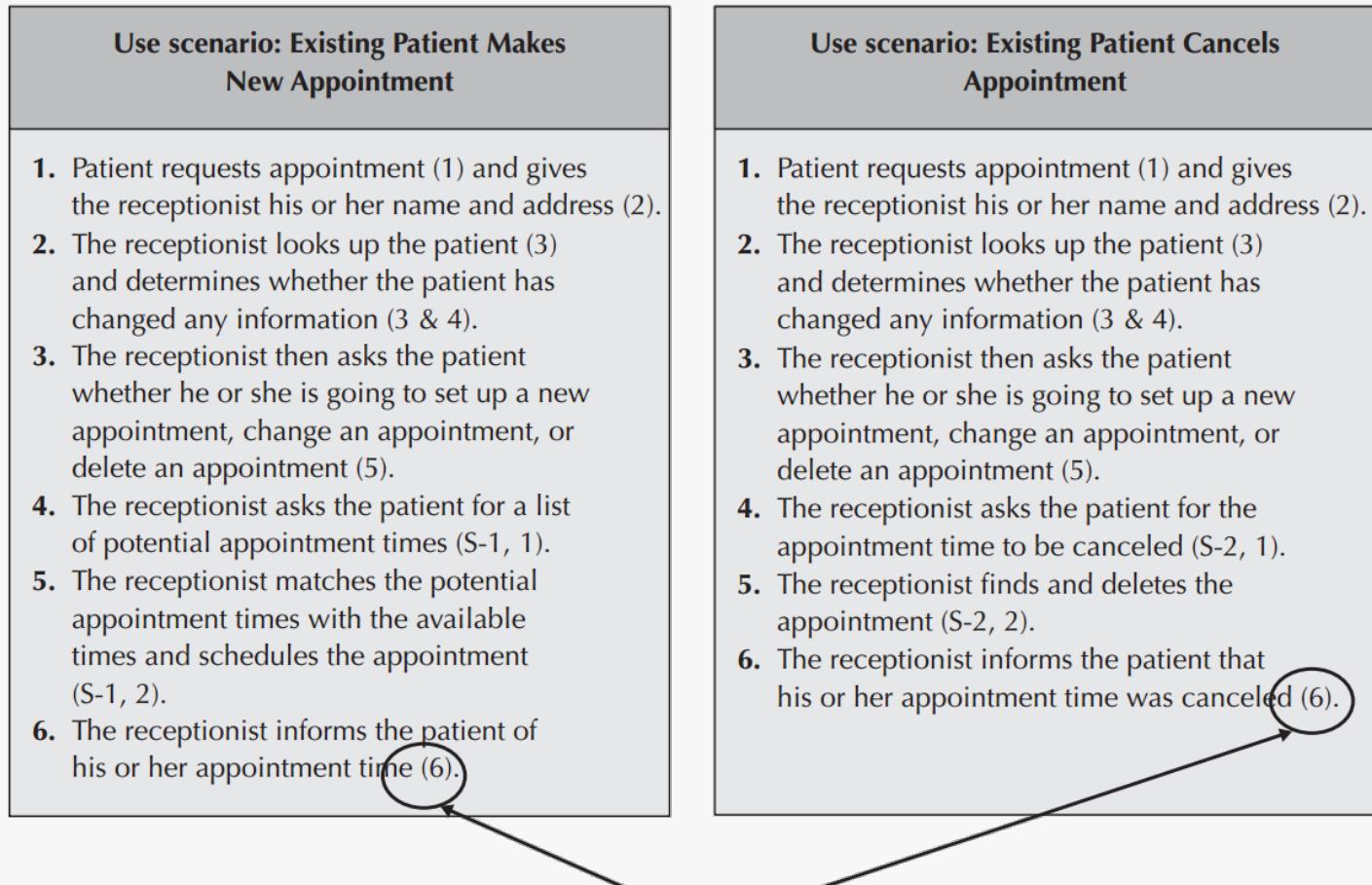
❖ Use-Case Diagram



(source: Dennis, Alan, Barbara Haley Wixom, and Roberta M. Roth. Systems analysis and design. John wiley & sons.)

Use Scenarios Example (2)

❖ Use scenarios



The numbers in parentheses refer to specific events in the essential use case.

(source: Dennis, Alan, Barbara Haley Wixom, and Roberta M. Roth. Systems analysis and design. John Wiley & Sons.)



Interface Structure Design - ②

❖ The interface structure defines

- The basic components of the interface
- How they work together to provide functionality to us

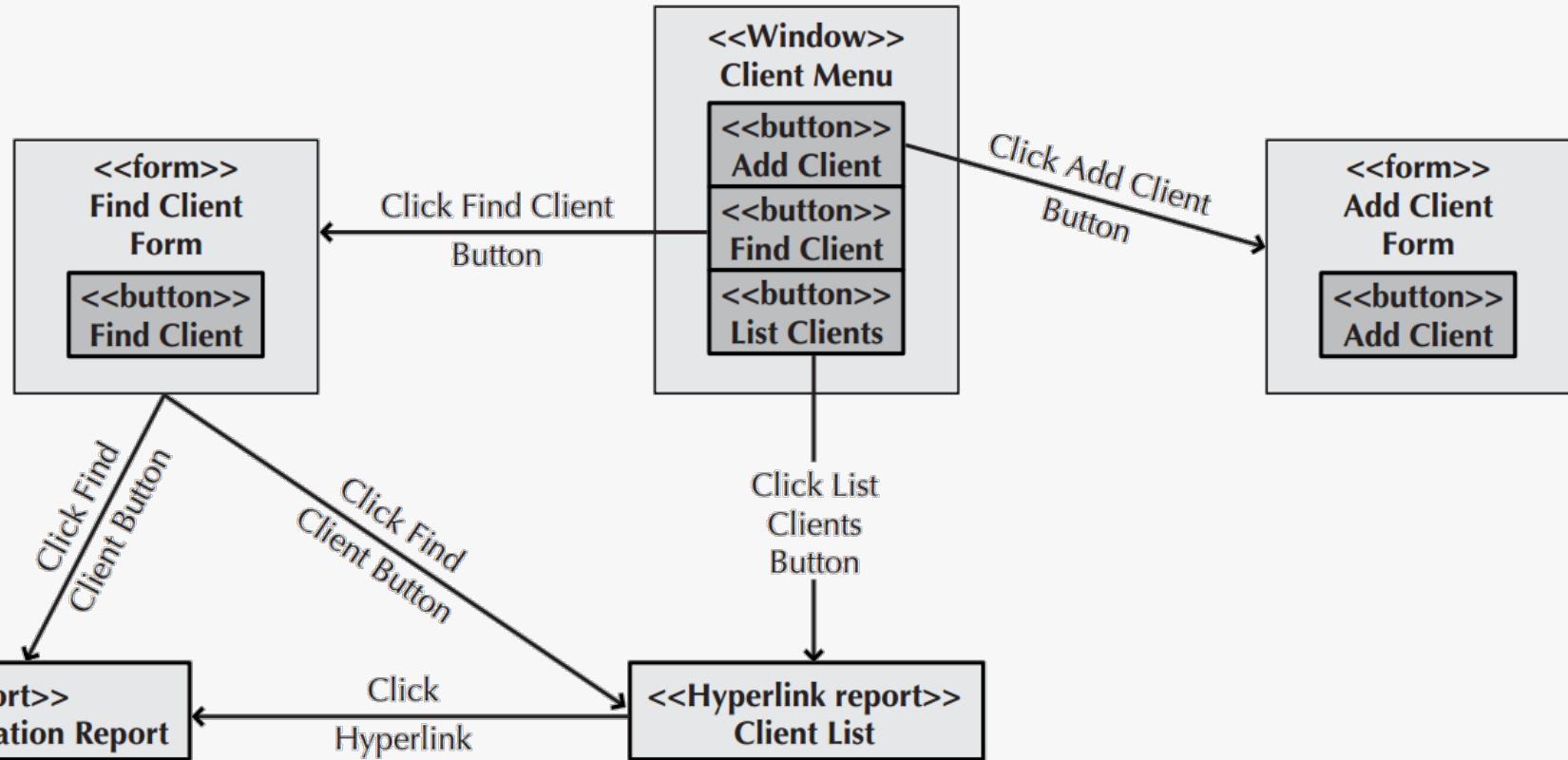
❖ Windows Navigation Diagrams (WND)

- Similar to a behavioral state machine
- Shows the relationship between all screens, forms, and reports used by the system
- Shows how the user moves from one to another
- Boxes represent components
- Arrows represent transitions from and to a calling state
- Stereotypes show interface type



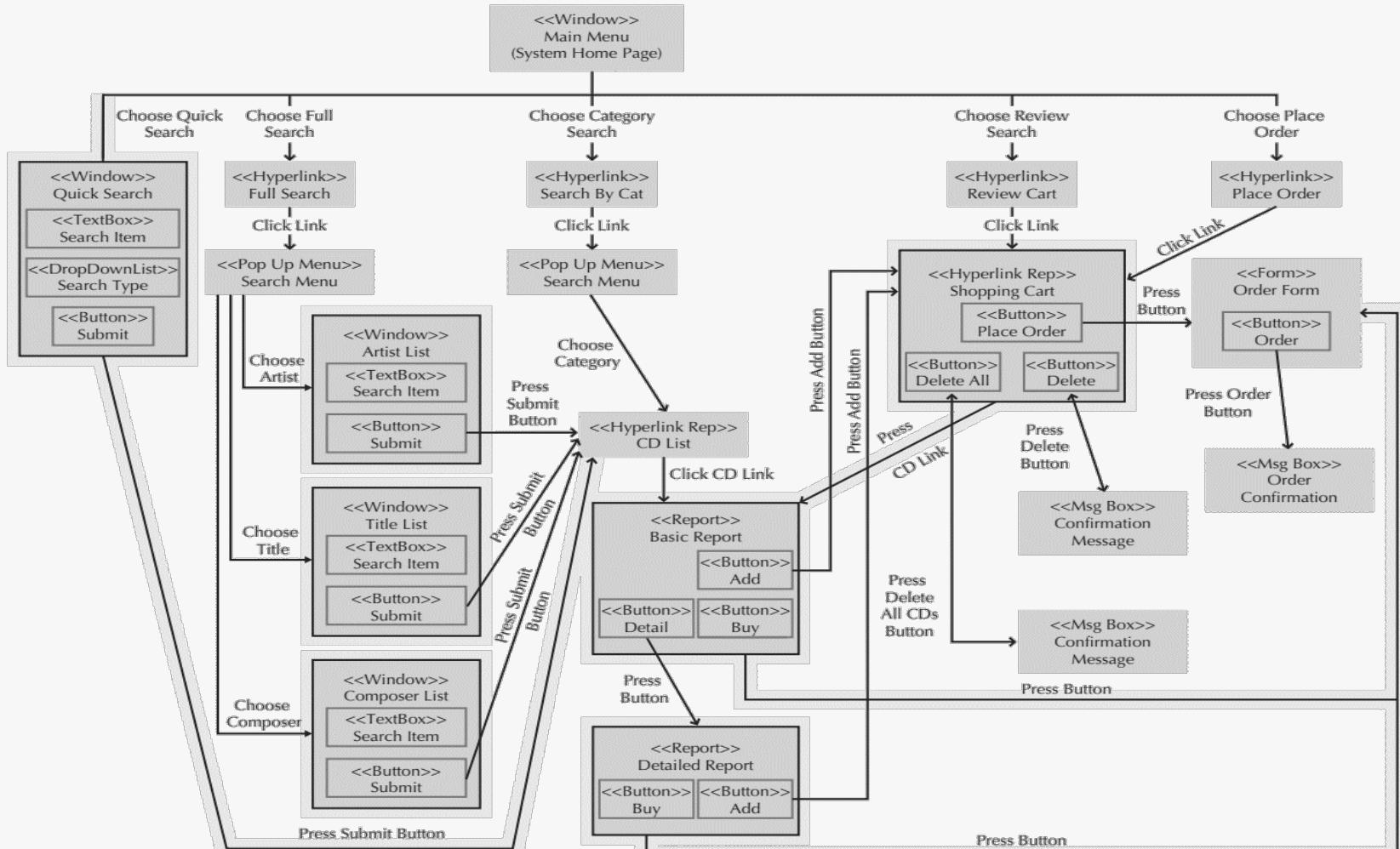
Simple WND Example

❖ Window Navigation Diagram



WND Example

❖ Window Navigation Diagram (CD selection company)



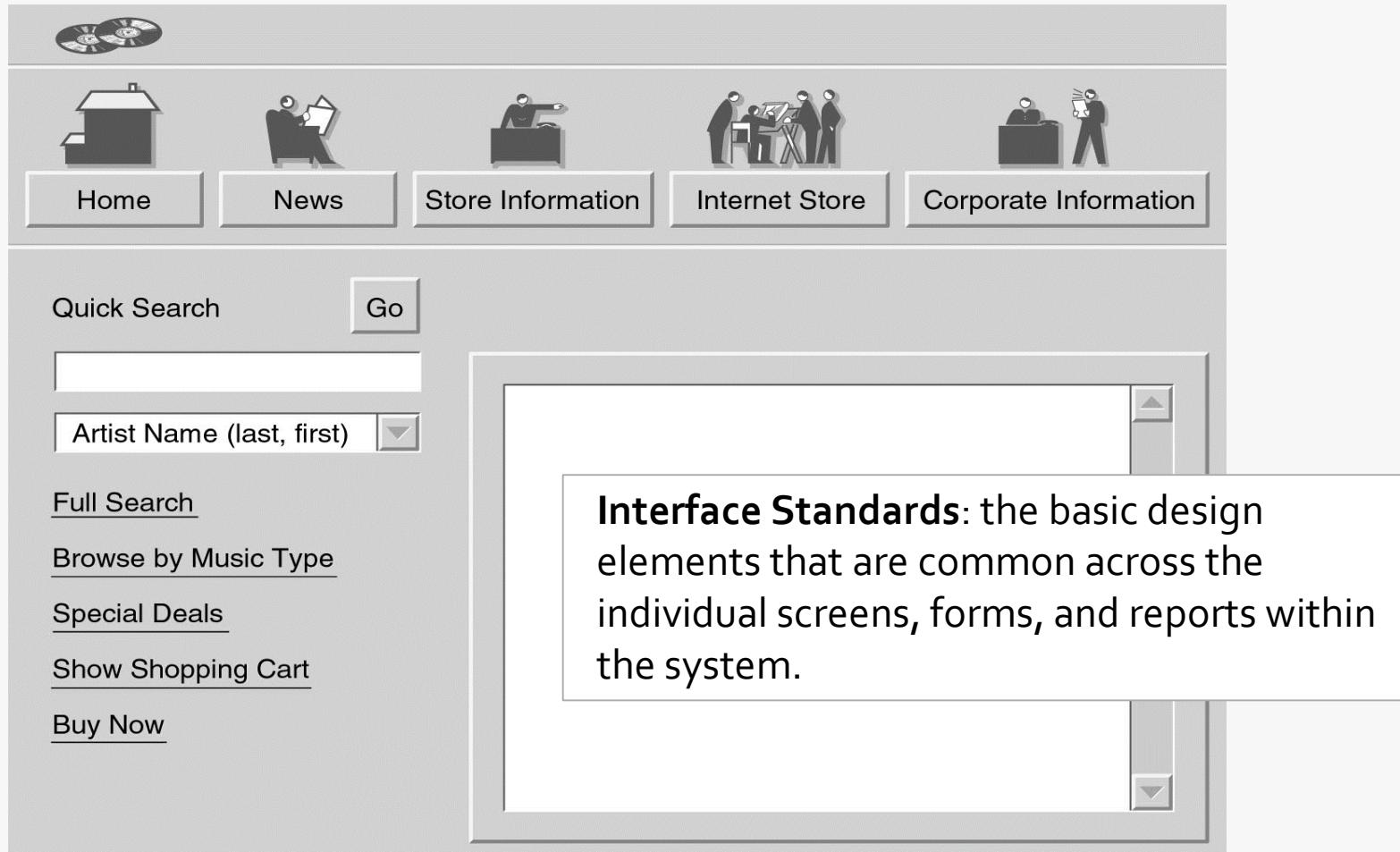
Interface Structure Design - ③

- ❖ Interface standards are basic design elements found across the system user interface
- ❖ Standards are needed for:
 - Interface metaphor: defines how an interface will work (e.g., the shopping cart to store items selected for purchase)
 - Interface objects
 - Interface actions
 - Interface icons
 - Interface templates



Interface Standards Design : interface template

- ❖ Example of interface template (CD selection company)



(source: Dennis, Alan, Barbara Haley Wixom, and Roberta M. Roth. Systems analysis and design. John Wiley & Sons.)

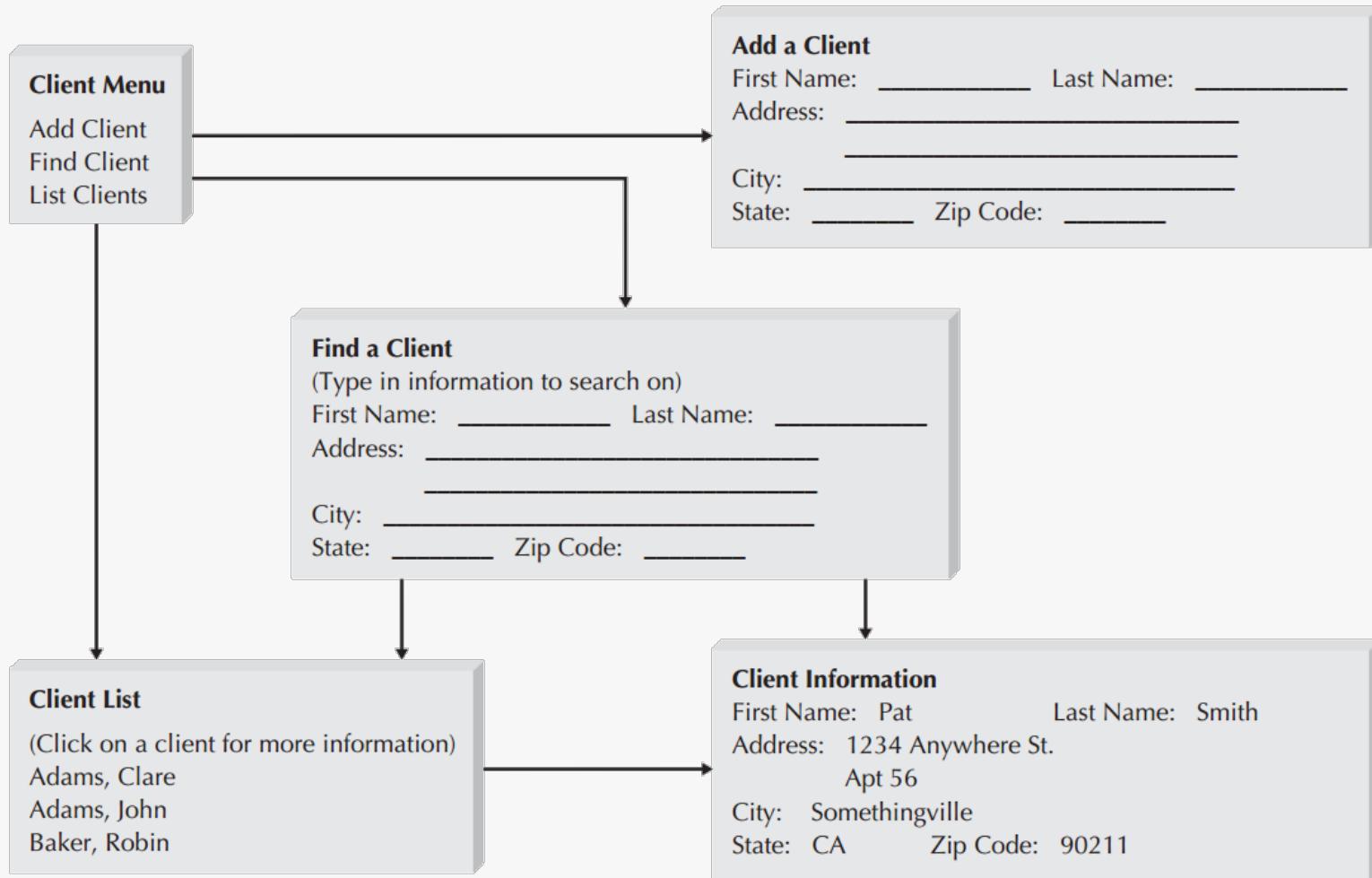


Interface Design Prototyping - ④

- ❖ **Mock-ups or simulations of computer screens, forms, and reports**
- ❖ **Four common approaches (listed in increasing detail)**
 - **Storyboard:** hand drawn pictures of what the screens will look like
 - **Windows layout diagram:** a computer generated storyboard that more closely resembles the actual interface
 - **HTML prototype:** web pages linked with hypertext
 - **Language prototype:** more sophisticated than HTML
 - Built in the programming language with no real functionality
 - User does not have to guess about the final appearance of the screen



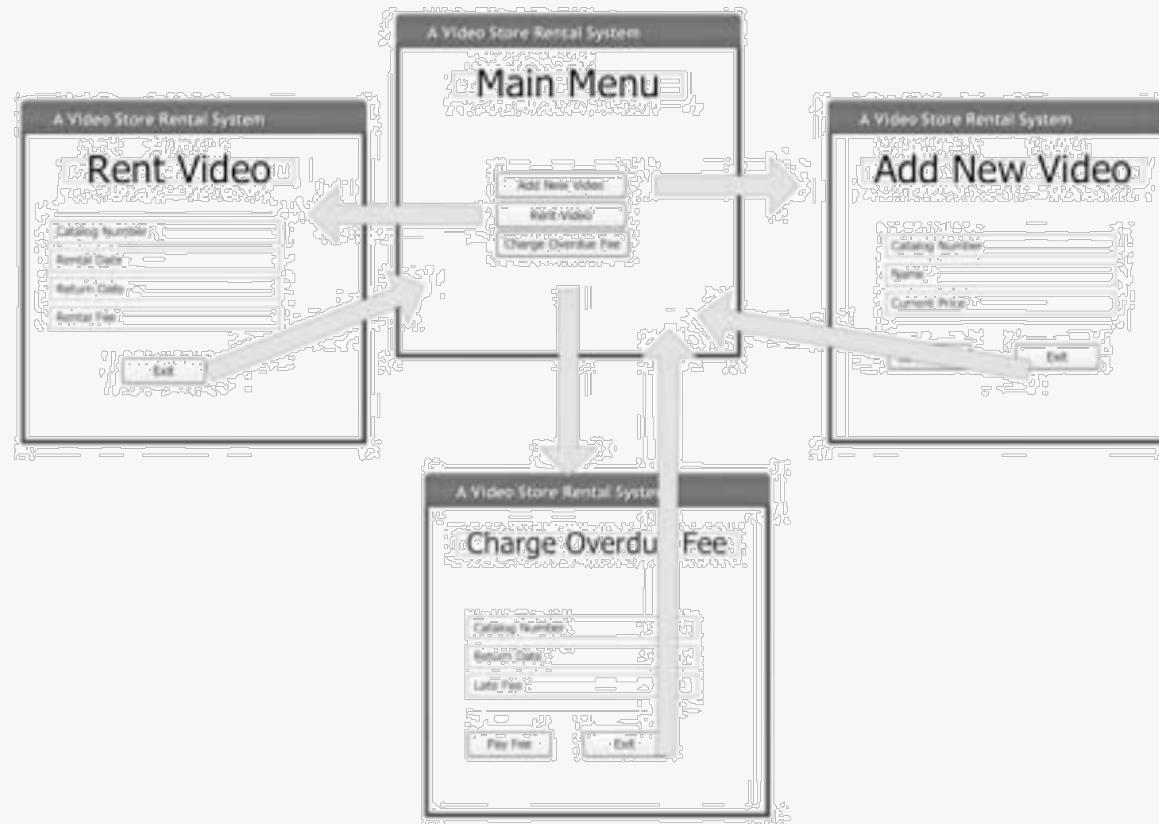
Story Board Example (1)



(source: Dennis, Alan, Barbara Haley Wixom, and Roberta M. Roth. Systems analysis and design. John wiley & sons.)



Story Board Example (2)



(source: Dennis, Alan, Barbara Haley Wixom, and Roberta M. Roth. Systems analysis and design. John wiley & sons.)



Story Board Example (3)

CREATE NEW COLLECTION

Annotations: Camera files, New Collection, Add to Collection, Select camera, Default camera location.

SELECT DATA FILES

Annotations: Adding to collection, Export files, Collection.

ORGANIZE HOME SCREEN

Annotations: Tools, Title, Items, Select a size in the bottom right.

SELECT FACE TO SORT BY

EDIT LAYOUT OF COLLECTION

User Lands on Home Page

The success of this page is determined by SEO strength. Problems with this page indicate problems with traffic.

User Navigates to Desired Info Page

The success of this page is determined by the UI of the home page. Can people find what they're looking for?

User Clicks on Call to Action

The success of this page is determined by CTA placement and UI. Are people clicking your CTAs?

User Enters Info and Starts Free Trial

Are you asking user the right questions and receiving the info you need to pursue them as leads?

User Interacts with Product

Does your product actually solve the problem that your customers are experiencing?

User Purchases Product

Do you have a clear and easy path to allow the user to complete their purchase without the need for assistance?

Source: IBM

Source: <https://www.uxbooth.com>



Interface Prototyping Example (1)

- ❖ Interface Prototype for CD Selection company

The image displays two versions of a user interface for a CD selection company. The top version shows a search results page for "Stewart, Al" with five album entries. The bottom version is a detailed view of the first result, "24 Carrots by Al Stewart (1993)", showing tracks, price, shipping cost, and purchase options.

Search Results for: Stewart, Al

- 24 Carrots**
Al Stewart (1993) \$11.97
- Best of Al Stewart**
Al Stewart (1987) \$11.97
- Between the Wars**
Al Stewart (1995) \$15.97
- Famous Last Words**
Al Stewart (1993) \$15.97
- Modern Times**
Al Stewart (1992) \$11.97

Search Results for: Stewart, Al

24 Carrots by Al Stewart (1993)
CD Price: \$11.97
Shipping Cost: \$2.00
Usually ships within 2 days

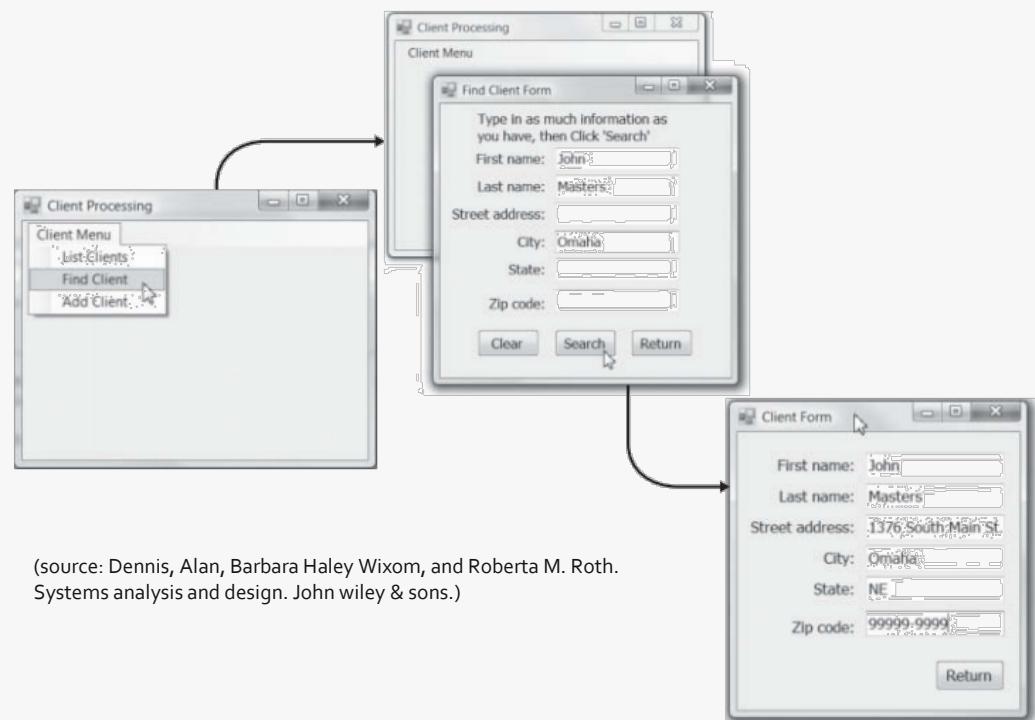
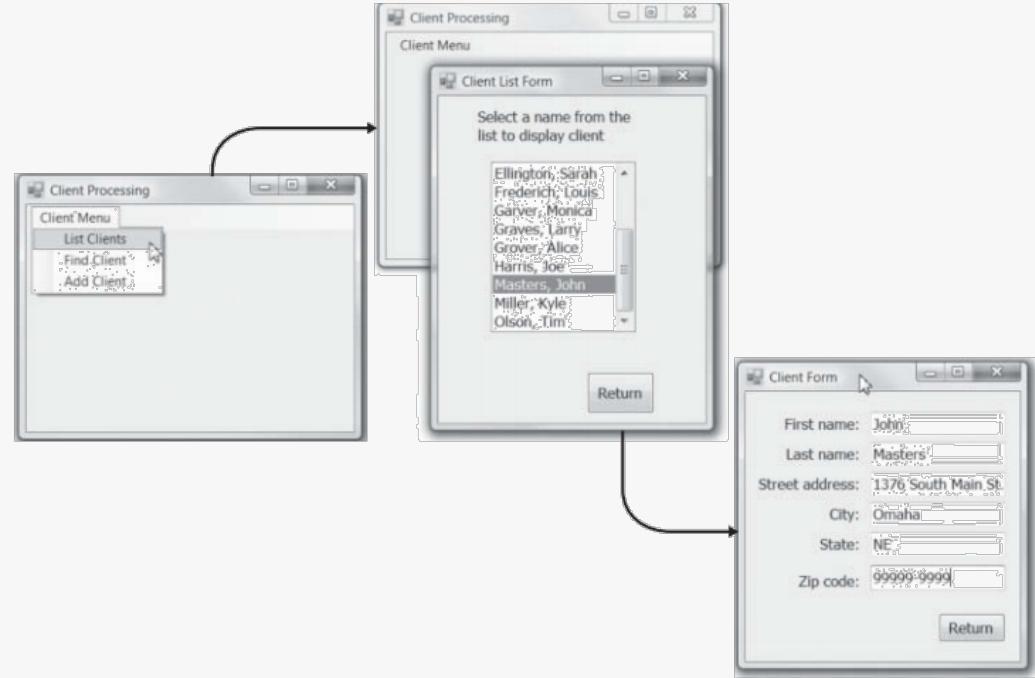
Tracks:

1. Running Man	7. Rocks in the Ocean
2. Midnight Rocks	8. Paint by Number
3. Constantinople	9. Optical Illusion
4. Merlin's Time	10. Here in Angola
5. Mondo Sinistro	11. Pandora
6. Murmansk Run	12. Indian Summer
Ellis Island	

More Information



Interface Prototyping (2)



Interface Evaluation - ⑤

- ❖ Goal is to understand how to improve the interface design before the system is complete
- ❖ Have as many people as possible evaluate the interface
- ❖ Ideally, interface evaluation is done while the system is being designed before it is built
 - Help identify and correct problems early
 - Designs will likely go through several changes after the users see it for the first time



Additional Considerations

- ❖ **Common sense approach to UI design**

- The way normal people think about

Please enter your phone number:

(216) 409-9989



Volume: 50



- ❖ **Navigation Design (similar as UX)**

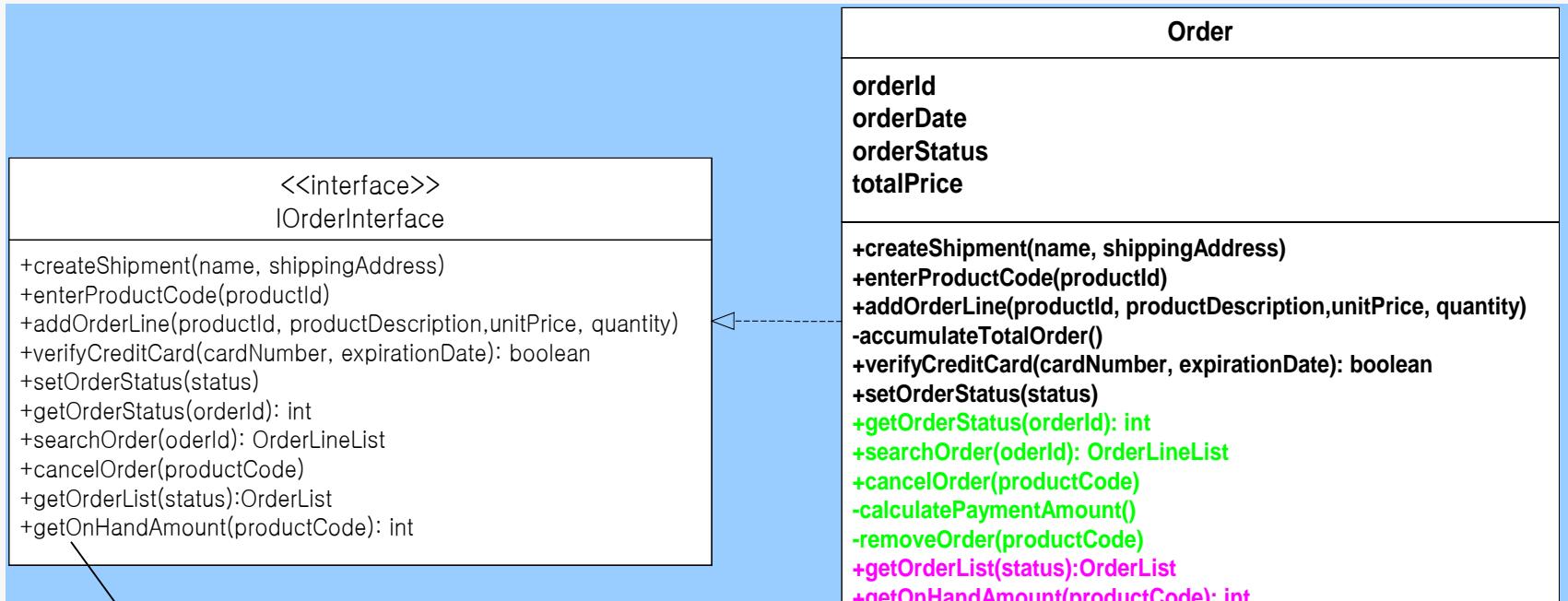
- The component that enables the user to navigate through the system

- ❖ **Messages**

- ❖ **Input and output of data**

- ❖ **Different domains (Mobile / Web / Social media/ Tablet / PC...)**

Interface Design in Diagram



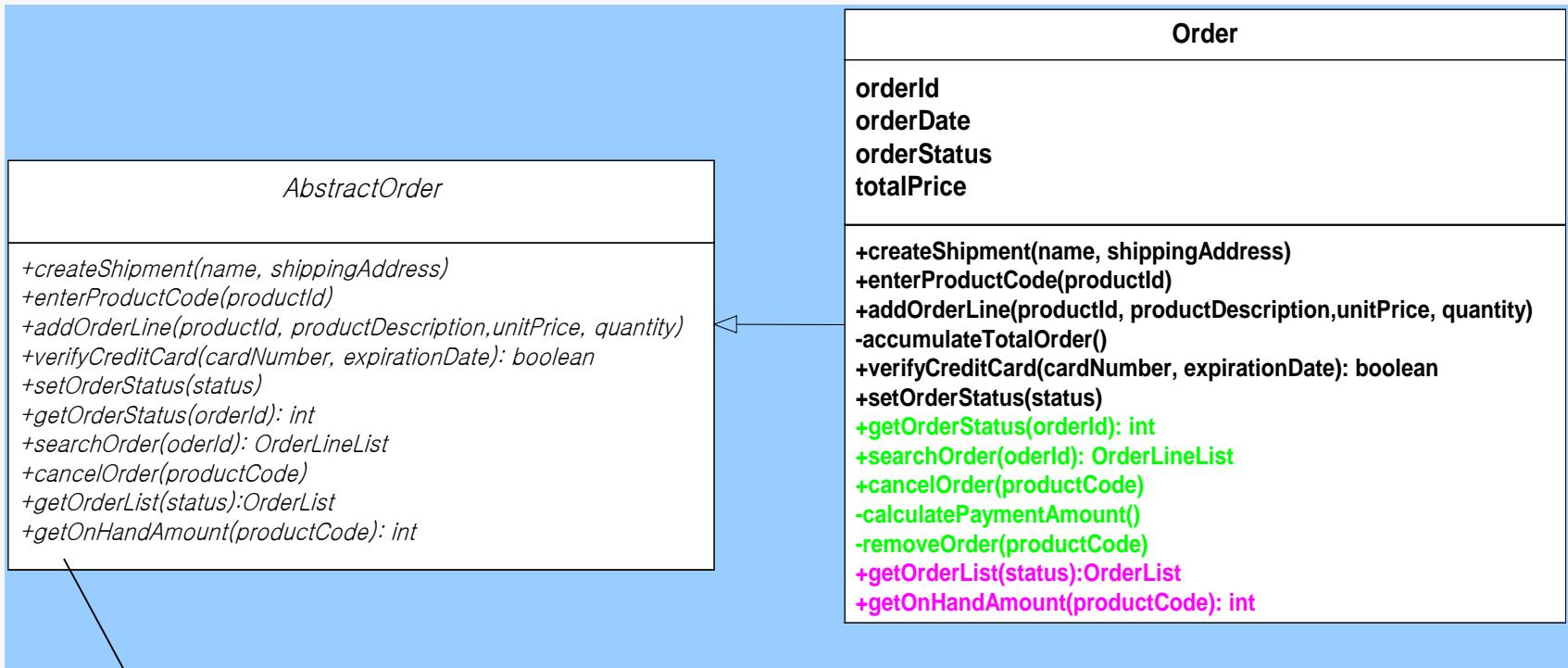
Java

**Interface : specify public operation only
(set of operation (method) signatures)**



Refinement: Order class realize IOrderInterface

Interface Design in Diagram



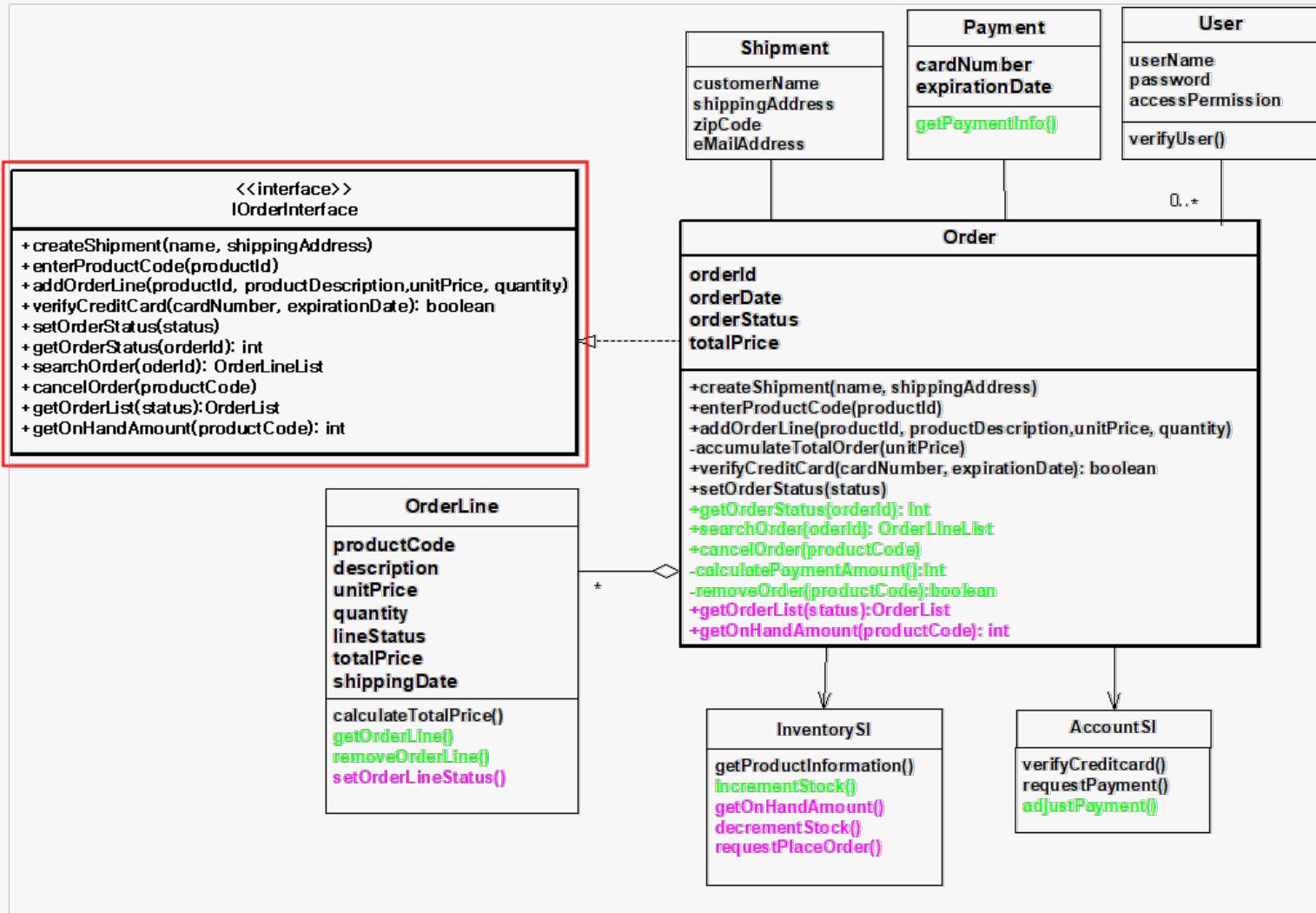
C++

Abstract class contains the specification of public operation only
- set of operation signatures, pure virtual function in C++

Inheritance: Order class redefines the properties
of AbstractOrder superclass



Refinement of Class Diagram



How Developer Can Make UI?

❖ I asked UI developer who is my friend
(her major is Contents Design)

- Apple

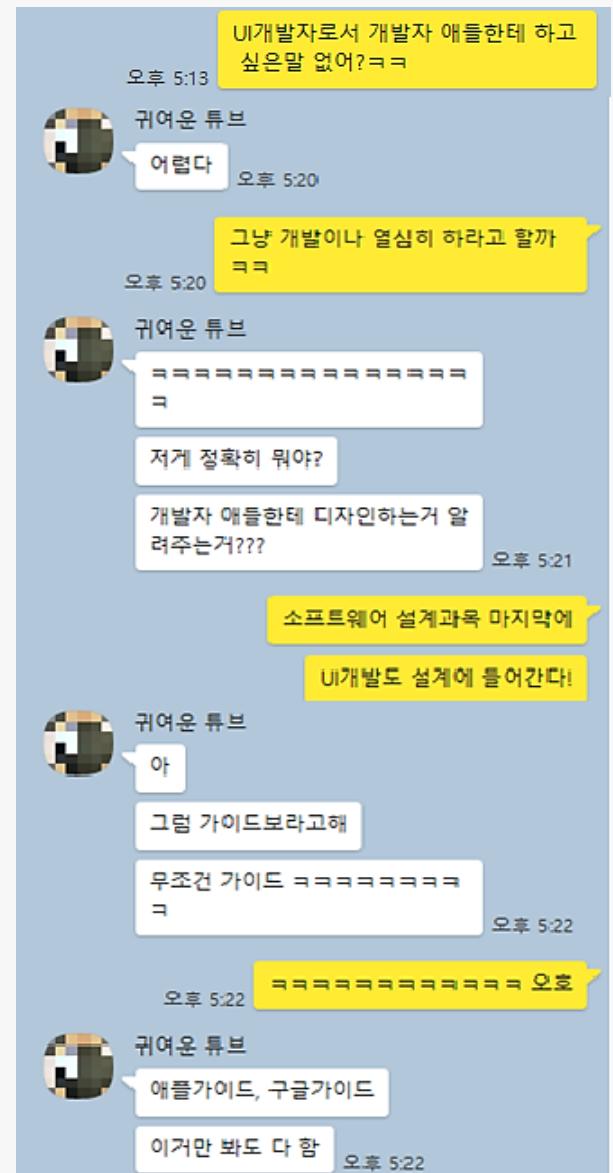
<https://developer.apple.com/design/human-interface-guidelines/>

- Material Design

<https://material.io/design>

- Google

<https://design.google/resources/>



Summary and Discussion

❖ User Interface Design

- Use scenario, Interface Structure, Window navigation diagram
- Interface class or Abstract class

