

SEVENTH EDITION

Systems Analysis AND Design

IN A CHANGING WORLD

Chapter 8

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Designing the User Interface

Chapter 8

Systems Analysis and Design in a Changing World 7th Ed Satzinger,
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Chapter 8: 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 (1 of 2)

- ➊ Explain the concepts of user experience, user interface, and usability
- ➋ Describe the metaphors that can be used to assist in user-interface design
- ➌ Describe important characteristics of human interface objects that affect usability
- ➍ Discuss the important principles of navigation through a software application

Learning Objectives (2 of 2)

- ➊ Explain how a storyboard can be used to help with user-interface design
- ➋ Describe important guidelines in user-interface design for desktop applications
- ➌ Describe important guidelines in user-interface design for mobile devices
- ➍ Design printed and on-screen reports appropriate to users' needs

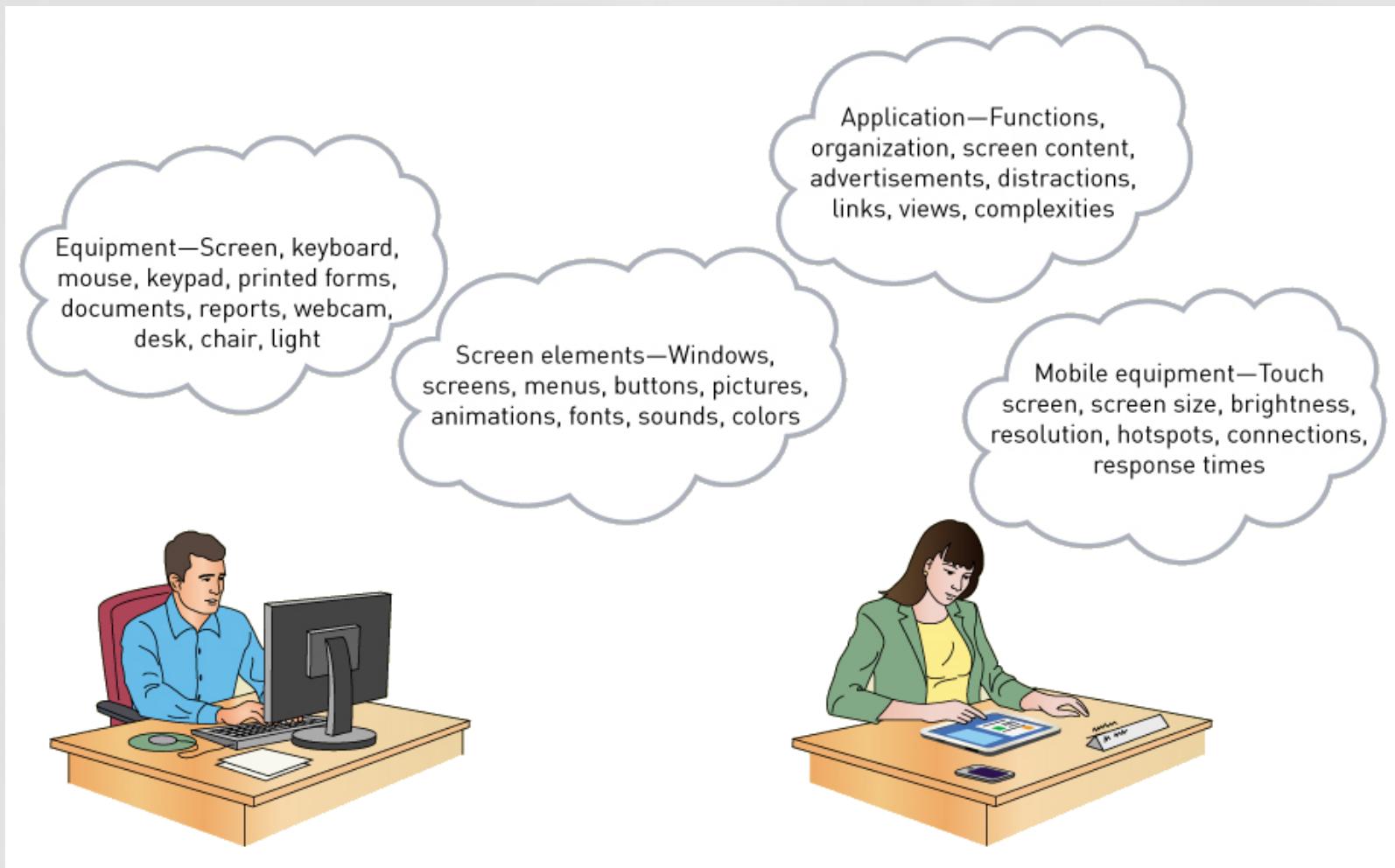
Overview

- 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
- Story boards are a powerful tool for UI design

User Experience

- User Interface – inputs and outputs that directly involve a human user/actor
 - A dialog goes on between actor and system
- User interface design must focus on entire User Experience (Human Computer Interaction –HCI)
- Called User-Centered Design
 - Focus early on users and their work
 - Evaluate designs to ensure usability
 - Use iterative development
- Usability is the objective

Components of the User Interface



Metaphors of Human Computer Interaction

● 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)

● 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

● Document metaphor

- metaphor in which data is visually represented as paper pages or forms

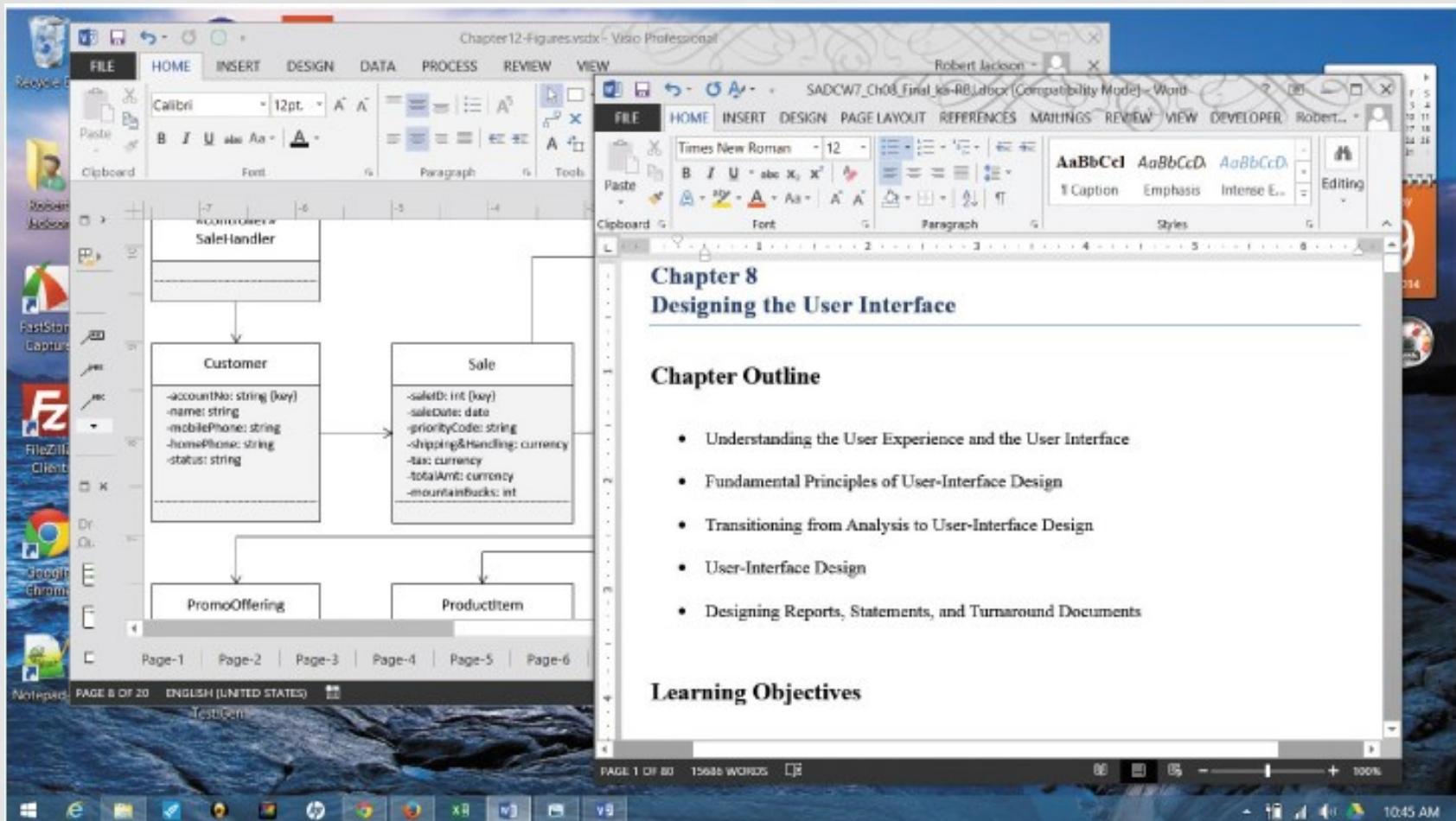
● Dialog metaphor

- 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

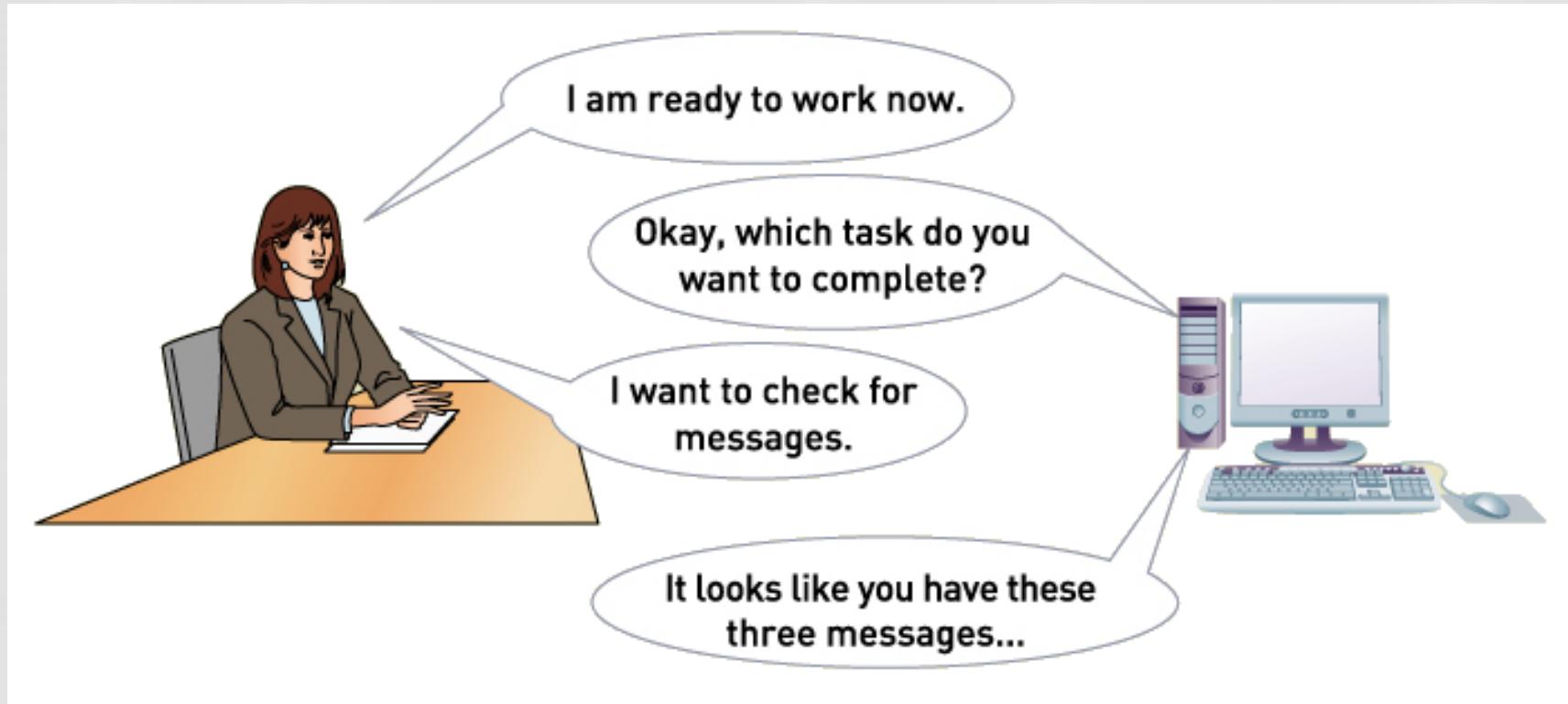
Metaphor Details

Metaphor	Description	Example
Direct manipulation	Manipulating objects on a display that look like physical objects (pictures) or that represent them (icons)	The user drags a folder icon to an image of a recycle bin or trash can to delete a collection of files.
Desktop	Organizing visual display into distinct regions, with a large empty workspace in the middle and a collection of tool icons around the perimeter	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).
Document	Visually representing the data in files as paper pages or forms: these pages can be linked together by references (hyperlinks)	The user fills in a form field for a product he or she owns, 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	The user and computer accomplishing a task by engaging in a conversation or dialog by using text, voice, or tools. such as labeled buttons	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.

Direct Manipulation, Desktop, and Document Metaphors On One Screen



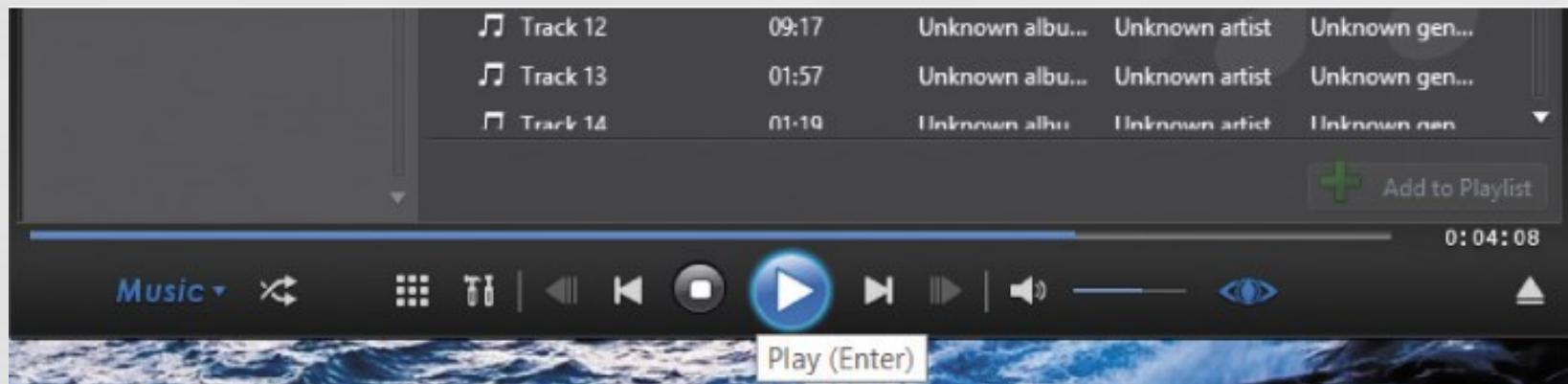
Dialog Metaphor



Principles of User-Interface Design (1 of 3)

● Human-Interface Objects

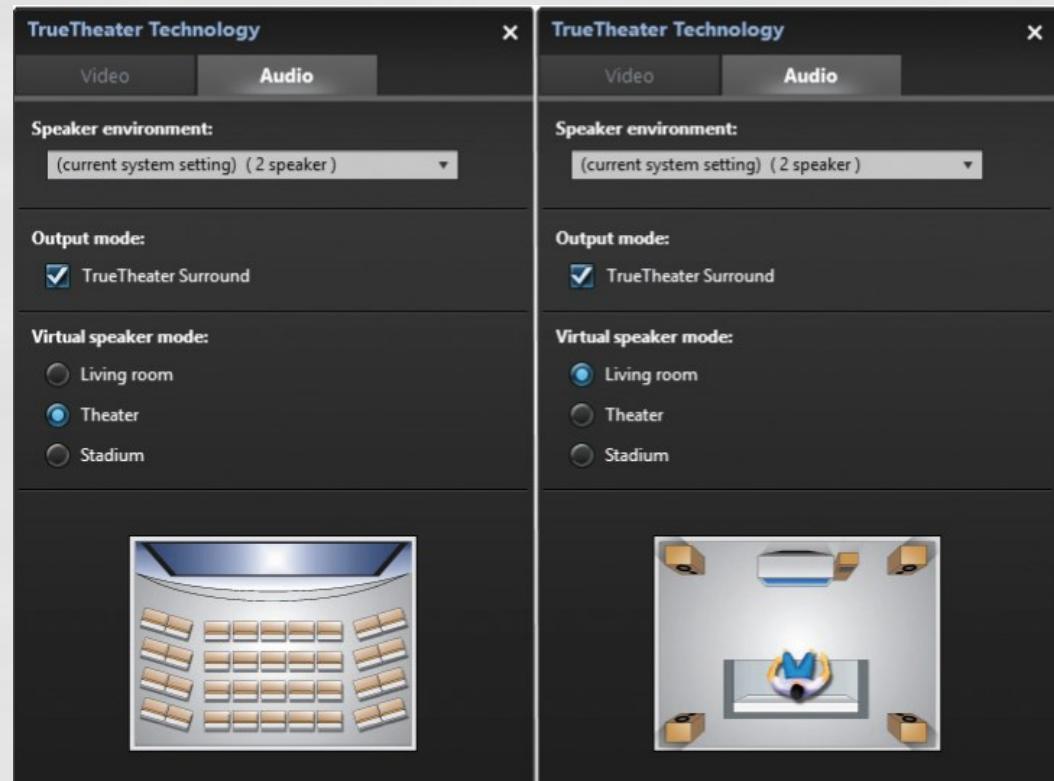
- Affordance – the appearance of the object suggests its function



Principles of User-Interface Design (2 of 3)

Human-Interface Objects

- Visible with Feedback
- Both visible on the display and provides a response to a user action (feedback)
- Good examples – radio buttons and check boxes



Principles of User-Interface Design (3 of 3)

● Consistency

- Across platforms
- Within a suite of applications
- Within a particular application

● Continuity

- Consistency across releases over time

Windows Continuity

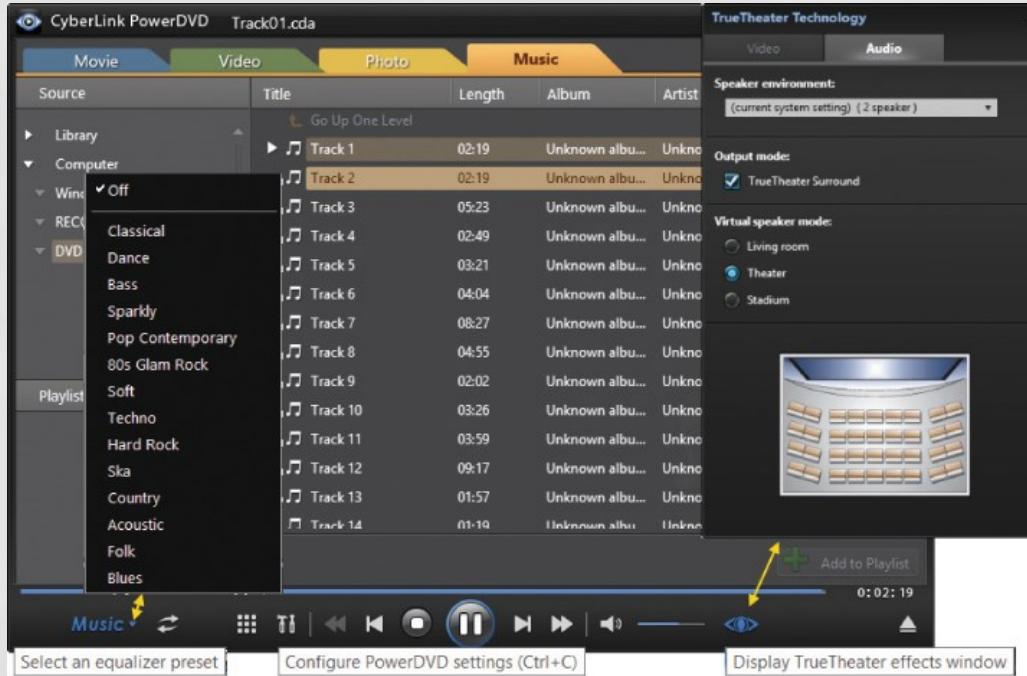
- Windows 7
- Windows 8



Principles of User-Interface Design (1 of 5)

➊ Discoverability

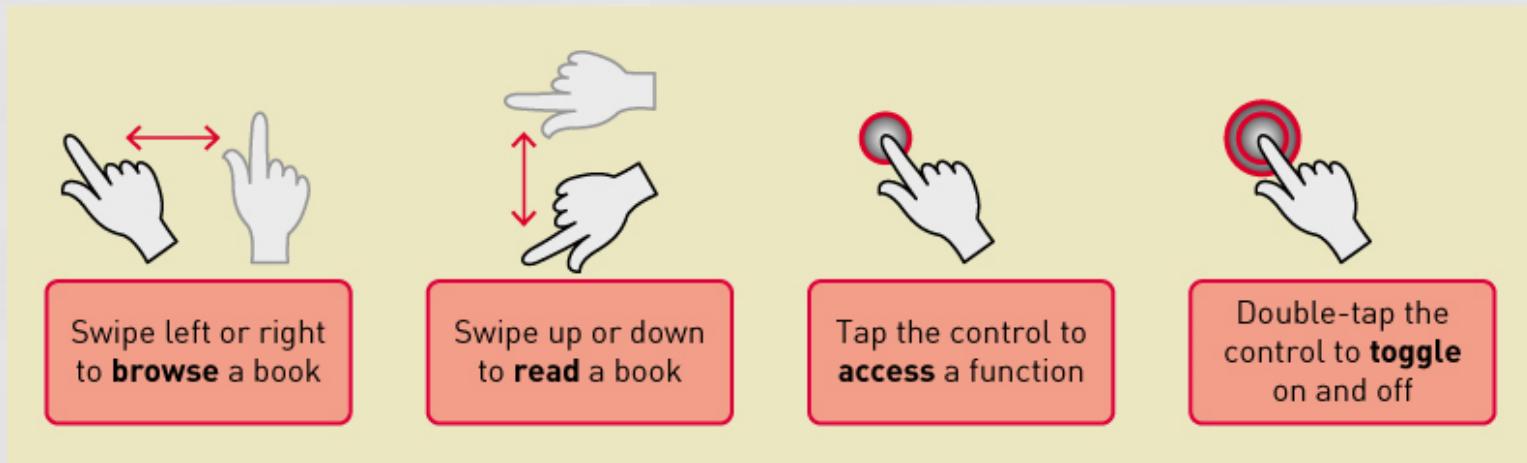
- ➊ To help users discover “hidden” features or objects
- ➋ Active discovery – mouse hovers, pop-ups, tool tips



Principles of User-Interface Design (2 of 5)

● Discoverability

● Visual Diagrams to guide users



Principles of User-Interface Design (3 of 5)

● Closure

- Closure on Dialogues – End of a series of actions
- Protect user's work – at end and for partially complete work
- Provide undo to reverse actions

Principles of User-Interface Design (4 of 5)

❸ Readability and Navigation

- ❶ Readable text for all users (type, size, color)



Principles of User-Interface Design (5 of 5)

● Readability and Navigation

- Clear navigation
- Reverse navigation – a way out – breadcrumbs navigation

● Usability and Efficiency

- Shortcut keys for experienced users
- Meaningful error messages
- Simplicity – KISS

RMO Homepage – clean and simple

The screenshot shows the homepage of RMObiz (Rocky Mountain Outfitters) as it would appear in Windows Internet Explorer. The page has a clean, modern design with a white background and a blue header bar.

Header:

- Address bar: www.rmo.biz - Windows Internet Explorer | http://www.rmo.biz/
- Favorites: www.rmo.biz - /
- Google search bar: Google
- Page navigation: Back, Forward, Stop, Refresh, Home, Page, Safety, Tools, Help

Main Content Area:

- Welcome to RMObiz
- (Log in or Register)
- 0 items **Checkout**
- FREE SHIPPING** on orders of \$100 or more
- Search** **All Departments**
- Shop for Clothing** (highlighted in blue)
- Shop for Gear**
- Wish List**
- Store Locator**
- My Account**
- My Orders**
- Women's Apparel**
- Men's Apparel**
- Kids' Apparel**
- Footwear**
- Accessories**
- Sale & Clearance**

Category Lists:

- Women's Jackets**
 - Casual Jackets
 - Down Jackets
 - Fleece Jackets
 - Insulated Jackets
 - Rain Jackets
 - Running Jackets
 - Soft Shell Jackets
 - All Women's Jackets
- Women's Clothing**
 - Footwear
 - Pants
 - Shirts
 - Shorts
 - Skirts and Dresses
 - Sweaters
 - Swimming
 - Underwear
 - Vests
 - Petite Clothing
 - Plus Sizes
 - All Women's Clothing
- Women's Accessories**
 - Belts
 - Gaiters
 - Gloves and Mittens
 - Hats
 - Headwear
 - Scarves
 - Socks
 - Sports Bras
 - Sunglasses
 - Watches
 - All Accessories

Image: A large, scenic photograph of a dirt road winding through a forest under a clear blue sky. A wooden signpost is visible on the left, with the text "Bear road ends" and "55 mi 48 ft".

Page Footer:

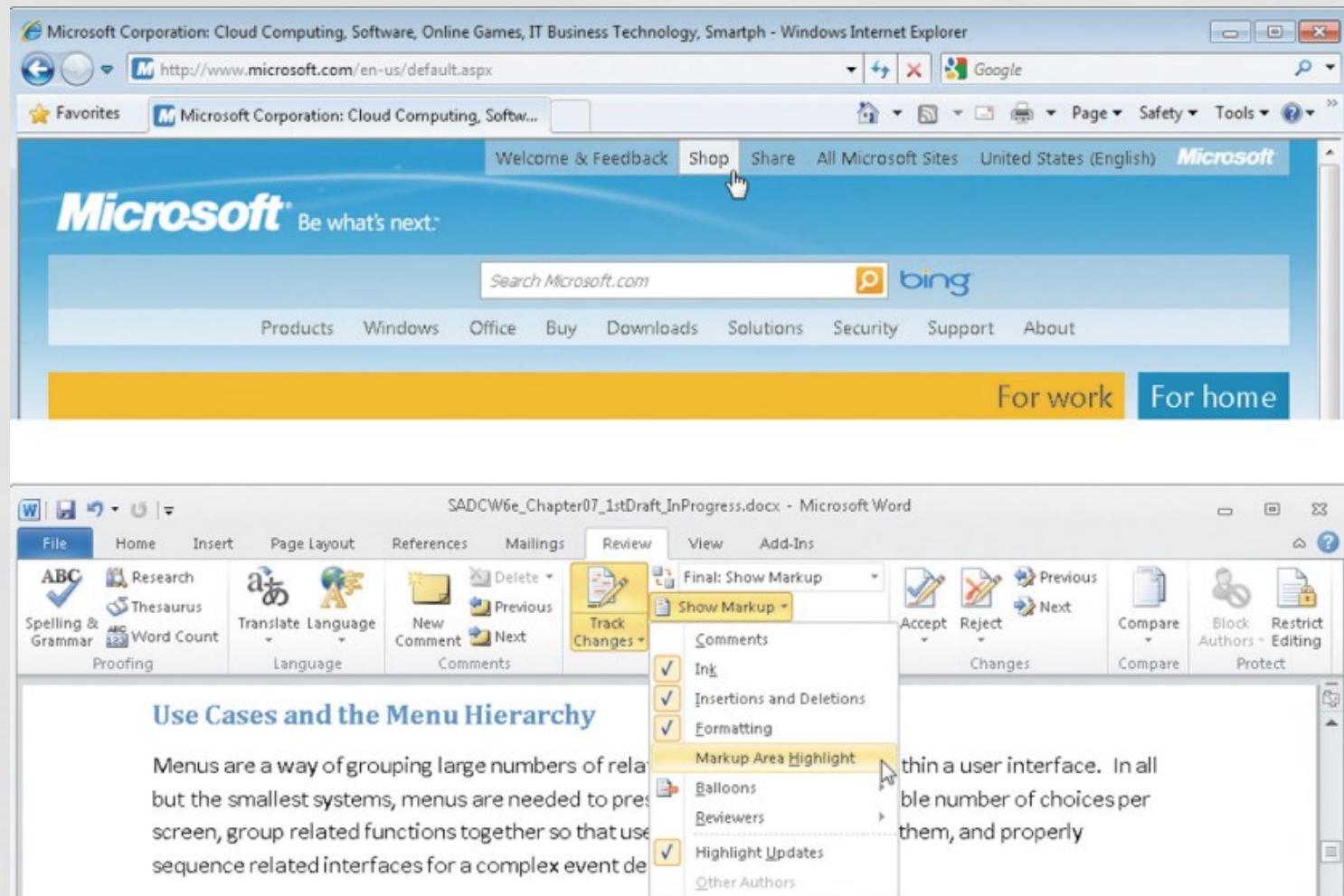
- Done
- Internet | Protected Mode: Off
- 100%

Transitioning from Analysis to UI Design

● Use Cases and the Menu Hierarchy

- We design use case by use case
- 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

Two Different Menu Styles



Some RMO Use Cases (1 of 2)

Grouped by Actor and Subsystem

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

Some RMO Use Cases (2 of 2)

Subsystem	Use case	Users/actors
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

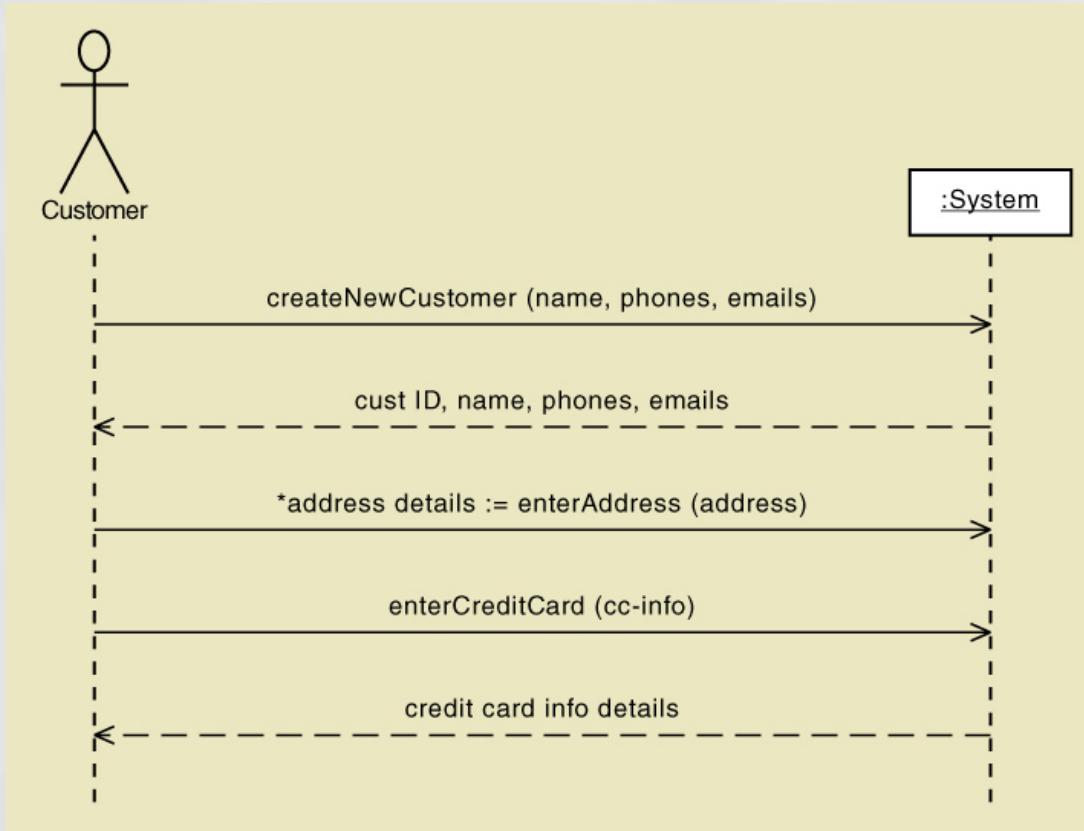
RMO Use Cases

Grouped into First Cut Menu Hierarchy

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

Analysis Models and Input Forms

- SSD defines input messages, which indicates what forms



Sample Customer Form

- ➊ First draft of RMO Customer Form from SSD information

Customer Form

RIDGELINE MOUNTAIN OUTFITTERS

Customer ID	<input type="text" value="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

Dialogs and Storyboards

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

From Dialog to Storyboard (part 1)

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?

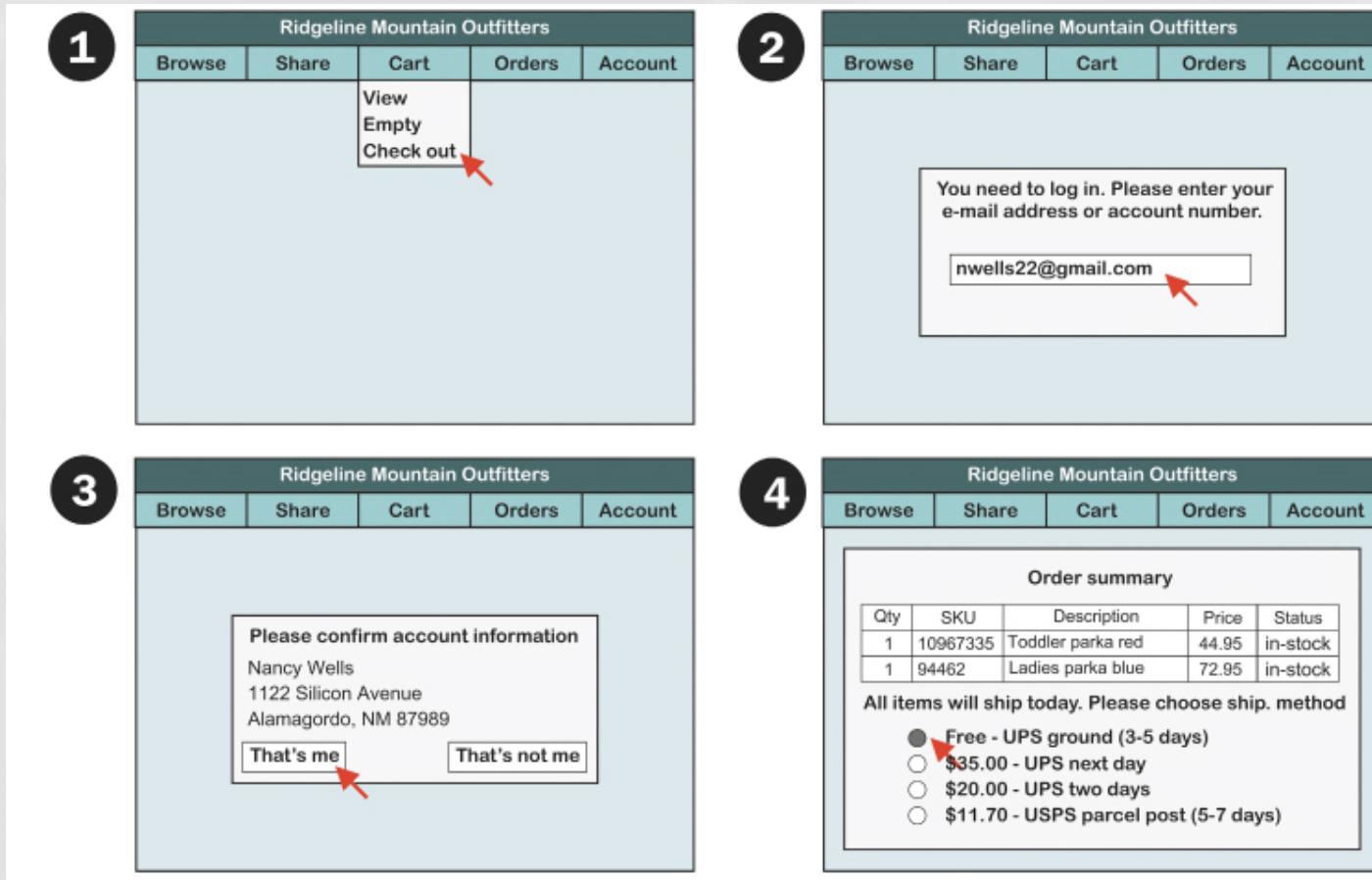
USER: My e-mail address is nwells22@gmail.com.

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?

From Dialog to Storyboard (part 1)



From Dialog to Storyboard (part 2) (1 of 2)

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.

From Dialog to Storyboard (part 2) (2 of 2)

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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

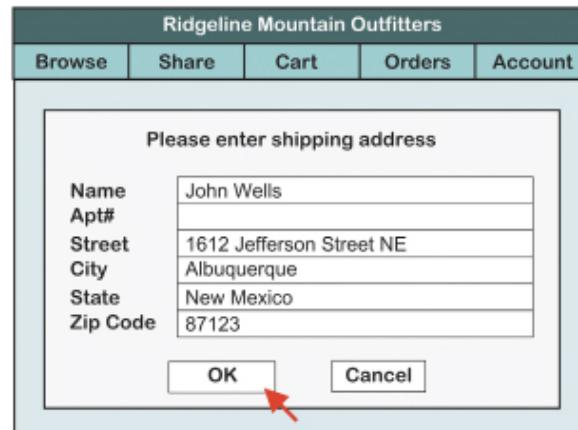
Ridgeline Mountain Outfitters

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



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Ridgeline Mountain Outfitters

Browse Share Cart Orders Account

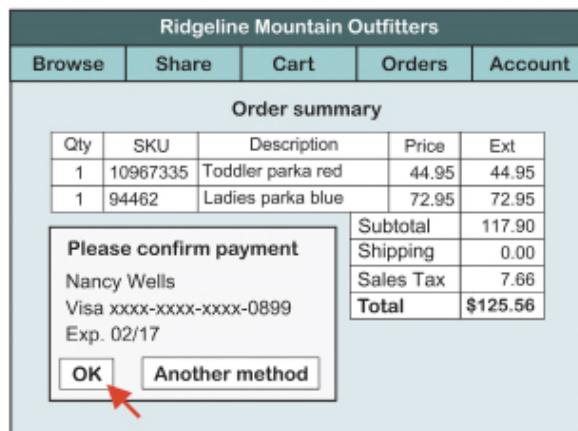
Order summary

Qty	SKU	Description	Price	Ext
1	10967335	Toddler parka red	44.95	44.95
1	94462	Ladies parka blue	72.95	72.95

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

Subtotal 117.90
Shipping 0.00
Sales Tax 7.66
Total \$125.56

OK Another method



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Ridgeline Mountain Outfitters

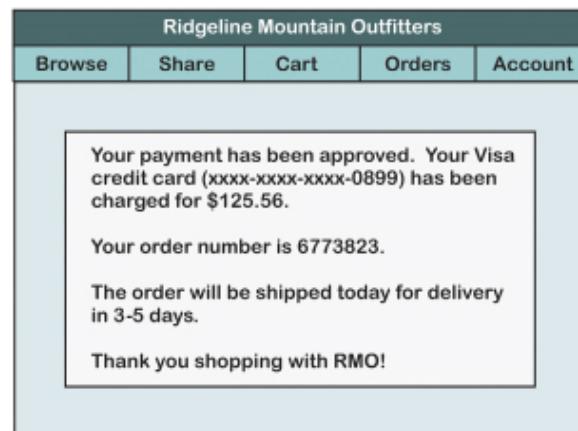
Browse Share Cart Orders Account

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!



User-Interface Design (1 of 3)

- 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

- Purposeful designs, location and grouping, no sloppiness or errors

● Poorly designed form –

The screenshot shows a user interface for a payment form. On the left, there's a group of radio buttons under the heading "Payment Options". The first option, "Pay by Credit Card", is selected. Other options include "Pay by Debit Card", "I want to pay by check", "Paypal", and "Send me a bill". To the right of these options is a "CardType" dropdown menu. The menu is currently open, showing "Visa", "Mastercard" (which is highlighted with a black background), "Visa", "American Express", and "Discover". To the right of the dropdown are input fields for "Number" and "ExpDate". Below the dropdown, there's a section for "Addresss" which includes a small map icon, "City", "State", and "Zip" fields.

User-Interface Design (3 of 3)

- ➊ Data Entry
 - ➊ Text box, list box, combo box, radio buttons, check boxes
 - ➋ Include online editing to minimize errors
- ➋ Navigation and Visibility
 - ➊ Minimize, maximize, close, scroll bars, resize

RMO Windows Form

RMO Customer Support System - Product Detail

RIDGELINE MOUNTAIN OUTFITTERS

Product Information

Product ID: 10967335
Size: 6
Color: Red

Product Picture



Next/Previous 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.

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
Gender: Toddler
Price: Min, Max
Product Type: Clothing - Outerwear

Matches: 3

Search Add to Order Exit

Sample Web page

- More navigation controls would help

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 Edit your Cart Proceed to checkout

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

\$10 Instant Gift Card

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,...



Considerations for Web-based Applications

- ➊ Layout and formatting
 - ➌ Various browser default settings
 - ➌ Impact of online advertising
- ➋ Data entry and user actions – client side programming
- ➌ Navigation and visibility – complete yet simple

Extreme advertising

- Only advertising on this page



RMO Checkout Page

- ➊ RMO shopping cart checkout
- ➋ Simple, easy to read

The screenshot shows a Windows Internet Explorer window displaying the RMO.biz checkout page. The URL in the address bar is <http://www.rmo.biz/>. The page title is "Welcome to RMO.biz". On the right side, there is a "Checkout" button and a "FREE SHIPPING" offer for orders over \$100. The main content area is divided into several sections:

- Product Summary:** A table showing two items:

Description	Size	Color	Price	Quantity	Total
Ladies parka	Medium (10-12)	Blue	\$72.95	1	\$72.95
Toddler parka	Medium	Red	\$44.95	1	\$44.95
- Billing Summary:** Customer information:

Customer	Nancy Wells	Change
Billing address	1122 Silicon Avenue 87989	Change
Delivery address	1612 Jefferson Street NE 87123	Change
Payment type	Visa, xxxx-xxxx-xxxx-0089	Change
Delivery method	UPS - Ground (3-5 days)	Change
- Order Summary:** A table showing the breakdown of the total order:

Subtotal	\$117.90
Shipping	\$0.00
Sales Tax	\$7.66
Credits	\$0.00
Order Total	\$125.56
- A message at the bottom says "Click Accept to confirm and process your order" followed by an "Accept" button.

Smartphones and Small Mobile Devices (1 of 3)

● Challenges

- Small screen size, small keyboards and touch screens, limited network capacity, app design guidelines and toolkits

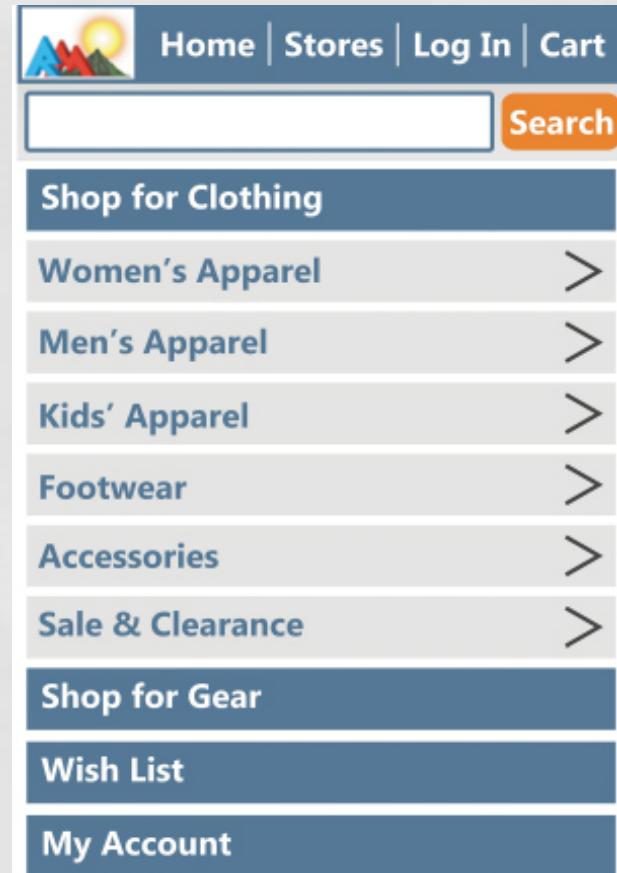


Smartphones and Small Mobile Devices (2 of 3)

- ➊ Layout and formatting
 - ➌ Rotating view, resizing, visible navigation, scrolling
- ➋ Data entry and user actions
 - ➌ Fat finger and accidental touches
- ➌ Navigation and visibility
 - ➌ Show site map
 - ➌ Use action bar
 - ➌ Visual clues
 - ➌ Back button

Smartphones and Small Mobile Devices (3 of 3)

- Sample prototype for RMO home page display



UI for Tablets

- Similar to smartphones, except more real estate to display



Designing Reports, Statements, and Turnaround Documents (1 of 2)

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

RMO Reports (1 of 5)

② Shopping cart order report

Ridgeline Mountain Outfitters—Shopping Cart Order							
Customer Information:				Order Details:			
Customer Name: Fred Westing Customer Number: 6747222				Order Number: 4673064 Today's Date: May 18, 2015			
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 <input type="checkbox"/> MasterCard <input type="checkbox"/> VISA <input checked="" type="checkbox"/> Discover <input type="checkbox"/> Account Number X X X X - X X X X - X X X X - 5 7 8 4 MO YR Expiration Date 05 / 17			
Thank you for your order. It is a pleasure to serve you. Check back next week for new weekly specials!!							

RMO Reports (2 of 5)

Inventory report

Ridgeline Mountain Outfitters – Products and Items						
ID	Season	Category	Supplier	Unit Price	Special Price	Discontinued
RMO12587	Spring/Fall	Mens C	8201	\$39.00	\$34.95	No
<i>Description</i> 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
<i>Description</i> 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		

RMO Reports (3 of 5)

Employee benefit report

Survivor Protection

In the event of your death while working for a participating employer, your designated beneficiaries could receive:

Lump Sum Benefits

\$50,000 Basic Life Insurance

\$230,000 Supplemental Life Insurance

\$148,677 Thrift Plan

\$31,686 Tax Sheltered Annuity (TSA) Plan

\$255 Social Security for your eligible dependents

\$460,618 Total*

RMO Reports (4 of 5)

You have not elected Universal Life Insurance. If you would like more information on this plan, please call 1-800-555-7772.

*Refer to page 7 for additional information on the amount of coverage needed to provide ongoing replacement income.

Accidental Death Benefits

If your death is due to an accident, your designated beneficiaries will receive the above benefits plus:

\$100,000 24-Hour Accidental Death and Dismemberment Insurance

\$100,000 Occupational Accidental Death and Dismemberment Insurance, if the accident is work related

RMO Reports (5 of 5)

Monthly Death Benefits

If you die before receiving the Master Retirement Plan benefits and you are vested and have a surviving spouse, your spouse may be eligible for a Qualified Pre-Retirement Survivor Annuity.

In addition, your family may be eligible for the following estimated monthly benefits from Social Security, not to exceed a maximum of \$2,591 based on:

\$1,110 each child under age 18

\$1,110 a spouse with children under age 16; or

\$1,058 for a spouse age 60 or older

Designing Reports, Statements, and Turnaround Documents (2 of 2)

● 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 (1 of 2)

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			\$ 747,368	\$ 1,698,222	\$ 23,391,023	965,610
Women's Clothing	Spring					
	Summer					
	Fall					
	Winter					
	All					
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			

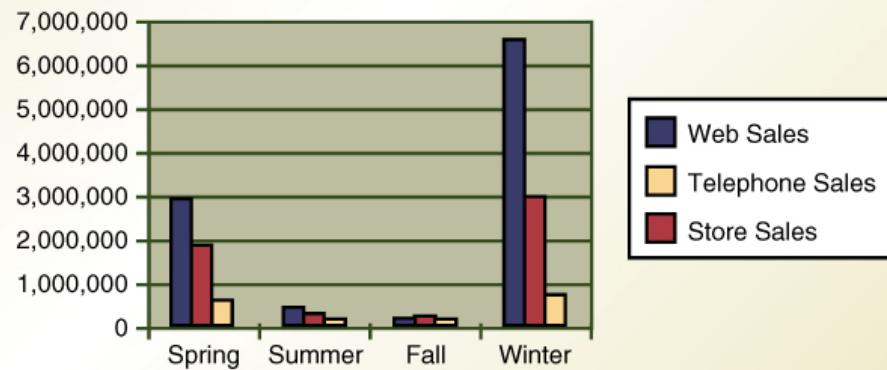
Electronic Reports (2 of 2)

Charts and graphs

Men's Clothing Sales—January 2015



Men's Clothing Sales by Season—January 2015



Summary (1 of 3)

- User interfaces involve direct user interaction with the system.
- The design of the user interface has a long history as human computer interaction (HCI) and relies on user-centered design, which focuses early on users, evaluates designs to ensure usability, and uses iterative development
- Metaphors are used to think about the nature of the user interface, and they include direct manipulation, desktop, document, and dialog metaphors.

Summary (2 of 3)

- Key user interface concepts include affordance and visibility for controls
- Other key principles include consistency, shortcuts, feedback, dialog closure, error handling, and reversal of actions
- Use cases are organized into one or more menu hierarchies to arrange functionality for users
- Dialogs and storyboards are used to design the interaction for each use case based on use case flow of activates and system sequence diagrams
- Guidelines are available for designing for Windows, Web browsers, and Handheld devices

Summary (3 of 3)

- ➊ Designing inputs involves identifying devices and mechanisms, identifying inputs and the data content, and determining the controls necessary
- ➋ Designing outputs includes designing detailed reports, summary report, exception reports, and executive reports
- ➌ Electronic reports and other outputs can include drill down, graphics, and multimedia