

# Software Engineering

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## 7. UI Design (Chapter 7)

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# Topics

- Understanding the User Experience and the User Interface
- Metaphors
- Fundamental Principles of User-Interface Design
- Transitioning from Analysis to User-Interface Design
- User-Interface Design
- Designing Reports, Statements and Documents
- Classroom Activity

# Overview

- **User interface** design must consider the entire **user experience**
- Good user interfaces are based on **good design principles** – visibility, affordance, feedback, etc.
- **Poorly** designed user interface can make the information system unusable
- **Storyboards** are a powerful tool for UI design

# User Interface

- **User Interface:** inputs and outputs that directly involve a human user/actor
  - A dialog goes on between actor and system
  - Design factor varies upon the interface purpose, user characteristics, interface device characteristics
    - Overall maximal ease of use, operational efficiency (for experts)
- In most projects, analysts separate the design of the *system* interface from the design of *user* interfaces due to required expertise and technology
  - Considerable coordination is required

# Usability

- Usability: the degree to which a system is easy to learn and use
  - Different types of users with different preferences and skills
    - if too flexible: some end users might feel lots
    - if too rigid, some users will be frustrated
  - Ease of learning vs. ease of use – conflict
- Usability에 영향을 주는 요소
  - 학습용이성(Learnability)
  - 효율성(Efficiency)
  - 기억용이성(Memorability)
  - 낮은 오류율
  - 자신감과 만족

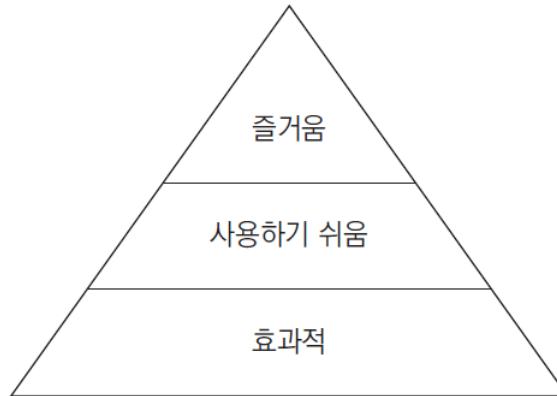


그림 8.2 사용성 요소의 우선순위

# User Experience (UX)

- User interface design must focus on entire **User Experience**
- called **User-Centered Design**
  - Focus **early** on users and their work
    - Perform **user-oriented analysis** and **design tasks early with high priority**
    - **User-related design decisions drive other design decisions and tasks**
  - Evaluate designs to ensure usability
  - Use iterative development
- **Usability** is the objective

# User Experience (UX)

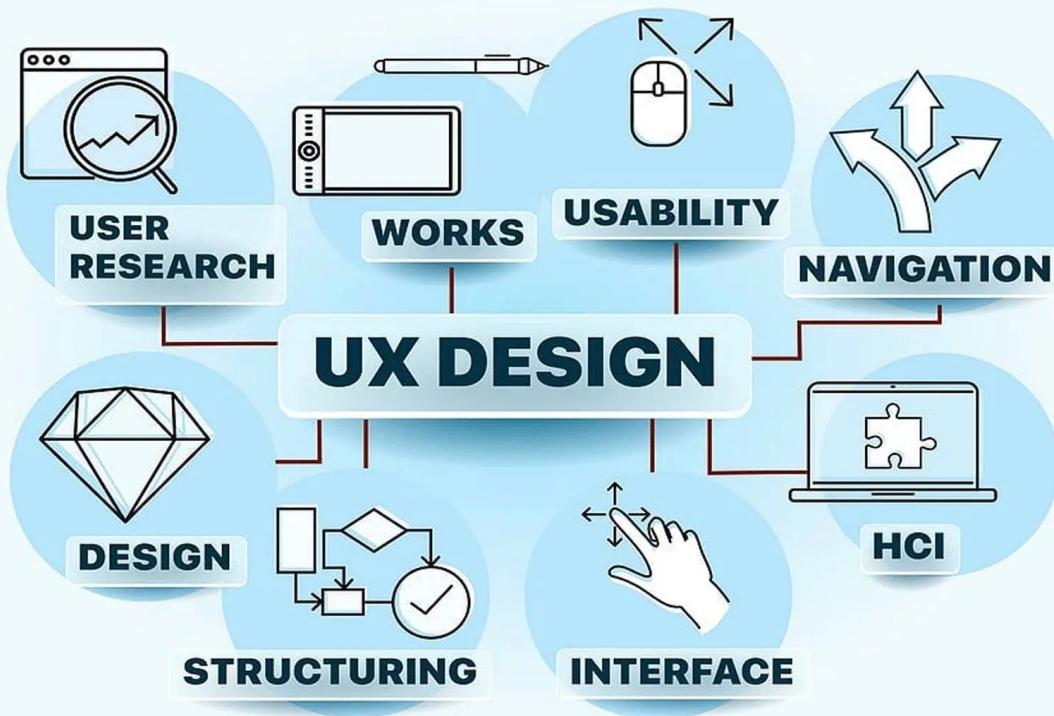


image reference: <https://uidesignz.com/blogs/best-ux-design-frameworks>

# Usability

- Testing User Interface design:
  - **Objective** data collection and statistic analysis
  - **Subjective** data about user perceptions and attitudes
    - formal surveys, focus group meetings, design walk-through, paper-and-pencil evaluation, expert evaluation, formal laboratory experiments, information observation, etc

# Usability 테스트

- 테스트 목적 설정
  - 학습성, 오류율, 예측성
- 대표 사용자 선정
  - 5 명 이상의 사용자
- 설문 준비 및 테스트
  - 테스트 대상을 준비
  - 사전, 사후 테스트 설문지 및 작업 시나리오 정의
  - 참가자에게 수행 요청
  - 사용성 테스트를 수행하고 데이터를 기록

# Components of the User Interface

Equipment—Screen, keyboard, mouse, keypad, printed forms, documents, reports, webcam, desk, chair, light

Screen elements—Windows, screens, menus, buttons, pictures, animations, fonts, sounds, colors

Application—Functions, organization, screen content, advertisements, distractions, links, views, complexities

Mobile equipment—Touch screen, screen size, brightness, resolution, hotspots, connections, response times



# Metaphors of Human Computer Interaction

# Metaphor

- To make computers easier to use and learn, designers of early visually oriented interfaces adopted metaphors
- **Metaphors: analogies between features of the user interface and aspects of physical reality that users are familiar with**

# Direct manipulation metaphor

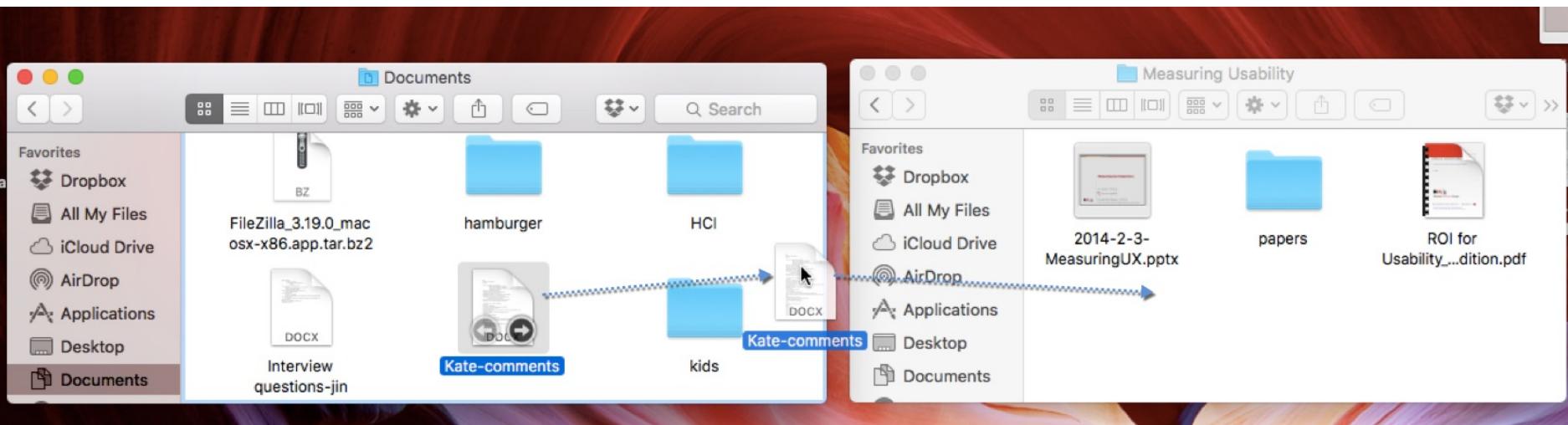
- Metaphor in which objects on a display are manipulated to **look like physical objects** (pictures) or **graphic symbols** that represent them (icons)
- Direct manipulation is one of the central concepts of graphical user interfaces (**GUIs**) and is sometimes equated with “what you see is what you get” (**WYSIWYG**)
- Example: The user drags a folder icon to an image of a recycle bin or trash can to delete a collection of files.
- More examples: <https://www.nngroup.com/articles/direct-manipulation/>

*On a mobile phone, you can pinch out to zoom into an image and pinch in to zoom out.*



image reference: <https://www.nngroup.com/articles/direct-manipulation/>

- Moving a file on MacOS using direct manipulation involves dragging that file from the source folder and moving it into the destination folder.



VS.

```
raluca — -bash — 94x6
Last login: Thu Aug 18 16:29:22 on ttys002
Raluca-MacBook-Air:~ raluca$ mv Documents/Kate-comments Documents/Measuring\ Usability/
```

- Moving a file in a command-line interface involves remembering the name of the command ("mv" in this case), the names of the source and destination folders, as well as the name of the file to be moved.

# Desktop metaphor

- Metaphor in which the **visual display is organized into distinct regions, with a large empty workspace in the middle and a collection of tool icons around the perimeter**
- Example
  - At computer startup, a Windows user sees a desktop, with icons for a clock, calendar, notepad, inbox and sticky notes (the computer interface version of a physical Post-It note).

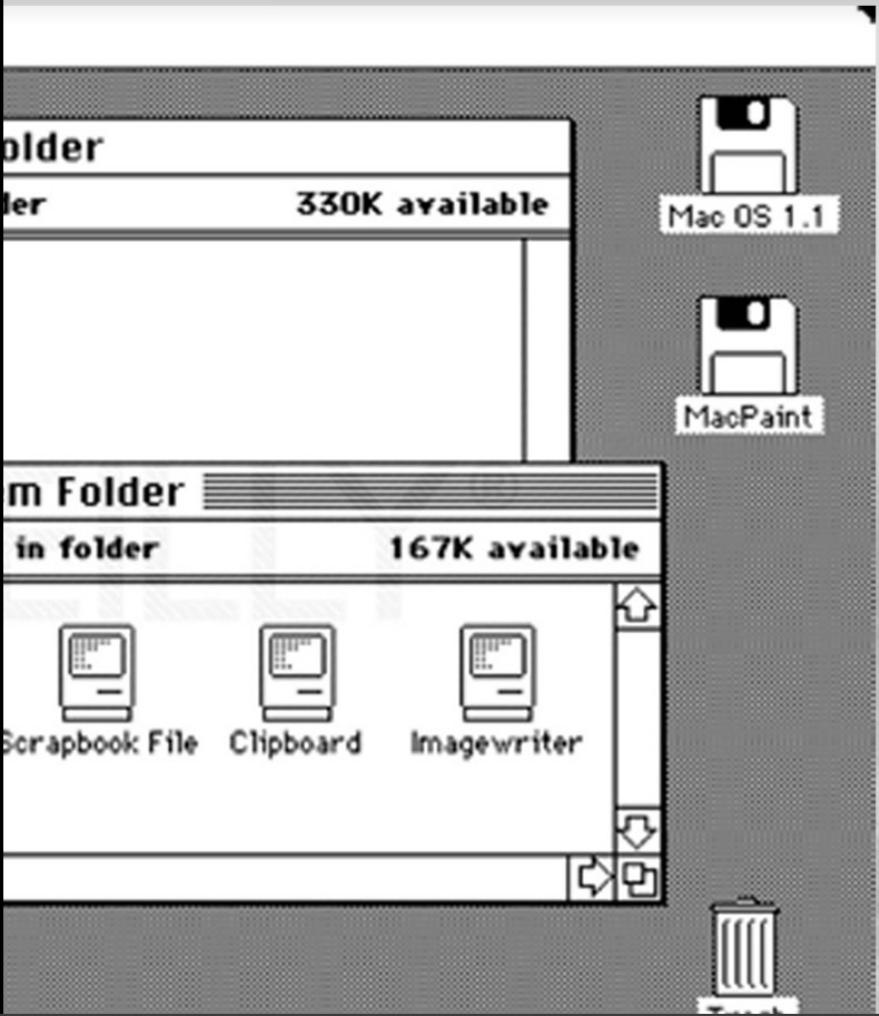


Image reference:  
<https://www.behance.net/gallery/40202533/Desktop-metaphor-example-%28June-2016%29>

# Document metaphor

- **Visually representing the data in files as paper pages or forms:** these pages can be linked together by **references** (hyperlinks)
- Example
  - The user fills in a form field for a product, and the manufacturer's Web site finds and displays the product's manual as an Adobe Acrobat file, which contains a hyperlinked table of contents and embedded links to related documents.

# Dialog metaphor

- Metaphor in which user and **computer accomplish a task by engaging in a conversation** or dialog via text, voice, or tools such as labeled buttons
- Example:
  - The user clicks a button labeled "troubleshoot" because the printer isn't working. The computer prints questions on the display, and the user responds by typing answers or selecting responses from a printed list.

# Dialog Metaphor



Recycle Bin Robert Jackson SADCW7\_Ch08\_Final.kz-RB.docx (Compatibility Mode) - Word

FILE HOME DESIGN DATA PROCESS REVIEW VIEW

Calibri 12pt. A A A A A A A A

B I U Aa Aa Aa Aa Aa Aa Aa

Font Paragraph Tools

Clipboard

WORLD ORDER SaleHandler

Customer

- accountNo: string (key)
- name: string
- mobilePhone: string
- homePhone: string
- status: string

Sale

- saleID: int (key)
- saleDate: date
- priorityCode: string
- shipping&Handling: currency
- tax: currency
- totalAmt: currency
- amountInBucks: int

PromoOffering ProductItem

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Chapter 8 Designing the User Interface

## Chapter Outline

- Understanding the User Experience and the User Interface
- Fundamental Principles of User-Interface Design
- Transitioning from Analysis to User-Interface Design
- User-Interface Design
- Designing Reports, Statements, and Turnaround Documents

## Learning Objectives

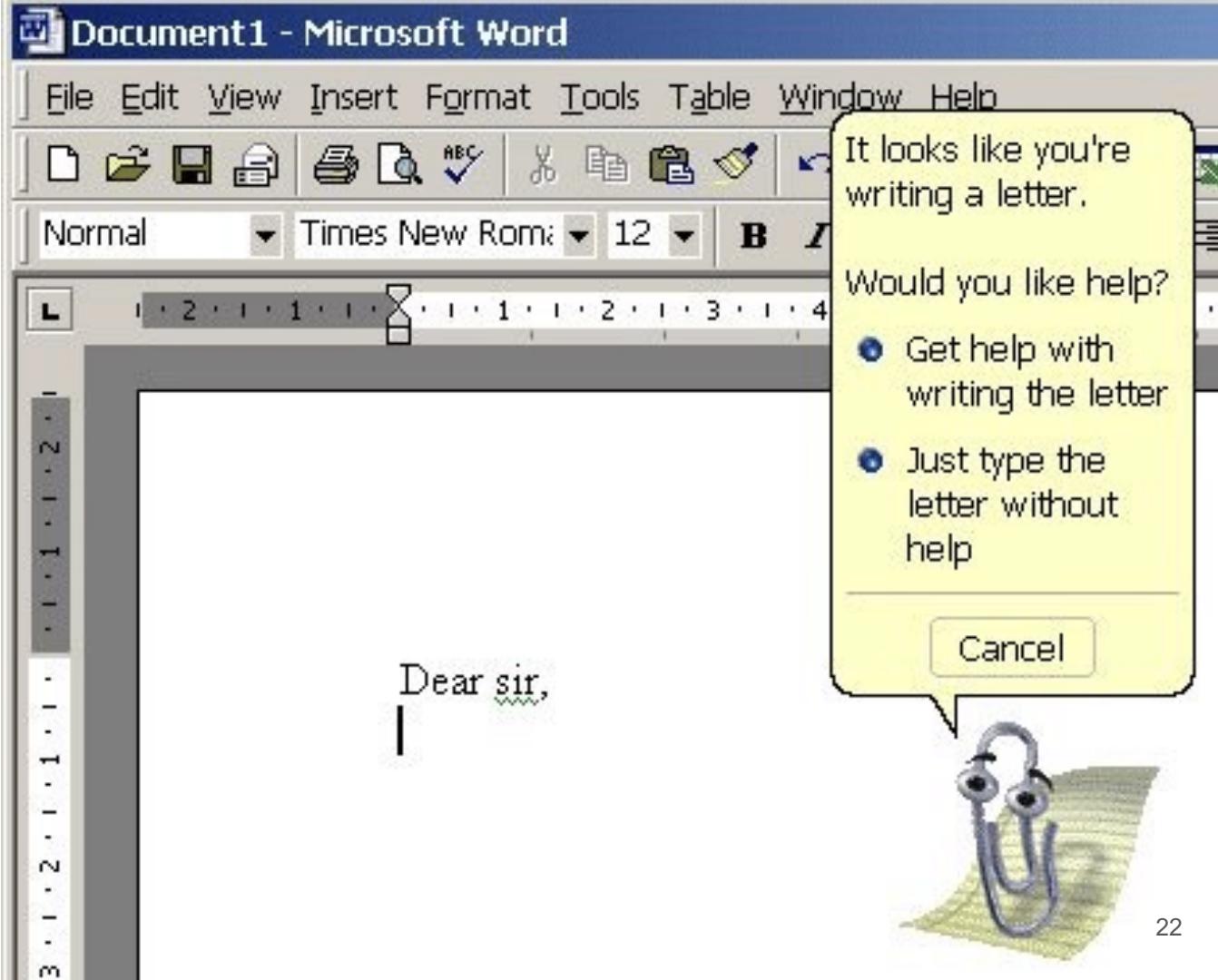
Direct Manipulation, Desktop, and Document Metaphors On One Screen

PAGE 1 OF 80 15686 WORDS

10:45 AM

# Examples of “unsuccessful” metaphors

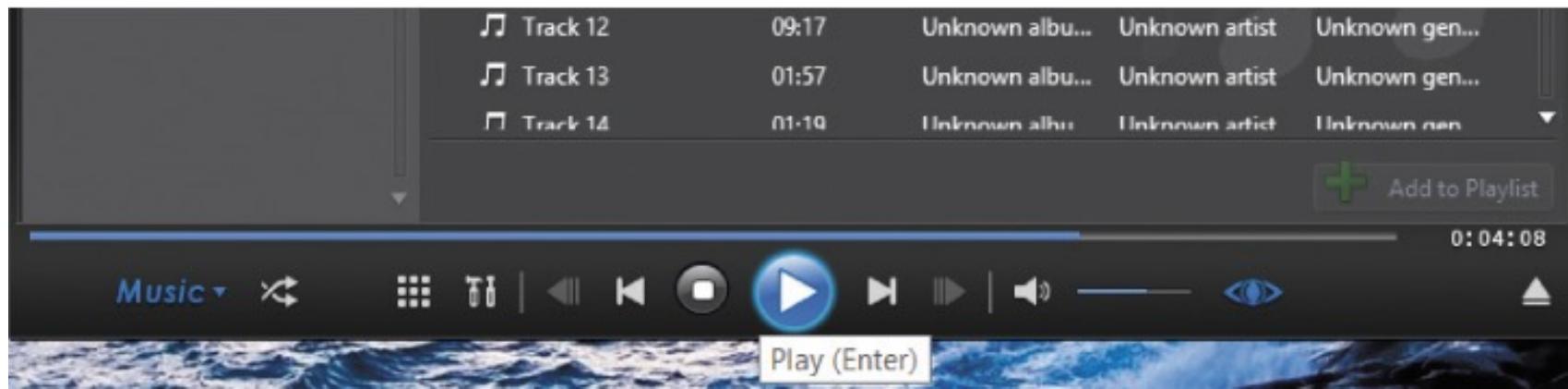
- MS Clippie
  - More examples:  
[http://hallofshame\(gp.co.at/metaphor.htm](http://hallofshame(gp.co.at/metaphor.htm)



# Principles of User-Interface Design

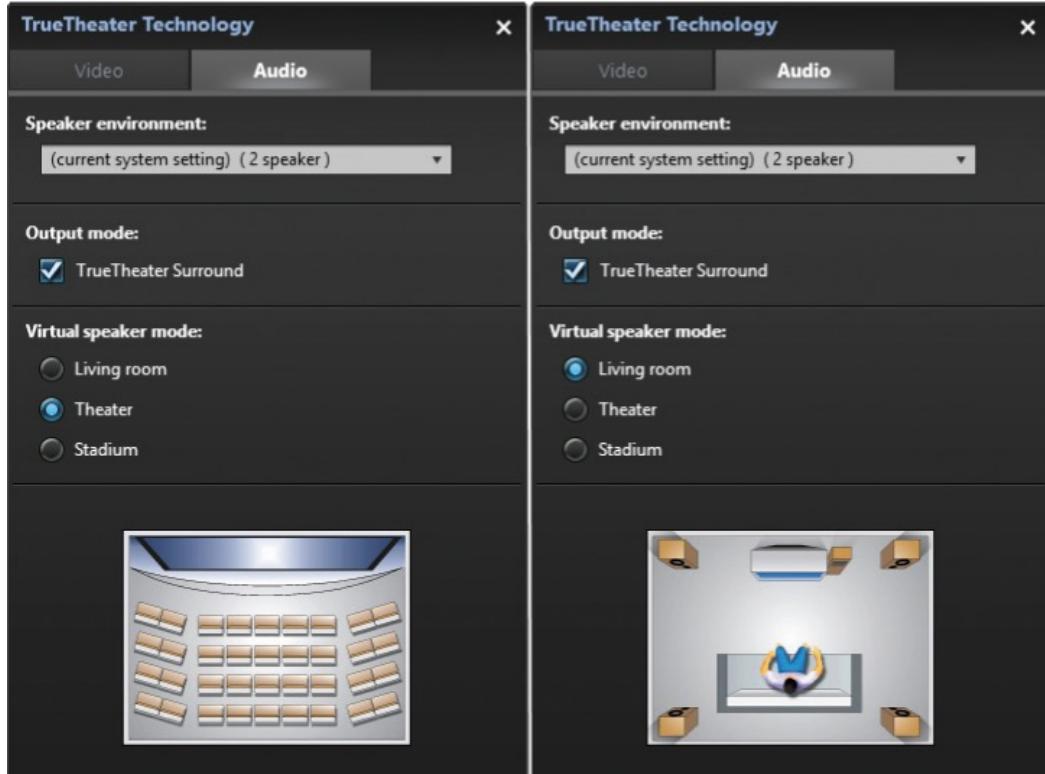
# Affordance

- **Affordance<sup>1</sup>** – the appearance of the object suggests its function
  - <sup>1</sup>affordance: 행동을 어떻게 해야할지 암시를 해준다는 뜻으로, 행동 유도성이라고도 불림
- Example:
  - UI for audiotape, videotape players in the 1970s; DVD and portable music players.
  - Widely incorporated into computer interfaces because so many users are familiar with them.



# Visibility

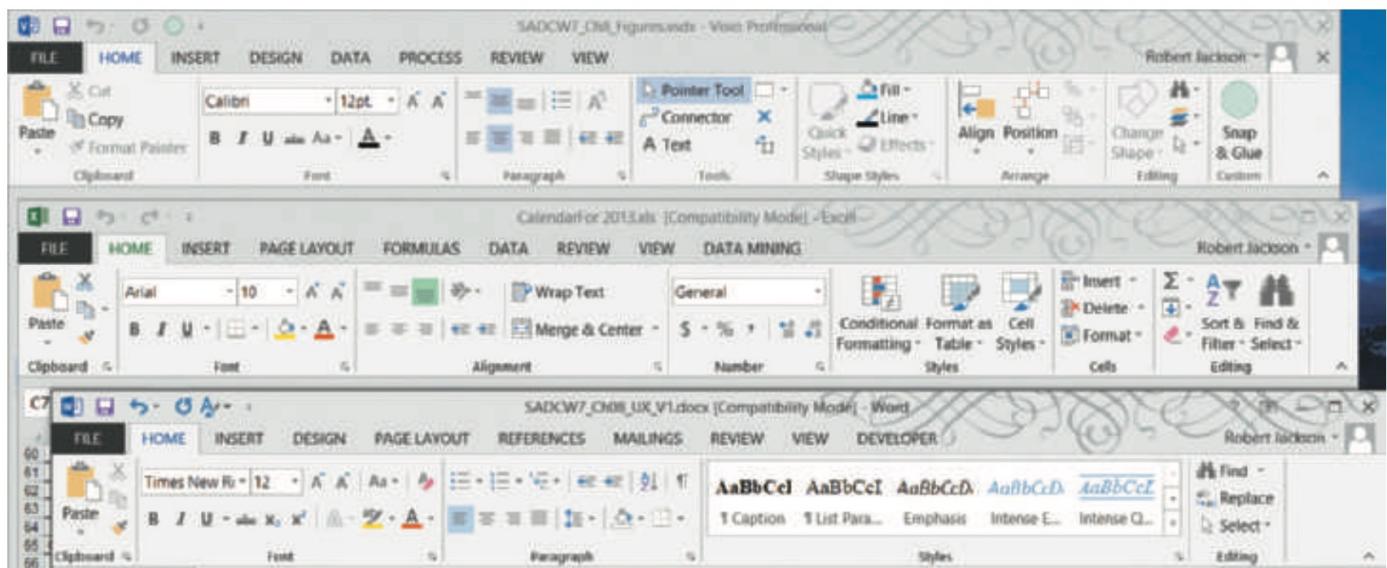
- **Visible with Feedback**
  - A control is visible so users know it is available
  - provides an immediate response (feedback) to a user action
- Good examples – radio buttons and check boxes



# Consistency

- UI should be designed for **consistency** in **function** and **appearance**
  - Across platforms
  - Within a suite of applications
  - Within a particular application
- Why?

After learning one way of doing this, it is difficult to change



*Three Microsoft applications showing the menu ribbon*

# Continuity

- Consistency across releases over time
  - Example: Windows Continuity
    - Windows 7
    - Windows 8

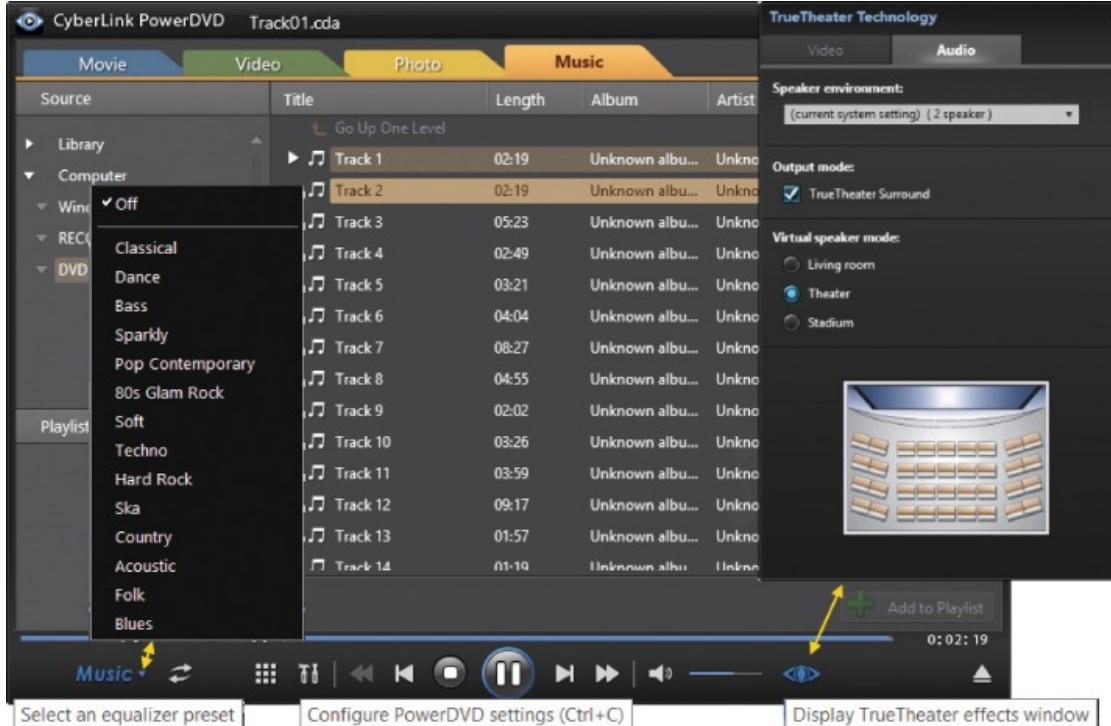


# Shortcuts

- User interfaces designed for novices impede experienced users' productivity.
- Provide **shortcut keys** for experienced users
  - Minimize the number of keystrokes, mouse clicks, and menu selections required to complete tasks.
- Examples:
  - Voice commands
  - Shortcut keys (e.g, Ctrl+C for copy and Ctrl+V for paste)
  - Application designers should use standard shortcuts when available or build their own

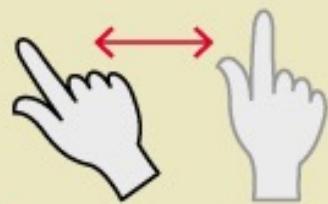
# Discoverability

- To help users discover “hidden” features or objects
- Active discovery – mouse hovers, pop-ups, tool tips

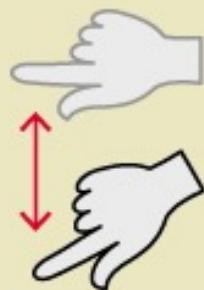


## Discoverability (cont'd)

- Visual diagrams to guide users



Swipe left or right  
to **browse** a book



Swipe up or down  
to **read** a book



Tap the control to  
**access** a function



Double-tap the  
control to **toggle**  
on and off

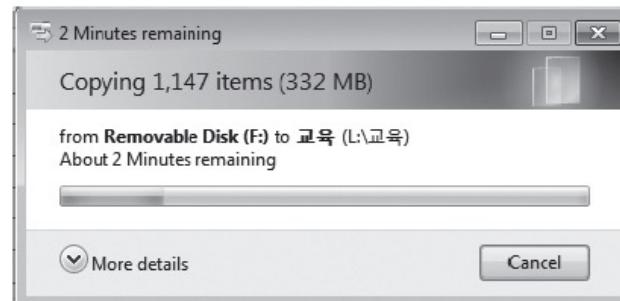
# Feedback

- Every action a user takes should result in feedback from the computer so the user knows the action was recognized.
  - Audible feedback:
    - e.g., clicking sounds when keys are pressed and beeps when on-screen buttons are pressed
  - Visible feedback:
    - e.g., the icon changes, or the progress meter shown during the download of a large file



## Feedback (cont'd)

- Feedback provides the user with a sense of **confirmation** and the feeling that a system is **responsive** and functioning **correctly**.
- Lack of feedback leaves the user wondering whether a command or input was recognized or whether the system is malfunctioning.
  - When subsequent processing is **delayed by more than a second or two**, users may repeatedly press controls or reenter information, resulting in processing **errors** and **user frustration**.



# Closure

- **Closure** on dialogues – **end of a series of actions**, e.g.,
  - *Continue* button and a *Finish* button that indicate the end of the process
  - Progress bar
- **Protect user's work** – at end and for *partially complete* work
  - Example: not conform to the principle of saving the user's work
    - When purchasing concert tickets or airline reservations, if you only want to change a date or time, often the application will require you to complete the entire form for every change
- Provide **undo** to reverse actions

# Error Handling

- A good user- interface design anticipates common errors and helps the user to avoid them.
- Present the user with *only valid options* for a specific point in a dialog
- When errors occur, the user interface needs mechanisms to **detect** them. The system must also help the user **correct** the error.
- The **error message** should state specifically **what is wrong** and explain **how to correct it**.

*The customer information entered is not valid. Try again.*

**vs.**

*The date of birth entered is not valid. Check to be sure only numeric characters in appropriate ranges are entered in the Date of Birth field.*

## Easy Reversal of Actions

- Users can explore options and take actions that can be cancelled or reversed without difficulty.
- Design includes **cancel buttons** on all dialog boxes and allow users to **go back a step at any time**.
- When the user deletes something *substantial*—a file, a record, or a transaction—the system should ask the user to **confirm the action** and **delay implementing the action**.
- User dialog reflects the structure (several steps for a complex task), internal programming collect the data to build “to do” list and process at once at the final step.
- User-interface performance can be improved
  - fewer potential processing delays between steps.

# Reducing Short-Term Memory Load

- **Avoid** requiring the user to **remember** anything from one form to another or from one dialog box to another during an interaction with the system.
- The interface should help users **keep track of where they are** in a complex process via **visual cues** and other aids.

# Readability and Navigation

- Readability and Navigation
  - Readable text for all users (type, size, color)
  - Clear navigation e.g.,
    - *Home > Women's clothes > WinterCoats*
  - Reverse navigation – a way out – **breadcrumbs** navigation
- Simplicity – KISS (Keep It Simple Stupid!)

*Mount St Helens Singles  
presents*

**End of Summer Activity  
Labor Day - Monday Sept 7, 2015**

*6:00 p.m. to 10:00 p.m.*

*Food*

*MSHS will provide hamburgers and other BBQ*

*Please bring Side Dishes, Salads, and Desserts.*

We will start serving shortly after 6:00.

## BREADCRUMBS



# Example Home Page: Simple Design and Navigation

www.rmo.biz - Windows Internet Explorer  
http://www.rmo.biz/

Favorites www.rmo.biz /

Welcome to RMO.biz (Log in or Register) 0 items  **Checkout**

 **Search** All Departments   
**FREE SHIPPING**  
on orders of \$100 or more

**Shop for Clothing** **Shop for Gear** **Wish List** **Store Locator** **My Account** **My Orders**

Women's Apparel	Men's Apparel	Kids' Apparel	Footwear	Accessories	Sale & Clearance
<b>Women's Jackets</b> -Casual Jackets -Down Jackets -Fleece Jackets -Insulated Jackets -Rain Jackets -Running Jackets -Wind Shells -Ski Jackets -Snowboard Jackets -Soft Shell Jackets -All Women's Jackets	<b>Women's Clothing</b> -Footwear -Pants -Shirts -Shorts -Skirts and Dresses -Sweaters -Swimming -Underwear -Vests -Petite Clothing -Plus Sizes -All Women's Clothing	<b>Women's Accessories</b> -Belts -Gaiters -Gloves and Mittens -Hats -Headwear -Scarves -Socks -Sports Bras -Sunglasses -Watches -All Accessories			

Done  Internet | Protected Mode: Off 100%

# UI 설계 원리

- 단순하고 자연스럽게 만들라
- 안전한 사용과 오류 회복이 쉽게 하라
- 직접 조작하고 바로 피드백 받게 하라
- 일관성을 유지하라
- 즉각적으로 만족시켜라
- 단축 명령을 제공하라
- 인식하기 쉽게 만들라
- 공간 기억을 활용하라
- 접근성이 좋게 하라
- 도움말과 문서는 최후의 수단

# The Transition from Analysis to User-Interface Design

# An Approach: Use cases to UI Design

- **Interactive use cases** are the starting point for a dialog.
  - The corresponding *use case specification*, *activity* and *sequence* diagrams are the initial dialog documentation.
  - Interactive use cases may require **the user to input choices and data** into the system (e.g., making an online order) or may generate outputs in response to a user request (e.g. when tracking a shipment).
- During design, dialogs for interactive use cases are further **refined by developing menus, forms, and other user-interface elements**.

# An Approach: Use cases to UI Design

- The top down approach
  - Menus (groups of related use cases, dialogs, and user interfaces) are defined first
  - Then, a detailed description of each interactive use case dialog and development of the related user-interface elements.
- The bottom-up approach
  - Interactive use cases are **prioritized**, and related dialogs and user interfaces are developed **one at a time**.
  - Menus are added later in the project when related sets of fully implemented user interfaces are completed.

# Use Cases and the Menu Hierarchy

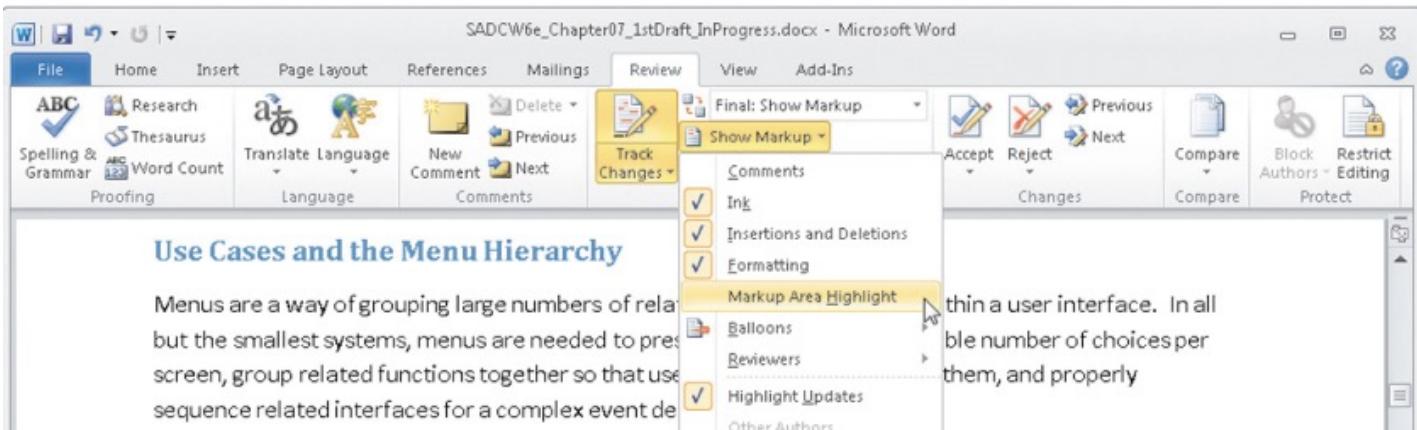
- Menus are a typical way to organize access to use case functionality
- Different types of users might have different menus
- Useful to design an overall menu hierarchy and then subsets for different users
- Once the hierarchy is established, menus can be implemented in a variety of ways

# Use Cases and the Menu Hierarchy

- Use cases and UI allocation to menu hierarchy decisions:
  - organization of the menus (flat versus deep),
  - the number of uses cases or menu choices,
  - the limits of human cognition.
    - 5-10 choices to avoid overloading the user
- For a typical business system,
  - an initial estimate of the number of menus = (the total number of interactive use cases) / 5
    - all use cases and additional menu items (e.g., setting options or preferences)

# Two Different Menu Styles

- the mouse pointer is positioned over the Shop item of the upper menu in a Web page.
- complex menu design, with three menu levels displayed.



# Grouping Use cases

- grouped by subsystem and actors

Subsystem	Use case	Users/actors
Sales	Search for item	Customer, customer service representative, store sales representative
Sales	View product comments and ratings	Customer, customer service representative, store sales representative
Sales	View accessory combinations	Customer, customer service representative, store sales representative
Sales	Fill shopping cart	Customer
Sales	Empty shopping cart	Customer
Sales	Check out shopping cart	Customer
Sales	Fill reserve cart	Customer
Sales	Empty reserve cart	Customer
Sales	Convert reserve cart	Customer
Sales	Create phone sale	Customer service representative
Sales	Create store sale	Store sales representative
Order fulfillment	Ship items	Shipping
Order fulfillment	Manage shippers	Shipping
Order fulfillment	Create backorder	Shipping
Order fulfillment	Create item return	Shipping, customer
Order fulfillment	Look up order status	Shipping, customer, management
Order fulfillment	Track shipment	Shipping, customer, marketing
Order fulfillment	Rate and comment on product	Customer
Order fulfillment	Provide suggestion	Customer

## use cases grouped into first-cut menus by similar function and user

- Use cases with common actors and event decomposition or that implement CRUD actions for a specific domain class are good candidates to be grouped into a single menu or related group of menus.
- Example on the right: Grouped into four menus. Each menu collects uses cases from one subsystem

Menu description	Menu choices (use cases)	Intended user(s)
<b>Shopping cart functions (primary or reserve)</b>	<b>Search for item</b> <b>View product comments and ratings</b> <b>View accessory combinations</b> <b>Switch carts (primary to reserve or vice versa)</b> <b>Fill shopping cart</b> <b>Empty shopping cart</b> <b>Check out shopping cart</b>	Customer
<b>Sale creation</b>	<b>Search for item</b> <b>View product comments and ratings</b> <b>View accessory combinations</b> <b>Create sale</b>	Customer service and store sales representatives
<b>Order shipment</b>	<b>Ship items</b> <b>Manage shippers</b> <b>Create backorder</b> <b>Create item return</b> <b>Look up order status</b> <b>Track shipment</b>	Customer service and store sales representatives
<b>Customer order control</b>	<b>Look up order status</b> <b>Track shipment</b> <b>Create item return</b> <b>Rate and comment on product</b> <b>Provide suggestion</b>	Customer

## Dialog Design for each menu option

- A dialog design is created for each menu option.
- After dialog design proceeds, the designer may redefine the menu options or structure.
  - missing or incomplete use cases during user- interface design results in a brief return to analysis activities to complete the documentation.
- Menus includes options that are not activities or use cases:
  - e.g., system controls, account maintenance, data based backup and recovery

# Dialogs and Storyboards

- For each use case, think of the natural flow of a dialog between user and computer
  - Based on **the flow of activities in use case** description and/or the system sequence diagram
  - Use **natural language** to emphasize feedback to user
  - Create a **Storyboard**
    - **Storyboard: the sequence of sketches of the screen each step of the dialog.**
  - Review the storyboard with users

# Documenting Dialogs

- No de-facto standards
- List the key steps for the dialog with a written description of what the user and computer do at each step.
  - the activity diagram
  - the use case specification
  - it can be more free form.
    - writing out as if user and computer were two people engaged in conversation.
- Sometimes, the designer can go right from the dialog to sketching a series of screens that make the design more visible.

# Example: Dialog (conversation form)

- Use case: *Check out shopping cart*

SYSTEM: What would you like to do?

USER: I'd like to check out.

SYSTEM: Okay. What is your e-mail address or account number?

USER: My e-mail address is [nwells22@gmail.com](mailto:nwells22@gmail.com).

SYSTEM: Fine. You are Nancy Wells at 1122 Silicon Avenue. Correct?

USER: Yes.

SYSTEM: All items in your cart are in stock and can be shipped today. Because your order subtotal is over \$100, you qualify for free UPS ground shipping (3 to 5 days). Other shipping options include next day (\$35.00), two day (\$20.00), and USPS parcel post (\$11.70, 5 to 7 days). How would you like your items to be shipped?

## Example: Dialog (conversation form)

USER: Free UPS ground shipping.

SYSTEM: We have a shipping address on file for you (1122 Silicon Avenue). Do you want your order shipped to that address?

USER: No.

SYSTEM: To what address would you like the order shipped?

USER: John Wells, 1612 Jefferson Street NE, Albuquerque, NM 87123.

SYSTEM: Okay, the total charge is \$125.56 (\$117.90 item subtotal plus \$7.66 sales tax). Shall I charge that amount to your credit card on file (a Visa with an account number ending in 0899)?

USER: Yes.

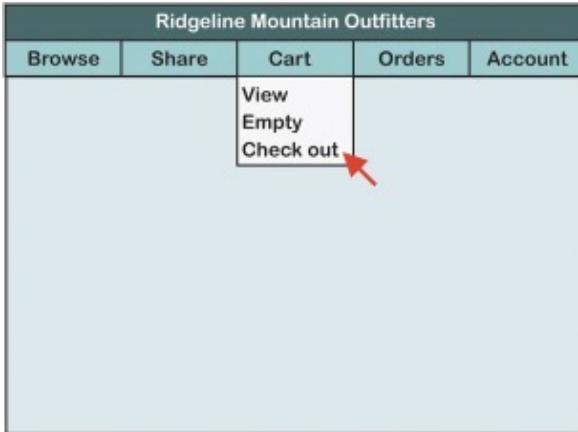
SYSTEM: Your payment has been approved, and your order is being prepared for shipment. A confirmation e-mail has been sent to you, and another will be sent with a shipment tracking number when the order is shipped later today. Can I help you with anything else?

USER: No.

# Storyboard Example : Check out shopping cart dialog

- Screen format is primitive
- Focus on the **fundamental design ideas** and avoid biasing the design to the capabilities of one specific application development tool.

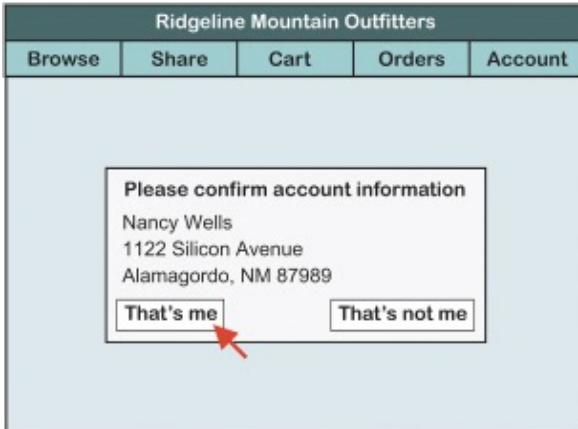
1



2



3



4



# Storyboard Example : Check out shopping cart dialog

5

Ridgeline Mountain Outfitters

Browse Share Cart Orders Account

Please confirm shipping address  
Nancy Wells  
1122 Silicon Avenue  
Alamagordo, NM 87989

OK Use another address

6

Ridgeline Mountain Outfitters

Browse Share Cart Orders Account

Please enter shipping address

Name John Wells  
Apt#  
Street 1612 Jefferson Street NE  
City Albuquerque  
State New Mexico  
Zip Code 87123

OK Cancel

7

Ridgeline Mountain Outfitters

Browse Share Cart Orders Account

Order summary

Qty	SKU	Description	Price	Ext
1	10987335	Toddler parka red	44.95	44.95
1	94462	Ladies parka blue	72.95	72.95

Subtotal 117.90  
Shipping 0.00  
Sales Tax 7.66  
Total \$125.56

Please confirm payment  
Nancy Wells  
Visa xxxx-xxxx-xxxx-0899  
Exp. 02/17

OK Another method

8

Ridgeline Mountain Outfitters

Browse Share Cart Orders Account

Your payment has been approved. Your Visa credit card (xxxx-xxxx-xxxx-0899) has been charged for \$125.56.

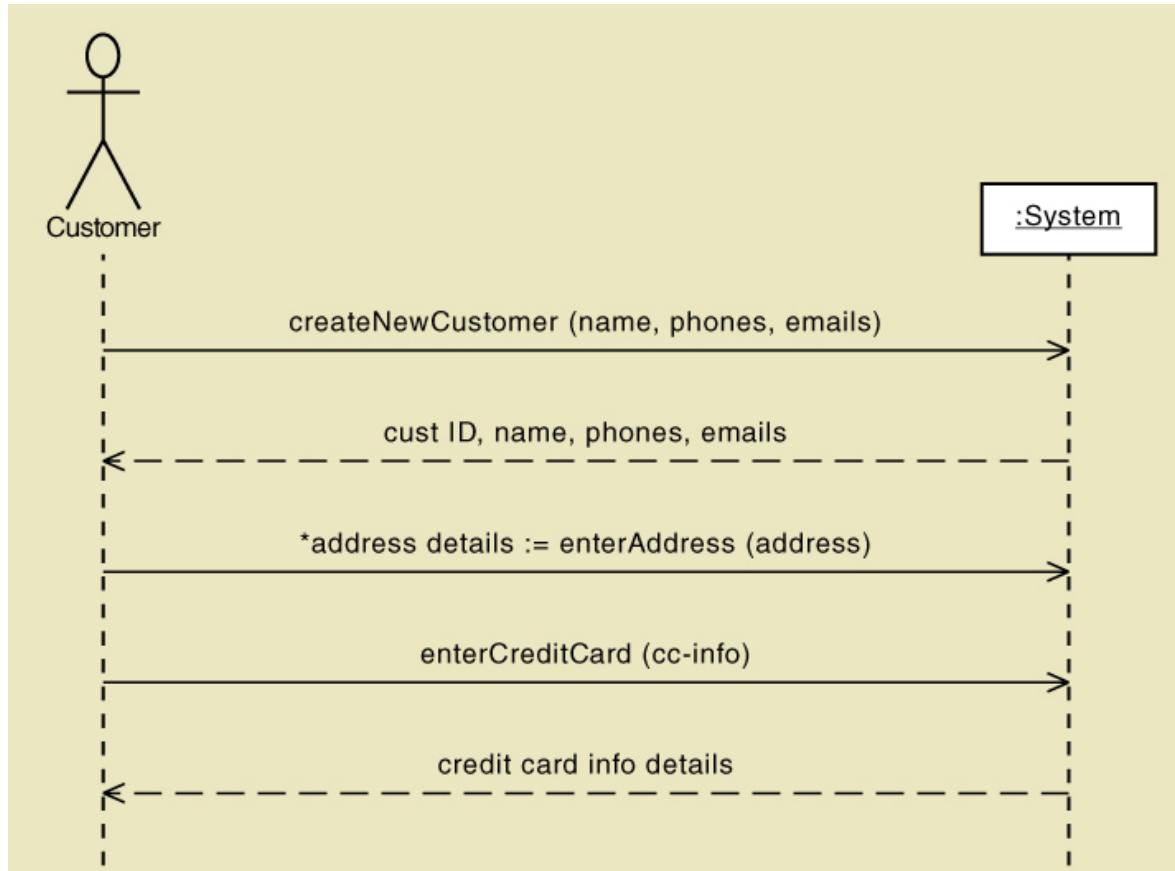
Your order number is 6773823.

The order will be shipped today for delivery in 3-5 days.

Thank you shopping with RMO!

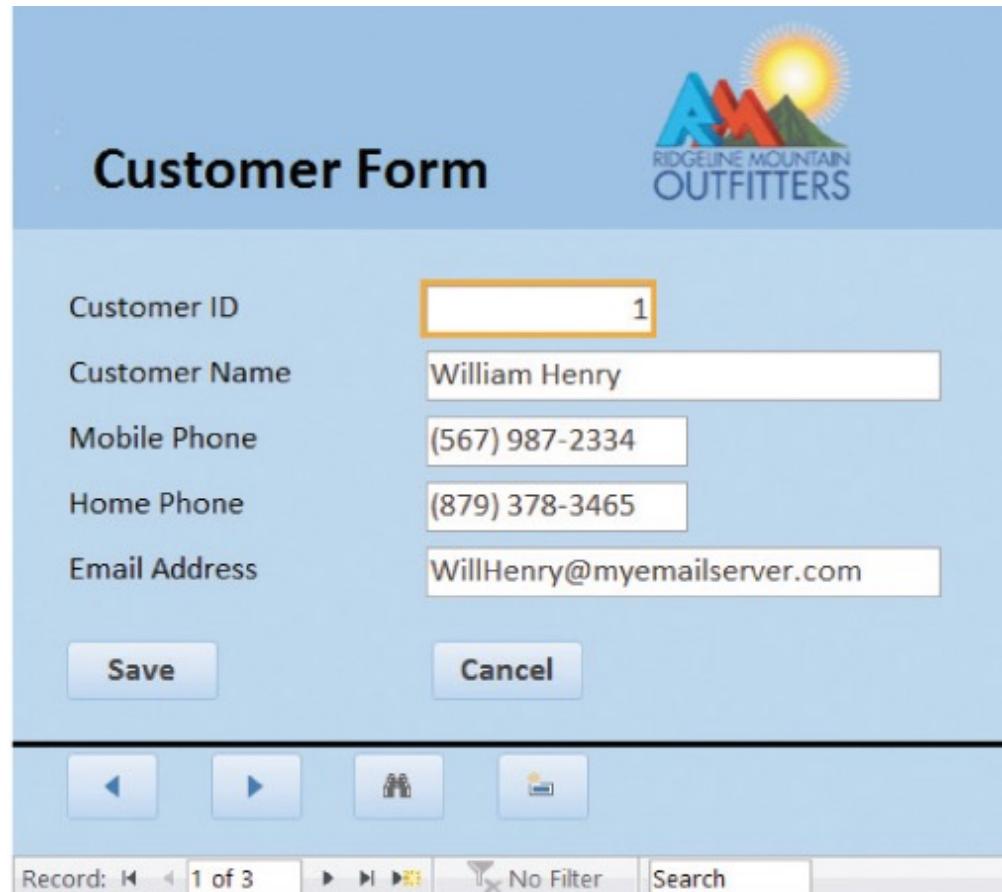
# Analysis Models and Input Forms

- Sequence diagram defines input messages, which indicates what forms



## Sample Customer Form

- First draft of RMO Customer Form from Sequence Diagram information



The screenshot shows a customer form for Ridgeline Mountain Outfitters. The logo features a stylized mountain range with a sun rising over it. The form has fields for Customer ID (containing '1'), Customer Name ('William Henry'), Mobile Phone ('(567) 987-2334'), Home Phone ('(879) 378-3465'), and Email Address ('WillHenry@myemailserver.com'). Below the form are 'Save' and 'Cancel' buttons. At the bottom, there are navigation icons for back, forward, search, and filter, along with a record counter ('1 of 3') and a search bar.

Customer ID	1
Customer Name	William Henry
Mobile Phone	(567) 987-2334
Home Phone	(879) 378-3465
Email Address	WillHenry@myemailserver.com

Save      Cancel

Record: 1 of 3    No Filter    Search

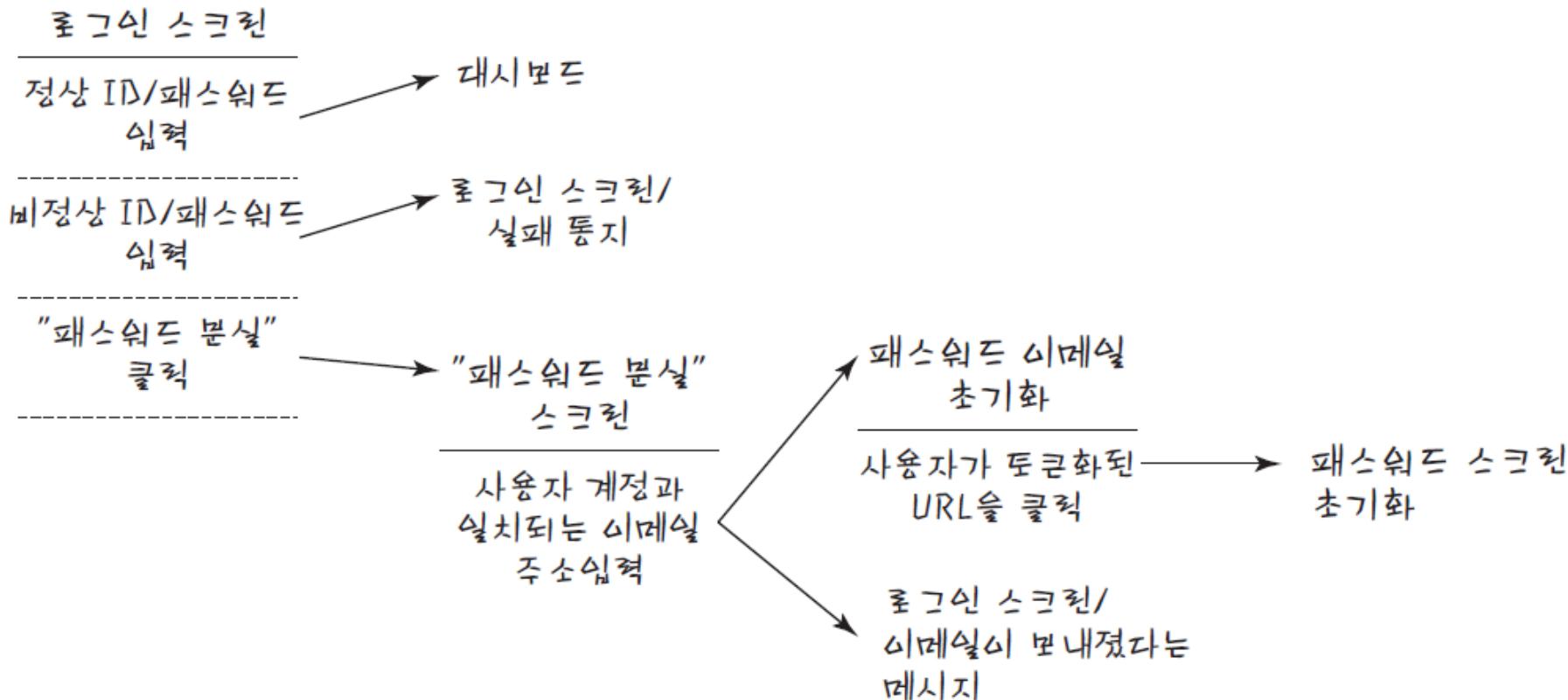


그림 8.13 UI 흐름 분석

# User Interface Design

# User-Interface Design

- Is the system a custom application or browser based?
- What kinds of devices will the user-interface need to support?
- What operating systems will the user-interface run on?

# User-Interface Design (2 of 3)

- Desktop and Laptop UIs
  - Layout and Formatting
    - Design screens with purpose: Each screen should have a primary purpose or use.
    - Consider location and grouping.
      - Place important items where they are easily found. Make logical groupings of related items and place them closer together.
    - Ensure professionalism

## Example of Poorly Designed Form

Payment Options

Pay by Credit Card

Pay by Debit Card

I want to pay by check

Paypal

Send me a bill

CardType

Debit Card

Addresss

City

State

Zip

Number

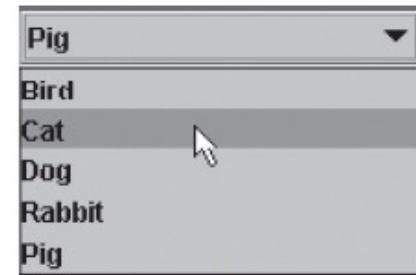
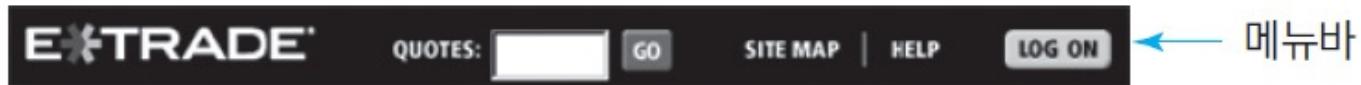
ExpDate

Number

- inconsistent labels, inconsistent text box types, poor spacing, misspelled words, ...

# User-Interface Design

- Data Entry
  - Text box
  - Use controls that minimize keystrokes.
    - list box, combo box, radio buttons, check boxes
    - date control
    - auto correction
  - Set focus and tabbing.
  - Set font and text box sizes appropriately.
  - Include online editing to minimize errors.

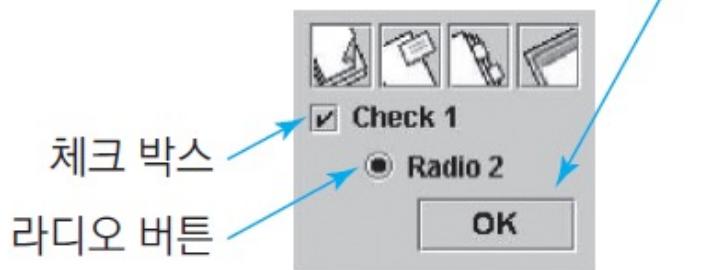


다이얼로그 박스

명령 버튼

리스트 박스

드롭다운 리스트 박스



텍스트 박스

그림 8.18 여러 가지 UI 컨트롤

# UI Elements

- 윈도우 – 응용 프로그램 내용이 표시되는 영역
- 탭 – 응용 프로그램이 여러 인스턴스를 실행할 수 있는 경우 별도의 창으로
- 메뉴 – 표준 명령의 배열
- 아이콘 – 응용 프로그램을 나타내는 작은 그림
- 커서 – 포인터
- 명령 버튼 - 사용자의 명령을 지시 받으려 할 때 사용
- 다이얼로그 박스 - 시스템이 수행할 작업에 대한 정보를 사용자에게 입력하게 할 때

# UI Elements

- 텍스트 박스 - 메시지를 보여주거나 사용자가 데이터를 입력할 곳
- 토글 버튼 - 버튼을 클릭하면 상태를 'on', 'off'로 변환
- 리스트 박스 - 사용자가 선택할 수 있는 후보 리스트를 디스플레이
- 드롭다운 리스트 박스 - 현재의 선택을 보여주고 사용자가 화살표를 클릭하면 가능한 선택 후보들을 펼쳐서 보여줌
- 라디오 버튼 - 여러 가지 제시된 것 중 하나만을 선택할 때 사용
- 체크 박스 - 그룹 중에 하나 이상의 후보를 선택할 때

# Example: RMO Windows Form

RMO Customer Support System - Product Detail

**Product Information**

**Product ID** 10967335

**Size** 6

**Color** Red

**Product Picture**

**Product Description**

Toddlers medium-weight parka. Fleece lined. Hood with velcro closure. Elastic sleeve openings with glove/mitten hooks. One interior and two exterior pockets with velcro closures. Machine wash and dry. Nylon/polyester shell. Cotton lining.

**Next/Previous Picture**

**Regular Price** \$49.95

**Sale Price** \$44.95

**Inventory**

**ID** COT77448

**In Stock** 41

**On Order** 0

**Due Date** 00/00/0000

**Search Criteria**

**Key Words**

parka  
velcro

**Catalog**

**Any**

**Price**

**Min**

**Max**

**Gender**

**Toddler**

**Product Type**

**Clothing - Outerwear**

**Matches**

**Next/Previous**

**Search**

**3**

**Add to Order**

**Exit**

# 화면 설계

- 쉽게 배울 수 있고 사용할 수 있는 자료 입력 화면 가이드라인
  - 항목의 입력이 끝났음을 알리기 위한 키를 반드시 정한다.
  - 콤보 박스를 사용하여 입력하게 하면 입력 오류를 줄일 수 있다.
- 입력 양식
  - 처리할 자료를 요청하고 모으는데 사용하는 양식

이름	고해원		
주민번호	610720-*****		
닉네임	<input type="text"/>	<input checked="" type="checkbox"/> 닉네임 적용	<input type="button" value="닉네임 중복확인 &gt;"/>
아이디	<input type="text"/>	<input type="button" value="아이디 중복확인 &gt;"/>	4~12로 해야하며 한글/특수문자 입력불가입니다.
비밀번호	<input type="text"/>	영문 및 영문 숫자 조합 6~16자리로 입력하실 수 있습니다.	
비밀번호확인	<input type="text"/>	패스워드 확인을 위해 다시한번 입력해주세요.	
핸드폰번호	010	<input type="button" value=""/>	- <input type="button" value=""/> <input checked="" type="checkbox"/> SMS 수신동의
주소	<input type="text"/>	- <input type="text"/>	<input type="button" value="우편번호찾기"/>
이메일	<input type="text"/>	@ <input type="text"/>	<input type="button" value="선택하세요"/>
<input checked="" type="checkbox"/> 기획전, 세일, 이벤트, 쿠폰관련 메일 수신동의			

# Navigation and Support Controls

- Navigation and Visibility
  - Minimize, maximize, close, scroll bars, resize
  - A good site design considers primary and secondary paths through the various screens.
    - including both forward and backward movement
  - Desktop systems should have adequate screen space to allow for clear positioning of menus, hot links, and buttons that are easily located.

# Sample Web page

- More navigation controls would help
  - the only way to return to the original list of search results is with the Back button on the browser.
  - A better design would be to include a Continue Shopping link back to the search page

Screenshot of an Amazon.com shopping cart confirmation page.

Shop by Department Search Books Go Hello, Robert Your Account Try Prime Cart Wish List

1 item added to Cart

The Real George Washington (American Classic Series)  
by Jay A. Parry  
\$18.36  
Only 7 left in stock (more on the way).  
 This is a gift Learn more

Order subtotal: \$18.36  
1 item in your Cart

Add \$16.64 of eligible items to your order to qualify for FREE Shipping (Some restrictions apply)

Robert, open the Amazon.com Store Card and Get \$10 Off Instantly  
Your current subtotal: \$ 18.36  
Gift Card savings: - \$ 10.00  
Your cost after savings: \$ 8.36

Apply now

Frequently Bought With *The Real George Washington (American Classic Series)*

The Real Benjamin Franklin (American Classic Series)	The Real Thomas Jefferson (American Classic Series)	The 5000 Year Leap (Original Authorized Edition)	The Everything Kids' Money Book: Earn It, Spend It, Save It!

# Considerations for Web-based Applications

- Technical aspects
  - be aware of **file sizes** and **page load times**
  - include **sufficient error-handling** capability to reestablish the dialogue if the connection breaks.
  - Web site need to be **compatible** with all of the potential browsers.
- Layout and formatting
  - various **browser default settings**
  - different **screen sizes**
  - Impact of online advertising
- Navigation and visibility – complete yet simple
  - Navigation links be checked periodically.

# Example: RMO Checkout Page Example

- Simple, easy to read
- Tasks are clear with easily discernable organization and clear instructions.
- Plenty of white space to allow for additional instructions or navigation elements if needed.

The screenshot shows a checkout page from the website www.rmo.biz. At the top, there's a header with the URL 'http://www.rmo.biz/' and a search bar. Below the header, the page title is 'Welcome to RMO.biz' with links for 'Log in or Register' and 'Checkout'. A 'FREE SHIPPING' offer is displayed for orders over \$100. The main content area is organized into several sections:

- Product Summary:** A table showing two items: 'Ladies parka' and 'Toddler parka'. Each item has dropdown menus for 'Size' and 'Color'.
- Billing Summary:** Information for the customer Nancy Wells, including address, delivery address, payment type (Visa), and delivery method (UPS - Ground).
- Order Summary:** A summary of the order details, including Subtotal (\$117.90), Shipping (\$0.00), Sales Tax (\$7.66), Credits (\$0.00), and Order Total (\$125.56).
- Buttons:** A 'Click Accept to confirm and process your order' button and an 'Accept' button.

The bottom of the page includes standard browser controls like back, forward, and search, along with a status bar indicating 'Protected Mode: Off' and '100% zoom'.

# Smartphones and Small Mobile Devices

- Challenges
  - Small screen size, small keyboards and touch screens, limited network capacity, app design guidelines and toolkits
- important tradeoff between the work area of the screen, and the navigation elements.

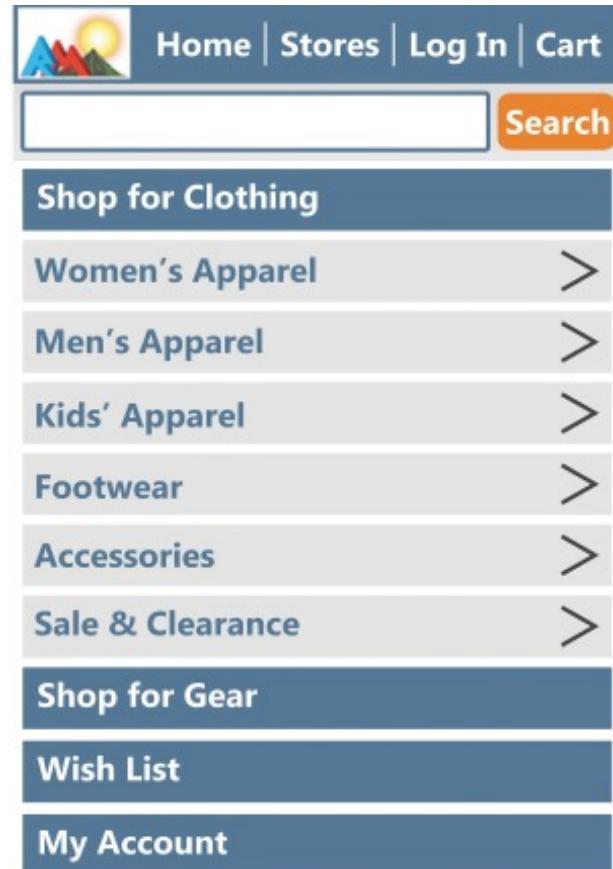


# Smartphones and Small Mobile Devices

- Layout and formatting
  - Rotating view, resizing, visible navigation, scrolling
- Data entry and user actions
  - Fat finger and accidental touches
- Navigation and visibility
  - landing screen (first loading screen): how the app/site is organized
  - Use action bar at the bottom (or top) of every screen with common navigation or action controls
  - Visual clues
  - Back button

# Smartphones and Small Mobile Devices

- Example: Sample prototype for RMO home page display



# UI for Tablets

- Similar to smartphones, except more real estate to display
- Layout and formatting for tablets:
  - applications must support both portrait and landscape display.
- Possible to have multiple action areas on a tablet.
- The small screen size and the lack of physical keyboards and mouse interaction do require that developers still design screen layout carefully.



# Designing Reports, Statements and Documents

# Designing Reports, Statements and Documents

- Report Types
  - Detailed reports -- reports that contain specific information on business transactions
  - Summary reports -- reports that summarize detail or recap periodic activity
  - Exception reports -- reports that provide details or summary information about transactions or operating results that fall outside a predefined normal range of values
  - Executive reports -- reports used by high level managers to assess overall organizational health and performance

# Designing Report, Statement, ..

- 출력물은 다양한 종류가 있고 다양한 기술이 사용
- 출력물의 대부분은 인쇄된 리포트
  - 리포트는 매력적이고 전문적이어야 하며 무엇보다 읽기 쉬워야 함
  - 모든 리포트는 머리말과 꼬리말이 있어야 한다
  - 항목은 논리적인 순서로 display 하고 grouping 되어야 한다

열 제목			초과 근무 보고서 마감 날짜: 2009. 6. 22			보고서 머리말
점포명	직원 성명	직위	정규근무시간	초과근무시간	총근무시간	페이지 머리말
목동점	김현영	부팀장	40.0	1.5	41.5	
		중간 합	40.0	1.5	41.5	
양재점	최지현	부팀장	40.0	5.5	45.5	그룹 머리말
양재점	홍길동	직원	32.7	0.0	32.7	
		중간 합	72.7	5.5	77.7	
일산점	박찬종	직원	40.0	12.0	52.0	
일산점	변창일	팀장	40.0	10.0	50.0	
		중간 합	80.0	22.0	102.0	보고서 꼬리말
		총합	192.7	28.0	220.7	페이지 꼬리말

# Example: RMO Reports

- Shopping cart order report

 Ridgeline Mountain Outfitters—Shopping Cart Order

**Customer Name:** Fred Westing  
**Customer Number:** 6747222

**Shipping Address:**  
936 N Swivel Street  
Hillville, Ohio 59222

**Billing Address:**  
936 N Swivel Street  
Hillville, Ohio 59222

Qty	Product ID	Description	Size	Color	Price	Extended Price	
1	458238WL	Jordan Men's Jumpman Team J	12	White/ Light Blue	\$119.99	\$119.99	
1	347827OP	Woolrich Men's Backpacker Shirt	XL	Oatmeal Plaid	\$41.99	\$41.99	
2	8759425SH	Nike D.R.I. – Fit Shirt	M	Black	\$30.00	\$60.00	
1	5858642OR	Puma Hiking Shorts	L	Tan	\$15.00	\$15.00	
						Subtotal	\$236.98
						Shipping	\$8.50
						Tax	\$11.25
						Total	\$256.73

**Shipping Information:**

Shipping Method: Normal 7-10 day  
Shipping Company: UPS  
Tracking Number: To be sent via email  
Email Address: FredW253@aol.com

**Payment Information:**

American Express  MasterCard  VISA  Discover   
Account Number  -  -  -  MO YR  /   
Expiration Date  /

Thank you for your order. It is a pleasure to serve you.  
Check back next week for new weekly specials!!



### Ridgeline Mountain Outfitters – Products and Items

# Example: RMO Reports

- Inventory report

ID	Season	Category	Supplier	Unit Price	Special Price	Discontinued
RMO12587	Spr/Fall	Mens C	8201	\$39.00	\$34.95	No
<b>Description</b> Outdoor Nylon Jacket with Lining						
Size	Color	Style	Units in Stock	Reorder Level	Units on Order	
Small	Blue		691	150		
	Green		723	150		
	Red		569	150		
	Yellow		827	150		
Medium	Blue		722	150		
	Green		756	150		
	Red		698	150		
	Yellow		590	150		
Large	Blue		1289	150		
	Green		1455	150		
	Red		1329	150		
	Yellow		1370	150		
Xlarge	Blue		1498	150		
	Green		1248	150		
	Red		1266	150		
	Yellow		1322	150		

ID	Season	Category	Supplier	Unit Price	Special Price	Discontinued
RMO28497	All	Footwear	7993	\$49.95	\$44.89	No
<b>Description</b> Hiking Walkers with Patterned Tread Durable Uppers						
Size	Color	Style	Units in Stock	Reorder Level	Units on Order	
7	Brown		389	100		
	Tan		422	100		
8	Brown		597	100		
	Tan		521	100		
9	Brown		633	100		
	Tan		654	100		
10	Brown		836	100		
	Tan		954	100		
11	Brown		862	100		
	Tan		792	100		
12	Brown		754	100		
	Tan		788	100		
13	Brown		830	100		
	Tan		921	100		

# Designing Reports, Statements and Documents

- Electronic Reports
  - Drill down – to view additional detail related to an item
  - Linking reports to other reports
  - View data grouped various categories
- Graphical and Multimedia Reports
  - Charting and graphing of data

# Electronic Reports

- Drill down

Monthly Sales Summary						
Year	2015	Month	January			
Category	Season Code	Web Sales	Telephone Sales	Mail Sales	Total Sales	
Footwear	All	\$ 289,323	\$ 1,347,878	\$ 540,883	\$ 2,178,084	
Men's Clothing	Spring	\$ 1,768,454	\$ 2,879,243	\$ 437,874	\$ 4,691,484	
	Summer	213,938	387,121	123,590	724,649	
	Fall	142,823	129,873	112,234	384,930	
	Winter	2,980,489	6,453,896	675,290	10,109,675	
	All	1,839,729	4,897,235	349,234	7,086,198	
Totals			17,747,368	\$ 1,698,222	\$ 23,391,023	
Women's Clothing	Spring					
	Summer					
	Fall					
	Winter					
	All					965,610
Totals						

Monthly Sales Detail								
Year	2015	Month	January	Category	Men's Clothing	Season	Winter	
Product ID	Product Description	Web Sales	Telephone Sales	Mail Sales	Total Sales			
RMO12987	Winter Parka	\$ 1,490,245	\$ 3,226,948	\$ 337,640	\$ 5,054,833			
RMO13788	Fur-Lined Gloves	149,022	322,695	33,765	505,482			
RMO23788	Wool Sweater	596,097	1,290,775	135,058	2,021,930			
RMO12980	Long Underwear	298,050	645,339	68,556	1,003,005			
RMO32998	Fleece-Lined Jacket	447,075	1,258,079	100,271	1,805,425			
Total		\$ 2,980,489	\$ 6,743,836	\$ 675,290	\$ 10,394,615			

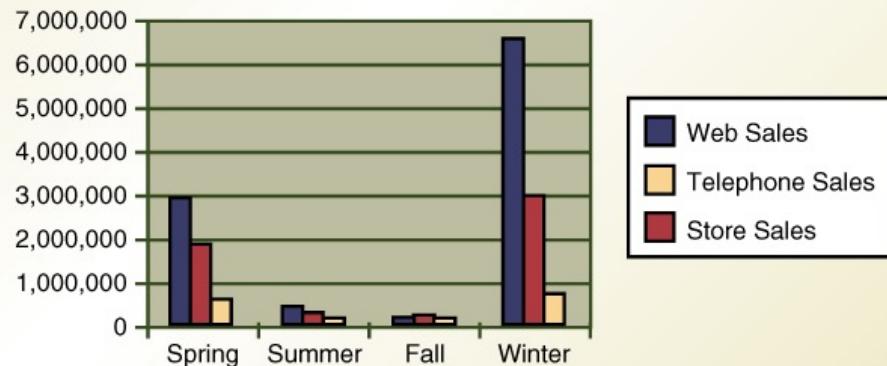
# Electronic Reports

- Charts and graphs

**Men's Clothing Sales—January 2015**



**Men's Clothing Sales by Season—January 2015**



# Classroom Activity

# Classroom activates

- For each member, work independently on
  - Grouping Use cases
  - Menu
  - Storyboard
- Discuss with your team
- Elaborate your design

Subsystem	Use case	Users/actors
Sales	Search for item	Customer, customer service representative, store sales representative
Sales	View product comments and ratings	Customer, customer service representative, store sales representative
Sales	View accessory combinations	Customer, customer service representative, store sales representative
Sales	Fill shopping cart	Customer
Sales	Empty shopping cart	Customer
Sales	Check out shopping cart	Customer
Sales	Fill reserve cart	Customer
Sales	Empty reserve cart	Customer
Sales	Convert reserve cart	Customer
Sales	Create phone sale	Customer service representative
Sales	Create store sale	Store sales representative
Order fulfillment	Ship items	Shipping
Order fulfillment	Manage shippers	Shipping
Order fulfillment	Create backorder	Shipping
Order fulfillment	Create item return	Shipping, customer
Order fulfillment	Look up order status	Shipping, customer, management
Order fulfillment	Track shipment	Shipping, customer, marketing
Order fulfillment	Rate and comment on product	Customer
Order fulfillment	Provide suggestion	Customer

Menu description	Menu choices (use cases)	Intended user(s)
Shopping cart functions (primary or reserve)	Search for item View product comments and ratings View accessory combinations Switch carts (primary to reserve or vice versa) Fill shopping cart Empty shopping cart Check out shopping cart	Customer
Sale creation	Search for item View product comments and ratings View accessory combinations Create sale	Customer service and store sales representatives
Order shipment	Ship items Manage shippers Create backorder Create item return Look up order status Track shipment	Customer service and store sales representatives
Customer order control	Look up order status Track shipment Create item return Rate and comment on product Provide suggestion	Customer

# UI Mock-up tools

- Paper & pencil
- Powerpoint, Visio, drawing tools
- UI Mock-up software
  - balsamiq
  - Figma
  - ...

## For the next class

- Java IDE

# References

- [1] Systems Analysis and Design in a Changing World, 7th edition, John Satzinger, Robert Jackson, Stephen D. Burd , Course Technology,
- [2] 소프트웨어 공학의 모든 것, 최은만, 생능출판

<https://www.nngroup.com/articles/direct-manipulation/>