

## Designing the User and System Interfaces

### Chapter 8

Systems Analysis and Design in a  
Changing World 6<sup>th</sup> Ed

Satzinger, Jackson & Burd

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## Chapter 8 Outline

- User and System Interfaces
- Understanding the User Interface
- User-Interface Design Concepts
- The Transition from Analysis to User-Interface Design
- User-Interface Design
- Identifying System Interfaces
- Designing System Inputs
- Designing System Outputs

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

## Learning Objectives

- Describe the difference between user interfaces and system interfaces
- Describe the historical development of the field of human-computer interaction (HCI)
- Discuss how visibility and affordance affect usability
- Describe user-interface guidelines that apply to all types of user-interface types and additional guidelines specific to Web pages and mobile applications

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

## Learning Objectives (continued)

- Create storyboards to show the sequence of forms used in a dialog
- Discuss examples of system interfaces found in information systems
- Define system inputs and outputs based on the requirements of the application program
- Design printed and on-screen reports appropriate for recipients

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

## Overview

- Information systems interact with people and other systems
- Poorly designed user interface can make the information system unusable
- Poorly designed system interfaces are a source of errors and inefficiency
- User and system interfaces involve both inputs and outputs and involve a large number of stakeholders

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

## User Interfaces and System Interfaces

- User Interface – inputs and outputs that directly involve a human user/actor
  - A dialog goes on between actor and system
- System Interface – the inputs and outputs that require minimal human intervention
  - Inputs captured automatically
  - Outputs direct to other systems
  - Printed and distributed outputs (statements, reports)

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## Three Components of the User Interface



Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## 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

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

## 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 hyper-linked 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.

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

## Dialog Metaphor



Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## 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

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## Some RMO Use Cases

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
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

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## RMO Use Cases

Grouped into First Cut Menu Hierarchy

Menu Description	Menu Choices (Use Cases)	Intended User(s)
Shopping cart functions (primary or reserve)	<ul style="list-style-type: none"> <li>■ Search for item</li> <li>■ View product comments and ratings</li> <li>■ View accessory combinations</li> <li>■ Switch carts (primary to reserve or vice versa)</li> <li>■ Fill shopping cart</li> <li>■ Empty shopping cart</li> <li>■ Check out shopping cart</li> </ul>	Customer
Sale creation	<ul style="list-style-type: none"> <li>■ Search for item</li> <li>■ View product comments and ratings</li> <li>■ View accessory combinations</li> <li>■ Create sale</li> </ul>	Customer service and store sales representatives
Order shipment	<ul style="list-style-type: none"> <li>■ Ship items</li> <li>■ Manage shippers</li> <li>■ Create backorder</li> <li>■ Create item return</li> <li>■ Look up order status</li> <li>■ Track shipment</li> </ul>	Customer service and store sales representatives
Customer order control	<ul style="list-style-type: none"> <li>■ Look up order status</li> <li>■ Track shipment</li> <li>■ Create item return</li> <li>■ Rate and comment on product</li> <li>■ Provide suggestion</li> </ul>	Customer

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## Dialog Design

- 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 of the dialog, showing the sequence of sketches of the screen each step of the dialog. (storyboarding)
  - Review the storyboard with users

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

## From Dialog to Storyboard (part 1)

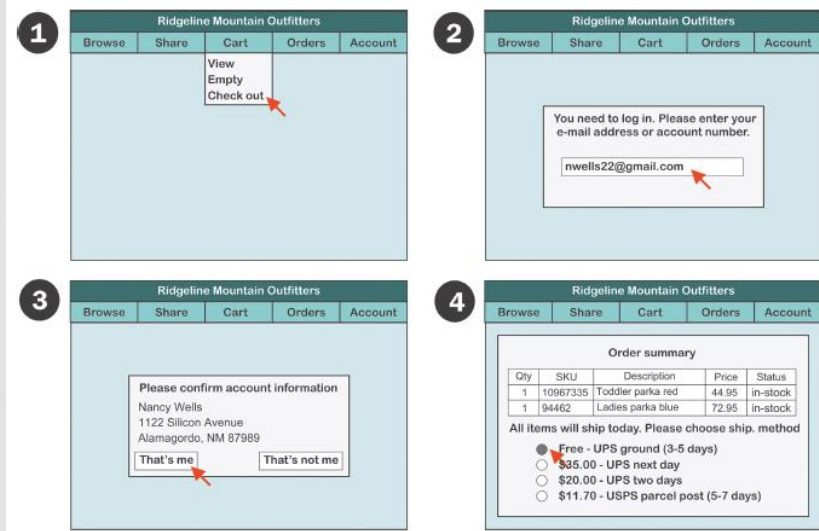
Use case *Check out shopping cart*

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 (3–5 days). Other shipping options include next day (\$35.00), two day (\$20.00), and USPS parcel post (\$11.70, 5–7 days). How would you like your items to be shipped?

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.



## From Dialog to Storyboard (part 1)



Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## From Dialog to Storyboard (part 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.

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## From Dialog to Storyboard (part 2)

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	10967335	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!

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## Guidelines for Windows and Forms

- Interface Layout and Formatting
  - Consistency, labels and headings, distribution and order, fonts and colors
- Data Entry
  - Text box, list box, combo box, radio buttons, check boxes
- Navigation and Support Controls
  - Minimize, maximize, close, scroll bars, resize

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

10

## RMO Windows Form

**RMO Customer Support System - Product Detail**


**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

Next/Previous

Add to Order

Exit

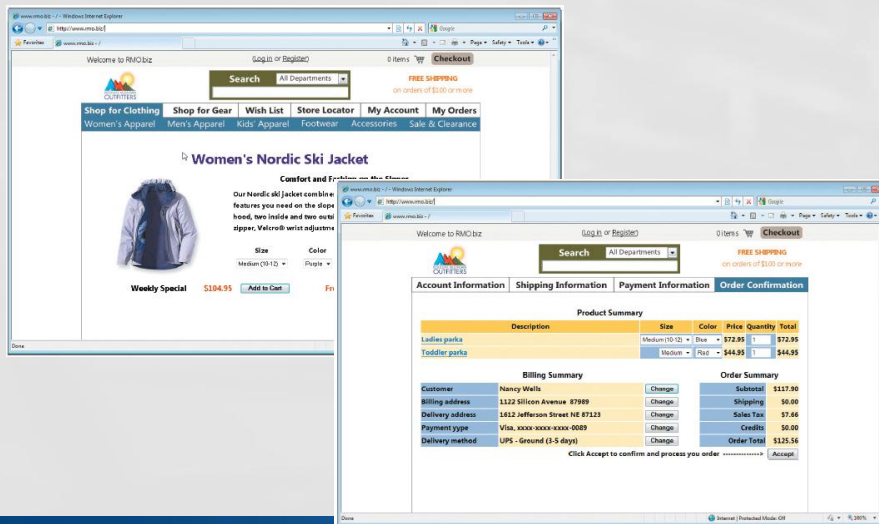
Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## Guidelines for Web Browser User Interfaces

- **Consistency**
  - Cascading Style Sheets (CSS) – Web page encoding standard that enables a Web site designer to specify parts of a page that will always look the same and parts that will vary by task or audience
- **Performance Considerations**
  - Sensitive to network connection, amount of information transmitted, type of information transmitted
- **Pictures, Video, and Sound**
  - Powerful, but compatibility issues arise
- **Users with Disabilities**
  - Assistive technologies -- software (such as text-to-speech and voice-recognition utilities) that adapts user interfaces to the special needs of persons with disabilities

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## RMO Example Using CSS for Consistency

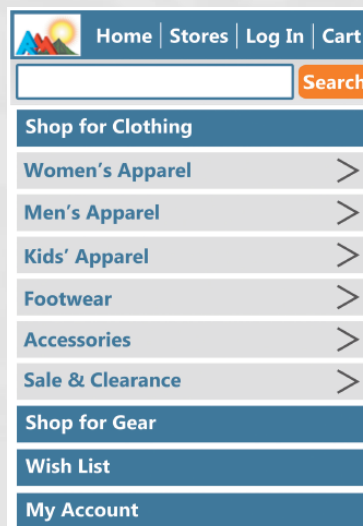


Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

## Guidelines for Handheld Devices

### Challenges

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



Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

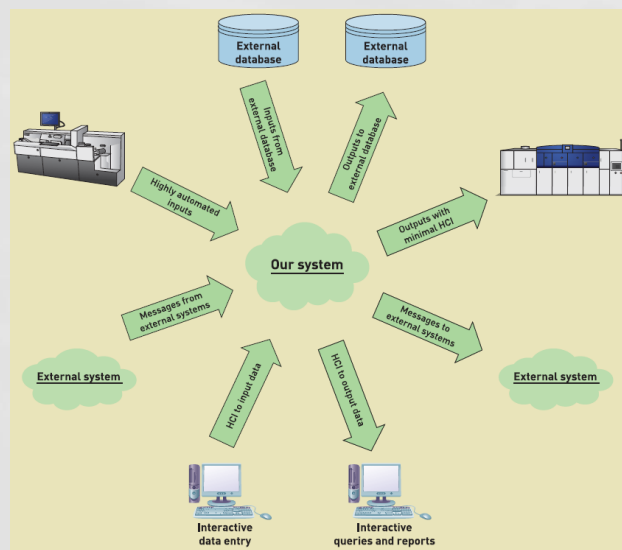
## Identifying System Interfaces

Inputs/outputs with minimal human intervention

- Inputs from and outputs to other systems
  - These are direct interfaces with other information systems, normally formatted as network messages.
- Highly automated inputs and outputs
  - These are captured by devices (such as scanners) or generated by persons who start a process that proceeds without further human intervention.
- Inputs and outputs to external databases
  - These can supply input to or accept output from a system.

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## Identifying System Interfaces



Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## XML for System Interfaces

- Extensible Markup Language (XML) -- extension of HTML that embeds self-defining data structures within textual messages
  - XML tags -- character sequences (such as <name> and </name>) that define the beginning, end, and meaning of the text that appears between them

```
<customer record>
  <accountNumber>RMO10989</accountNumber>
  <name>William Jones</name>
  <billingAddress>
    <street>120 Roundabout Road</street>
    <city>Los Angeles</city>
    <state>CA</state>
    <zip>98115</zip></billingAddress>
  <shippingAddress>
    <street>120 Roundabout Road</street>
    <city>Los Angeles</city>
    <state>CA</state>
    <zip>98115</zip></shippingAddress>
  <dayPhone>215.767.2334</dayPhone>
  <nightPhone>215.899.8763</nightPhone>
</customer record>
```

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

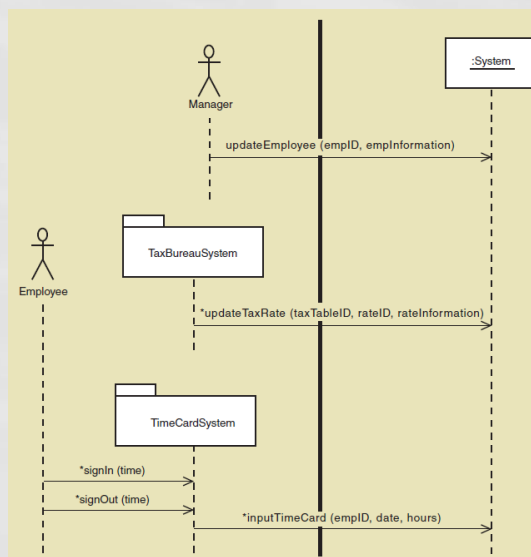
## System Inputs

- Primary Objective is Error Free Input
  - Use electronic devices wherever possible
  - Avoid human involvement as much as possible
  - If information is already available in electronic form, use it instead of re-entering information
  - Validate and correct information at time and location entered
- Device Examples
  - Magnetic card strip readers, bar code readers, optical character recognition, radio frequency ID tags (RFID), touch screen, electronic pens, digitizers, speech recognition

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## Defining System Inputs Details

- Sequence Diagram
- Details for messages



Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

## System Outputs

- 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

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

- Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## External Output Example

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.



## Internal Output Example

Detailed control break report

ID	Season	Category	Supplier	Unit Price	Special Price	Discontinued
RMO12587	Spri/Fall	Mens C	8201	\$39.00	\$34.95	No
<b>Description Outdoor Nylon Jacket with Lining</b>						
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	Footwee	7993	\$49.95	\$44.89	No
<b>Description Hiking Walkers with Patterned Tread Durable Uppers</b>						
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		

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## Drill Down Online Report

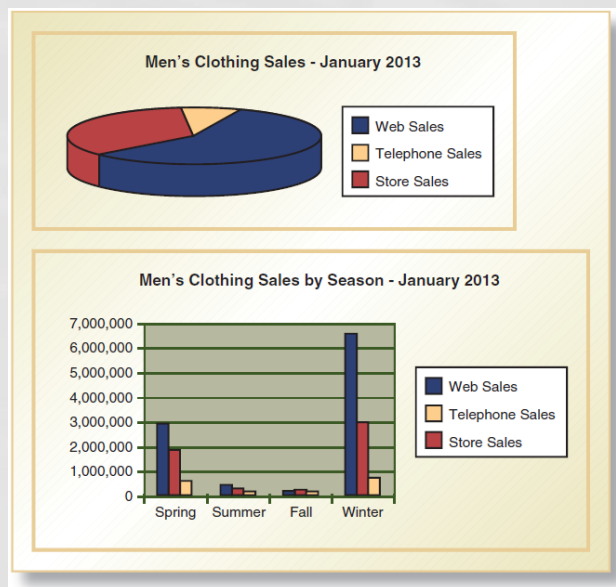
### Summary and Detailed

Monthly Sales Summary						
Year	2013	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	
Totals	All	\$ 4,494,729	\$ 4,897,235	\$ 349,234	\$ 7,086,198	
			\$ 1,747,968	\$ 1,698,222	\$ 23,391,023	
Women's Clothing	Spring				995,610	
	Summer					
	Fall					
	Winter					
	All					
Totals						

Monthly Sales Detail							
Year	2013	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		

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## Graphical Outputs



Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

## Summary

- There are two types of interfaces – user interfaces and system interfaces
- User interfaces involve direct user interaction with the system. System interfaces require minimal or no user interaction
- 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.

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016, Cengage Learning. All rights reserved.

## Summary (continued)

- Key user interface concepts include affordance and visibility for controls
- Other key principles include consistency, shortcuts, feedback, dialog closure, error handling, reversal of actions, and reducing short term memory loads
- 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

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.

## Summary (continued)

- System interfaces include inputs and outputs to other systems, highly automated inputs and outputs, and inputs and outputs to external databases.
- Designing system inputs involves identifying devices and mechanisms, identifying inputs and the data content, and determining the controls necessary
- Designing system outputs includes designing detailed reports, summary report, exception reports, and executive reports
- Outputs are also classified as internal, external, or turnaround
- Electronic reports and other outputs can include drill down, graphics, and multimedia

Systems Analysis and Design in a Changing World, 7th Edition - Chapter 8  
©2016. Cengage Learning. All rights reserved.