
Chapter 07

Designing the User and System Interfaces

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Objective

▶ Describe

- ▶ User interface
- ▶ System interfaces
- ▶ historical development of the field of human-computer interaction (HCI)
- ▶ how visibility and affordance affect usability
- ▶ user-interface guidelines
 - ▶ all types of user interface types
 - ▶ specific of Web pages
 - ▶ Specific of mobile application.



Objective (2)

- ▶ **Create**

- ▶ storyboards to show the sequence of forms used in a dialog.

- ▶ **Discuss**

- ▶ examples of system interface found in information systems.

- ▶ **Define**

- ▶ system input and outputs based on the requirements of the application program.

- ▶ **Design**

- ▶ printed
- ▶ on screen report



Open case: Interface design at AE

- ▶ Bob Crain, the plant manager, Aviation Electronic, Aircraft
- ▶ The support system consists product planning, purchasing, parts inventory, quality control, finished goods inventory, distribution
- ▶ Particular designing
 - ▶ Focus on user experience

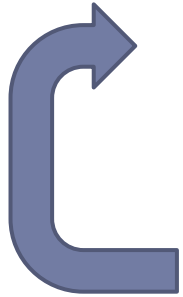
The very beginning
user

Professional user:
The cookie-cutter
transaction process



Open case: Interface design at AE (2)

Sara start create UI



1. Ask about events that the effect the process work
2. Focus on how the user would interact with the system.
3. Sketches of screens and asked user
4. Meeting and do design iteration process.
5. After the system completed and installed, most user already known how to use it.



Topics



7.1 User Interface

7.2 System Interface



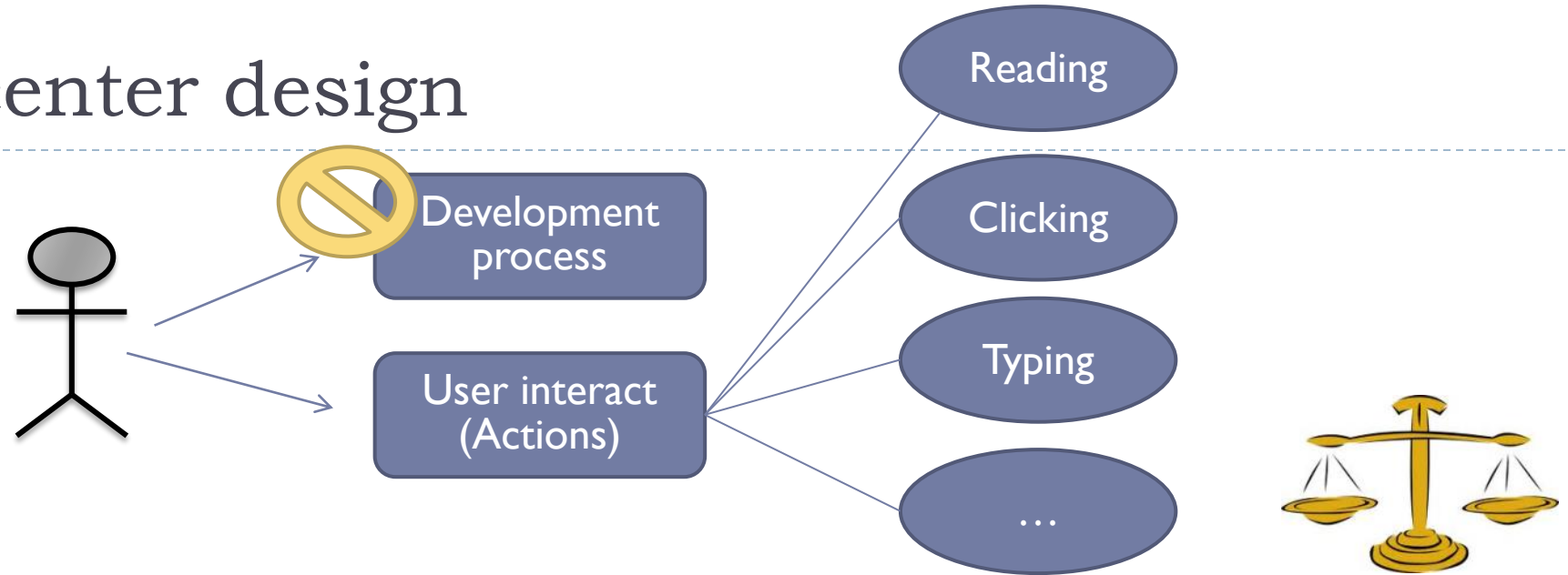
- Focus on inputs and outputs directly involve a human user / actor.
- A dialog goes on between actor and system.

7.1 User Interface

7.2 System Interface

- Focus on inputs and outputs required minimal human intervention.
 - Automatic input capturing
 - Automatic transfer output data to other systems
 - Automatic generate printed or pdf and distributed outputs to users (Statements reports).

7.1.1 User-center design



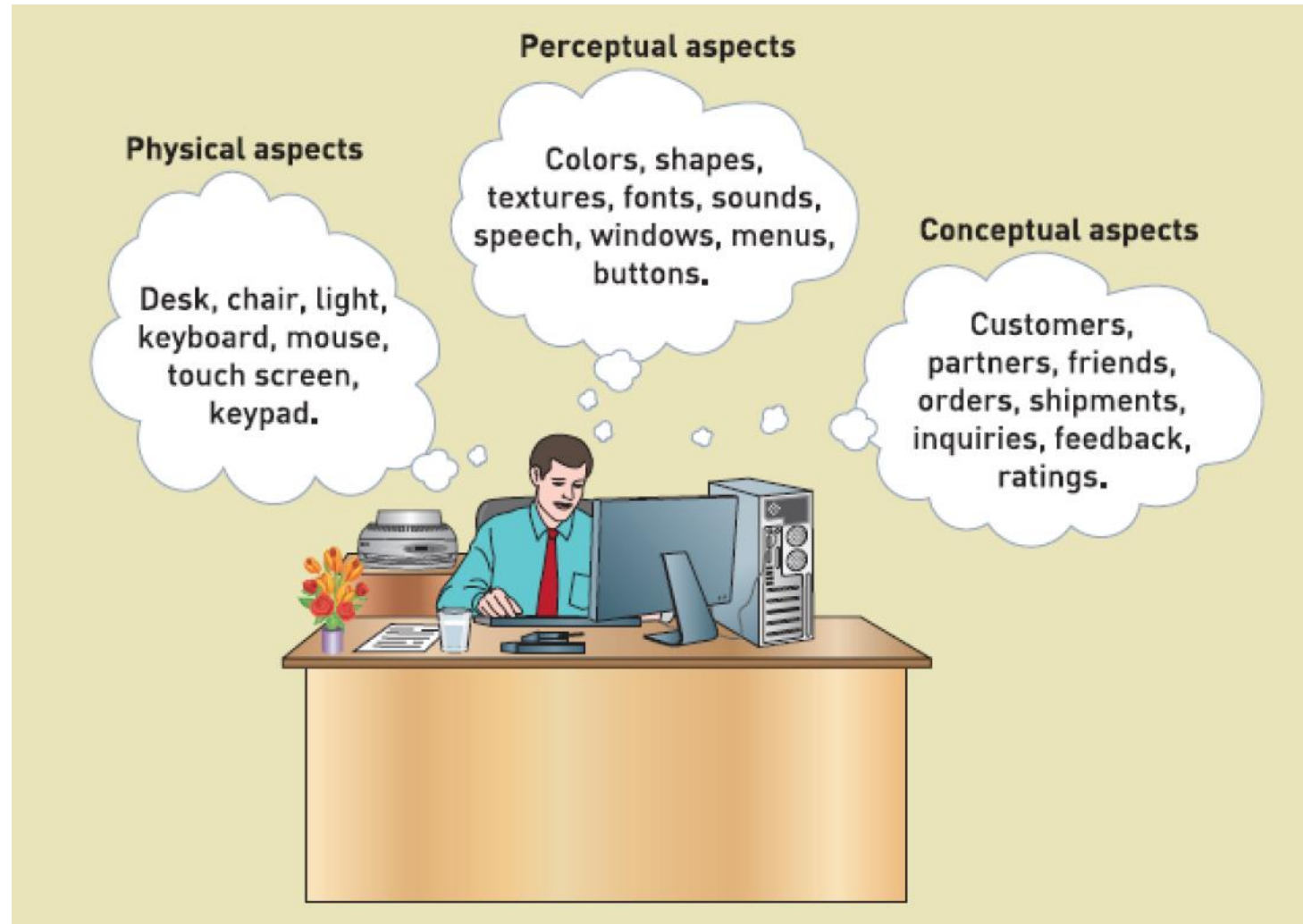
► Principles of user centered design

- Focus on their work of user
- Evaluate designs to ensure usability
 - Easy to learn (play without reading manual)
 - Easy to use (more functions)
- Use iterative development to get responses from user during development

User skills



7.1.1 User-center design (2)



7.1.2 Metaphors for human-computer interaction

- ▶ **Direct manipulate**
 - ▶ Metaphor in which object on a display are manipulated to look like physical objects (pictures) or graphic symbols that represent them (icons)
- ▶ **Desktop**
 - ▶ Metaphor in which the visual display is organized is to distinct regions, with a large empty workspace in the middle and a collection of tool icons around the perimeter
- ▶ **Document metaphors**
 - ▶ Metaphor in which data 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.
 - ▶ Computer “Listen to” User
 - ▶ Computer “Responses to” User

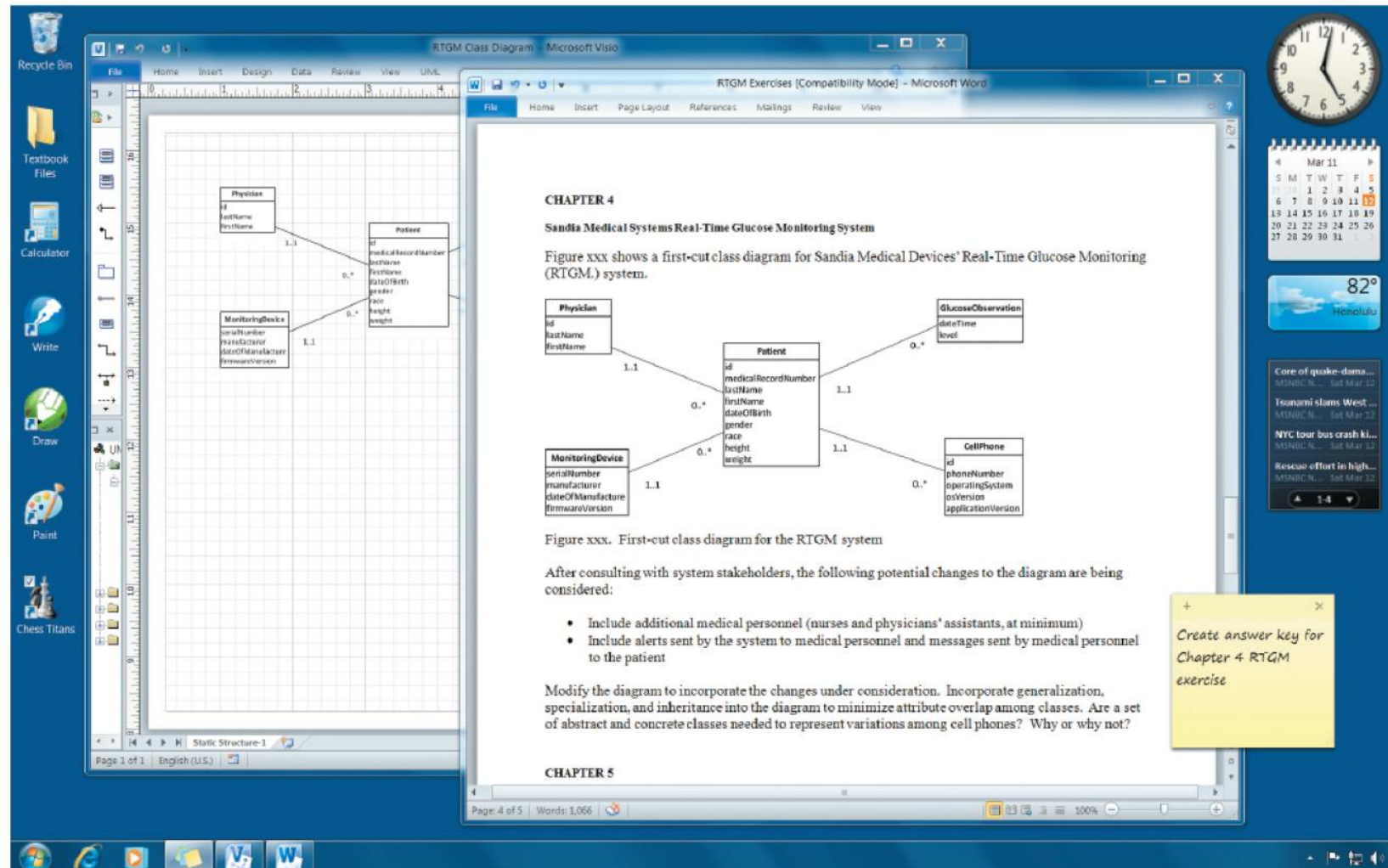


Metaphor details

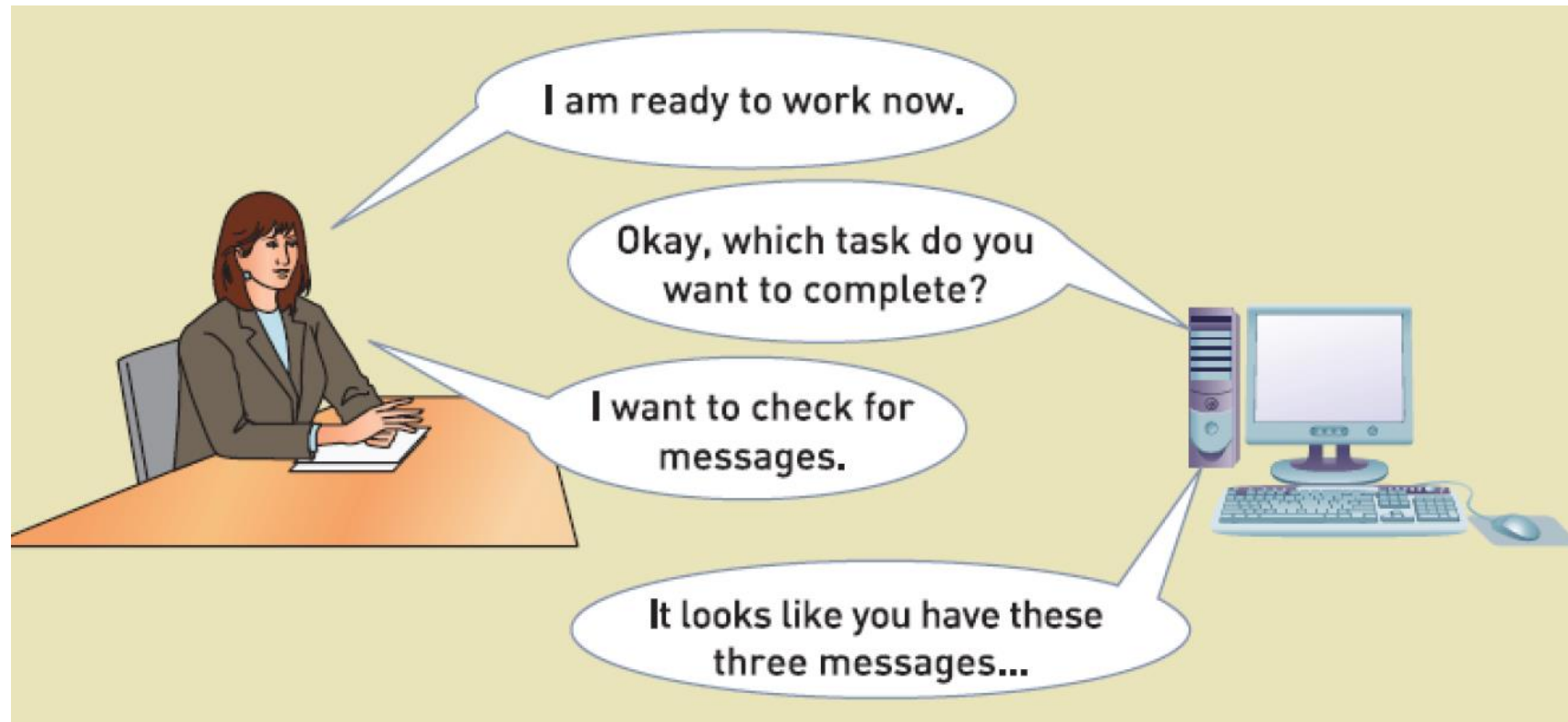
Metaphor	Description	Example
Direct manipulation	Manipulating objects on a display that look like physical objects (pictures) or that represent them (icons)	The user drags a folder icon to an image of a recycle bin or trash can to delete a collection of files.
Desktop	Organizing visual display into distinct 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.



Direct manipulation, desktop and document metaphors on one screen



Dialog metaphor



7.1.3 User-interface DESIGN CONCEPT

► HCI (Human Computer Interaction)

- Norman studied the efficiency and effectiveness of UI
- Norman give two key principles in good interact between a person and a machine

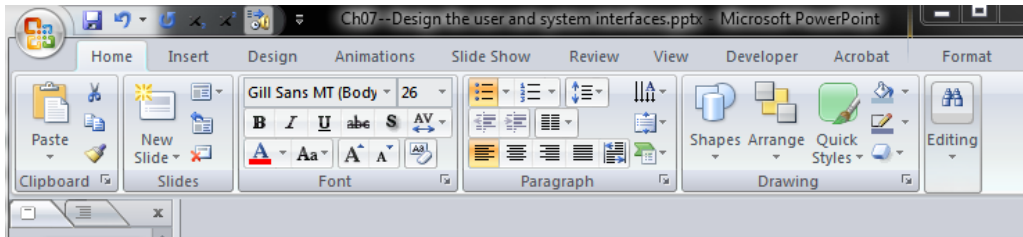
Affordance
(Controlling)

Visibility



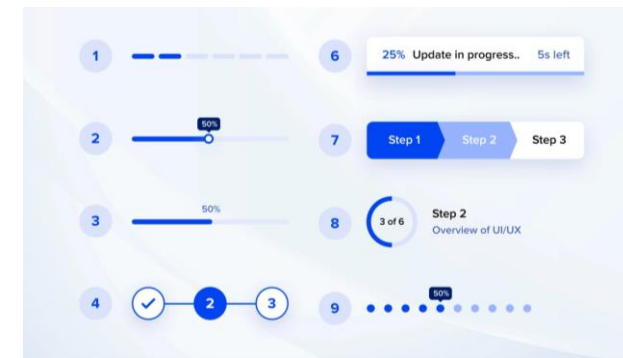
7.1.3 User-interface DESIGN CONCEPT

► Consistency



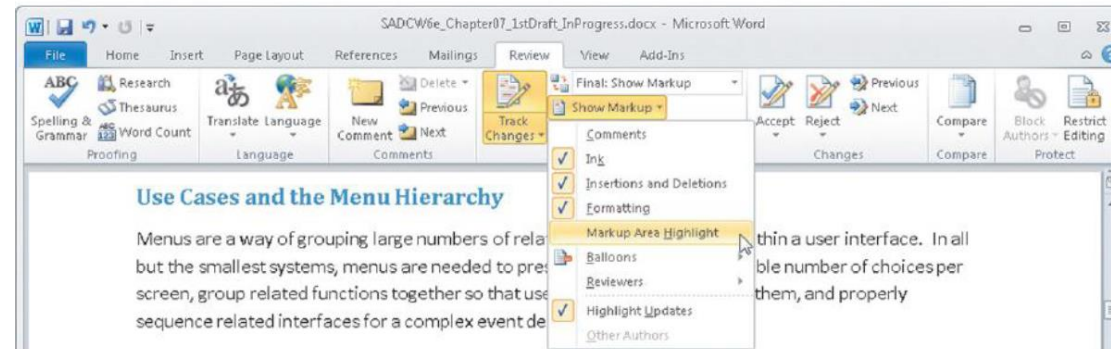
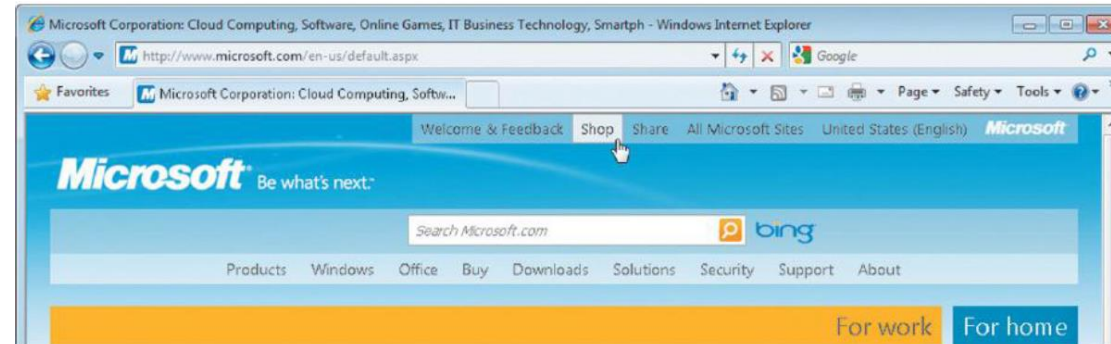
People are creatures of habit.
After we learn one way of doing things, it is difficult to change

- Shortcuts
- Feedback
 - Progress bars, toggle buttons
- Dialogs that yield closure
 - Input sequence, task step
- Error handling
- Easy reversal of action
 - Undo or redo action
- Reducing short-term memory load



7.1.4 Transition from analysis to user-interface design

- ▶ Use case and the menu hierarchy
- ▶ Dialogs and story boards



Example: 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

Example: RMO Use case 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">■ 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	<ul style="list-style-type: none">■ Search for item■ View product comments and ratings■ View accessory combinations■ Create sale	Customer service and store sales representatives
Order shipment	<ul style="list-style-type: none">■ Ship items■ Manage shippers■ Create backorder■ Create item return■ Look up order status■ Track shipment	Customer service and store sales representatives
Customer order control	<ul style="list-style-type: none">■ Look up order status■ Track shipment■ Create item return■ Rate and comment on product■ Provide suggestion	Customer

Is it can be grouped?

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 feed back to user
- ▶ Create a story board of the dialog, showing the sequence of sketches of the screen each step of the dialog. (storyboarding)
- ▶ Review the storyboard with users



From dialog to storyboard (part1)

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.

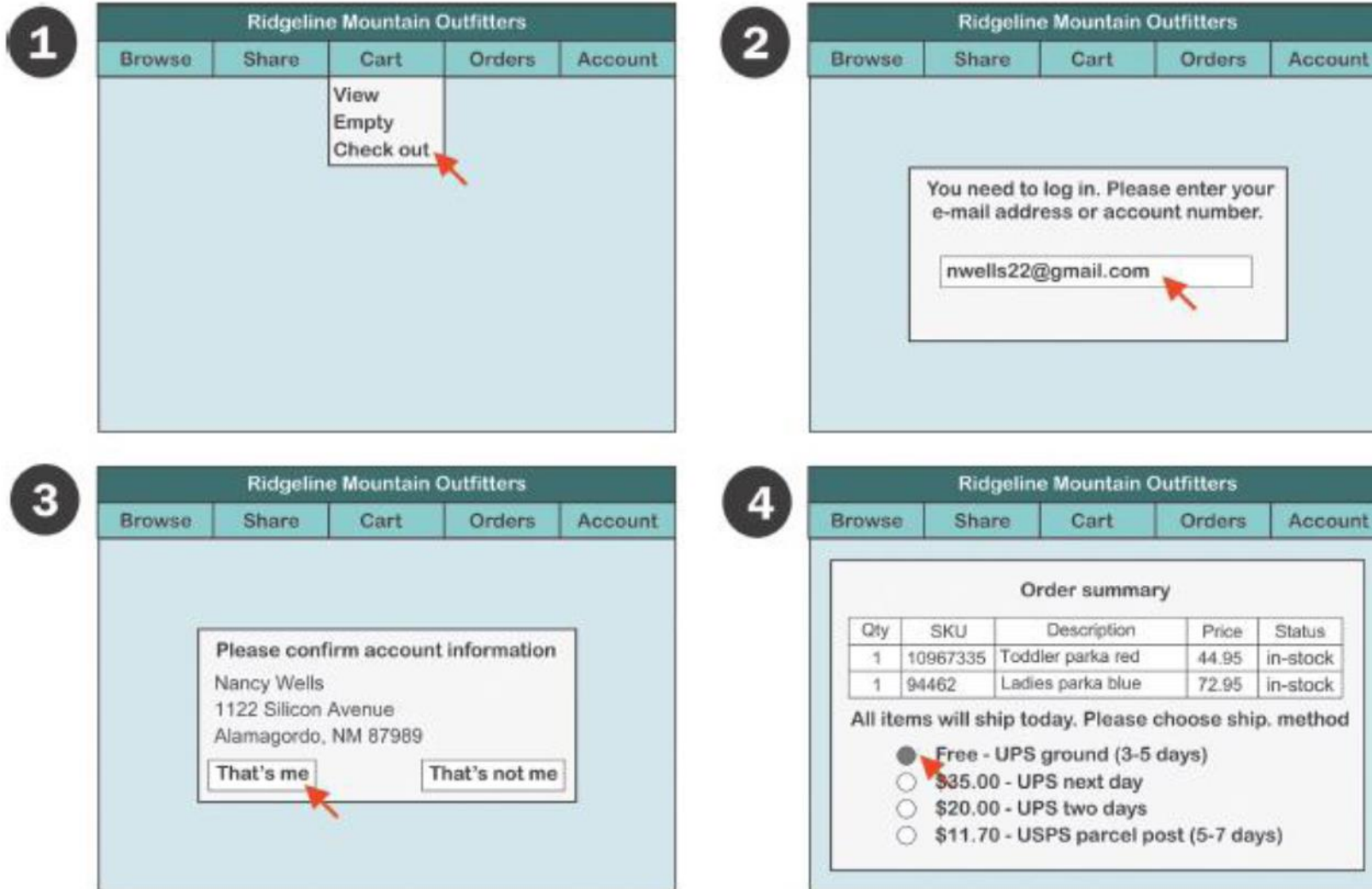
SYSTEM: Fine. You are Nancy Wells at 1122 Silicon Avenue. Correct?

USER: Yes.

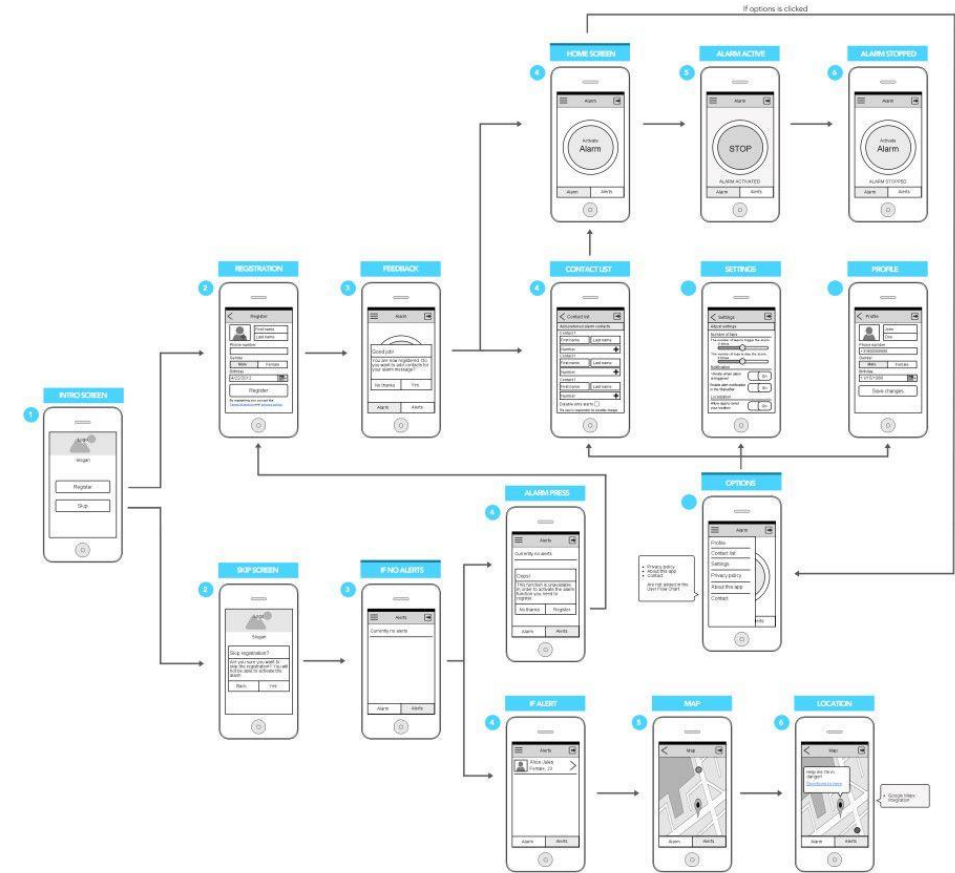
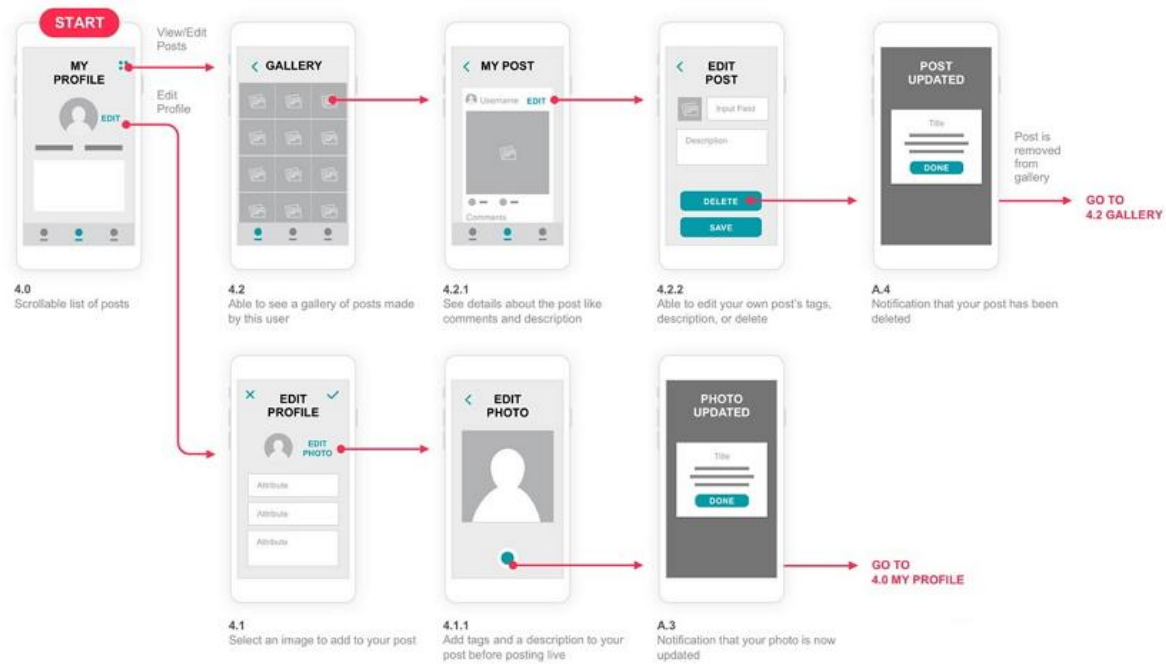
SYSTEM: All items in your cart are in stock and can be shipped today. Because your order subtotal is over \$100, you qualify for free UPS ground shipping (3–5 days). Other shipping options include next day (\$35.00), two day (\$20.00), and USPS parcel post (\$11.70, 5–7 days). How would you like your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



From dialog to storyboard (part1)



Example UI-Flow, User story



From dialog to storyboard (part2)

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 (part2)

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

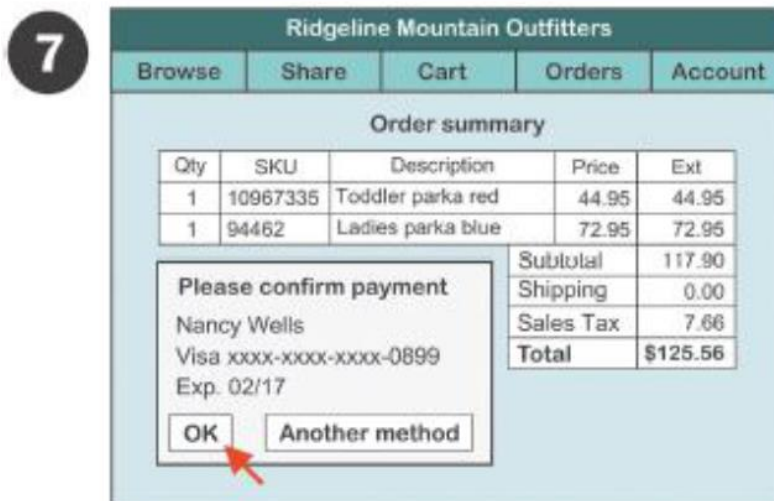
Order summary

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

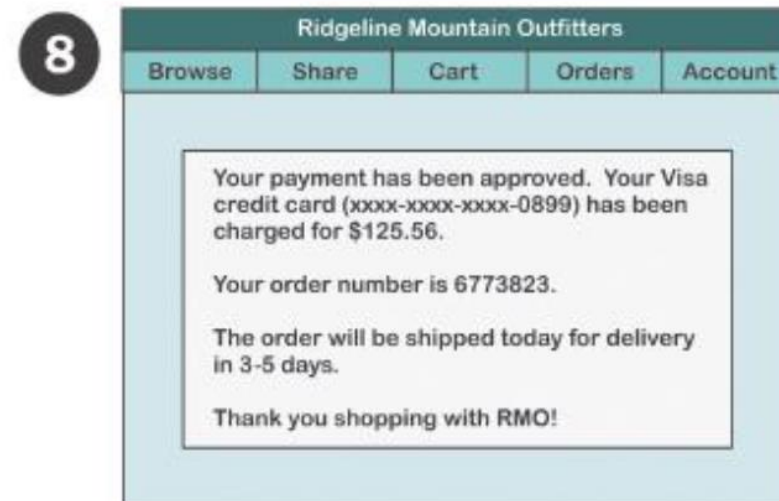
Browse Share Cart Orders Account

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!



7.1.5 Guideline for design windows and forms

- ▶ Interface layout and formatting

- ▶ Consistency
- ▶ Labels and handling
 - ▶ Easy to identify and read
- ▶ Distribution and Order
 - ▶ Button order
 - ▶ Tab order
- ▶ Font and colors

- ▶ Navigation and support controls

- ▶ Minimize
- ▶ Maximize
- ▶ Close
- ▶ Scroll bars
- ▶ Resize


- ▶ Data entry

- ▶ Text box
- ▶ List box
- ▶ Combo box
- ▶ Radio buttons
- ▶ Checkboxes



RMO windows form

RMO Customer Support System - Product Detail



RIDGELINE MOUNTAIN
OUTFITTERS


Product Information

Product ID:

Size:

Color:

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:

Sale Price:

Inventory

ID:

In Stock:

On Order:

Due Date:

Search Criteria

Key Words:

Catalog:

Gender:

Price: Min
Max

Product Type:

Matches:

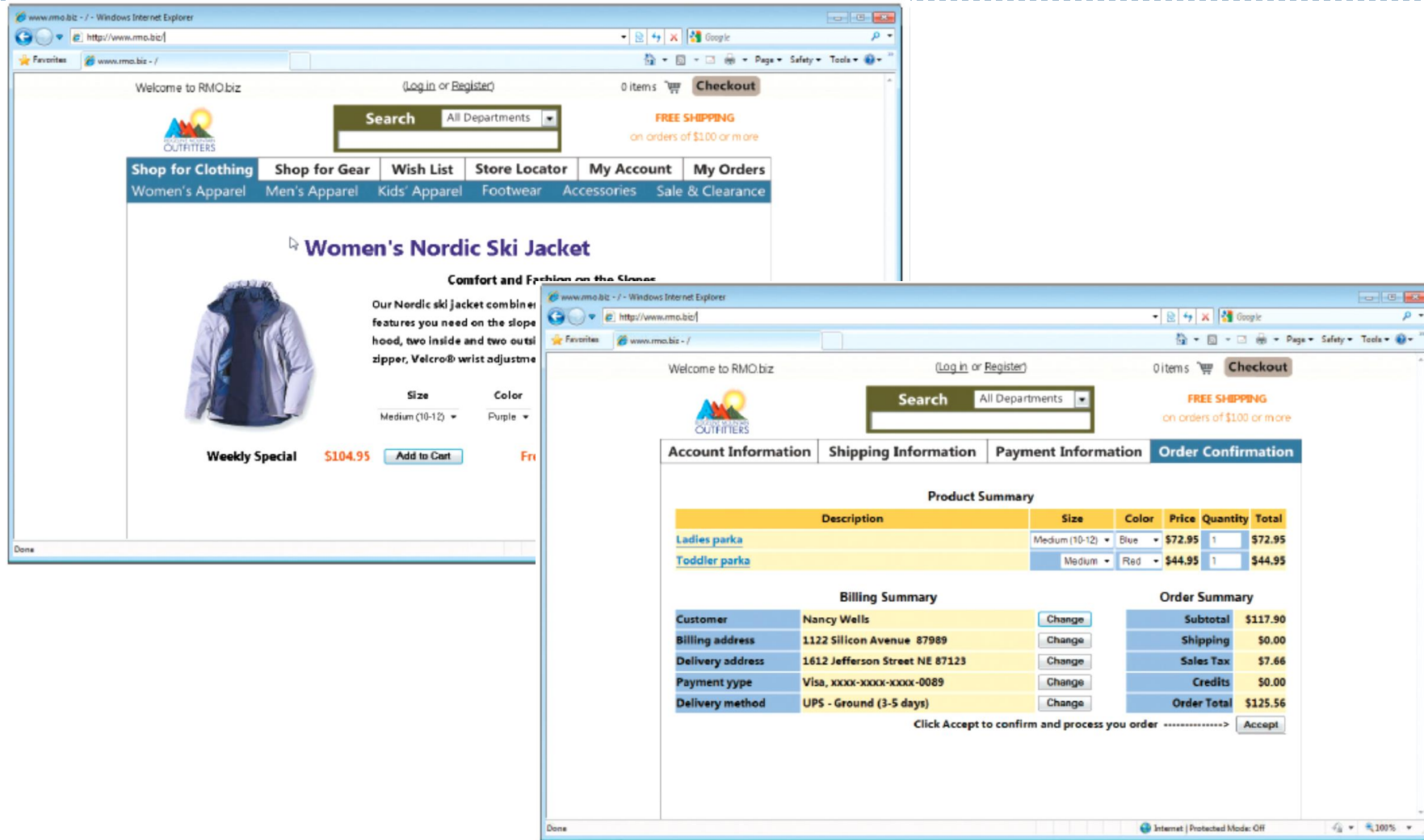
7.1.6 Additional guideline for Web browser user interface

- ▶ **Consistency**
 - ▶ Cascading Style Sheet (CSS)
- ▶ **Performance considerations**
 - ▶ Network connection
 - ▶ Session time
- ▶ **Picture, video, and sound**
- ▶ **User with disability**
 - ▶ Assistive technology
 - ▶ Text-to-Speech
 - ▶ Speech-to-text

```
body {color: olive; font-family: Verdana, sans-serif;  
      background-color: #FFFFFF; font-size: 85%;}  
hr {text-align: center;}  
.navbar {font-size: 75%; text-align: center;}  
h1 {color: #808000;}  
p.chapternav {text-align: center;}  
.footer {font-size: 80%;}
```



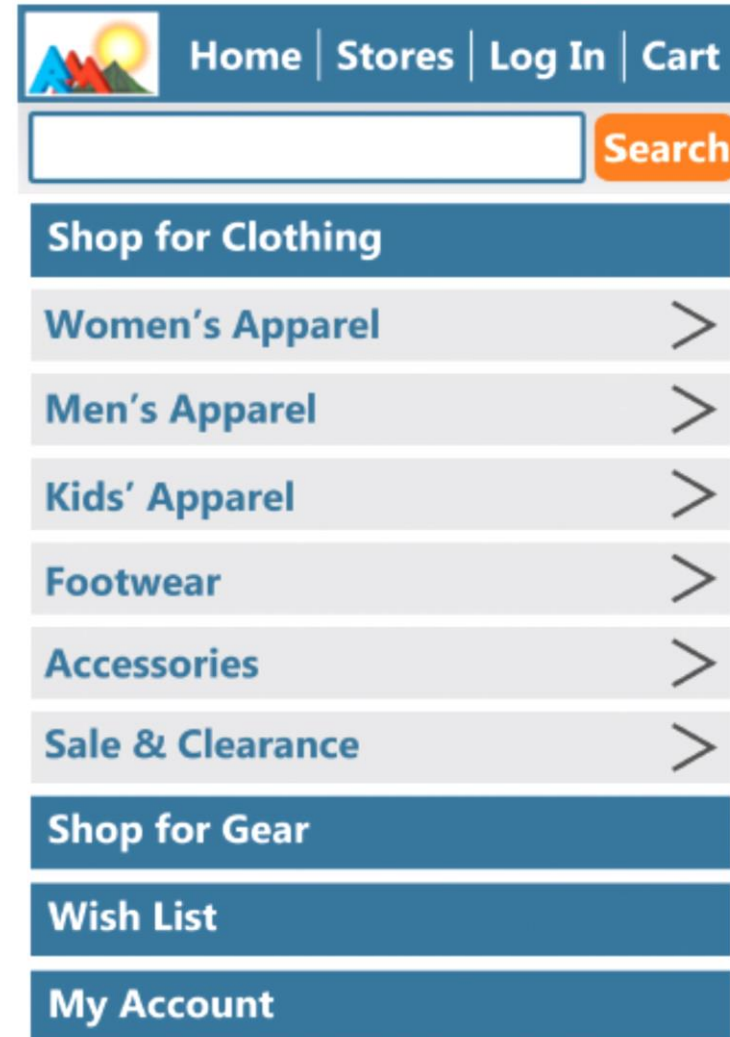
Example: RMO using CSS for consistency



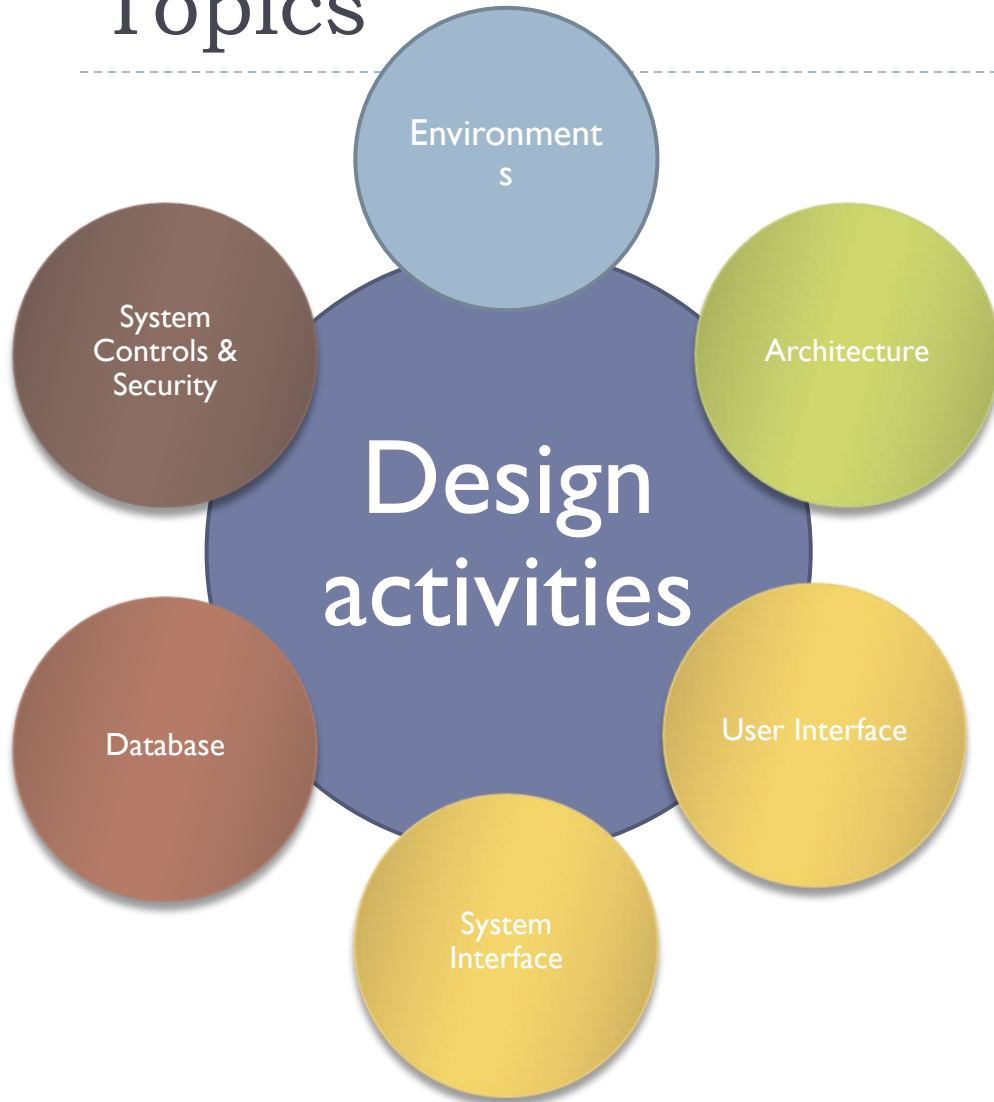
7.1.7 Additional guideline for handheld devices

- ▶ **Challenges**

- ▶ Small screen size
- ▶ Small keyboard and touch screen
- ▶ Limited network capacity
- ▶ App design guideline toolkits



Topics



7.1 User Interface

7.2 System Interface



7.2 System interface ?

- ▶ Input and output that require minimal human intervention
- ▶ Input (automatic) captured and transition transit to another system
- ▶ Output (automatic) generate or send information to other system without human interaction.
 - ▶ Example: end-month credit card statements emailed to cardholder.



7.2.1 Identifying system interface

- ▶ **Input form and output to other system**

- ▶ These are direct interfaces with other information systems, normally formatted as network messages.

- ▶ **Highly automated input and outputs**

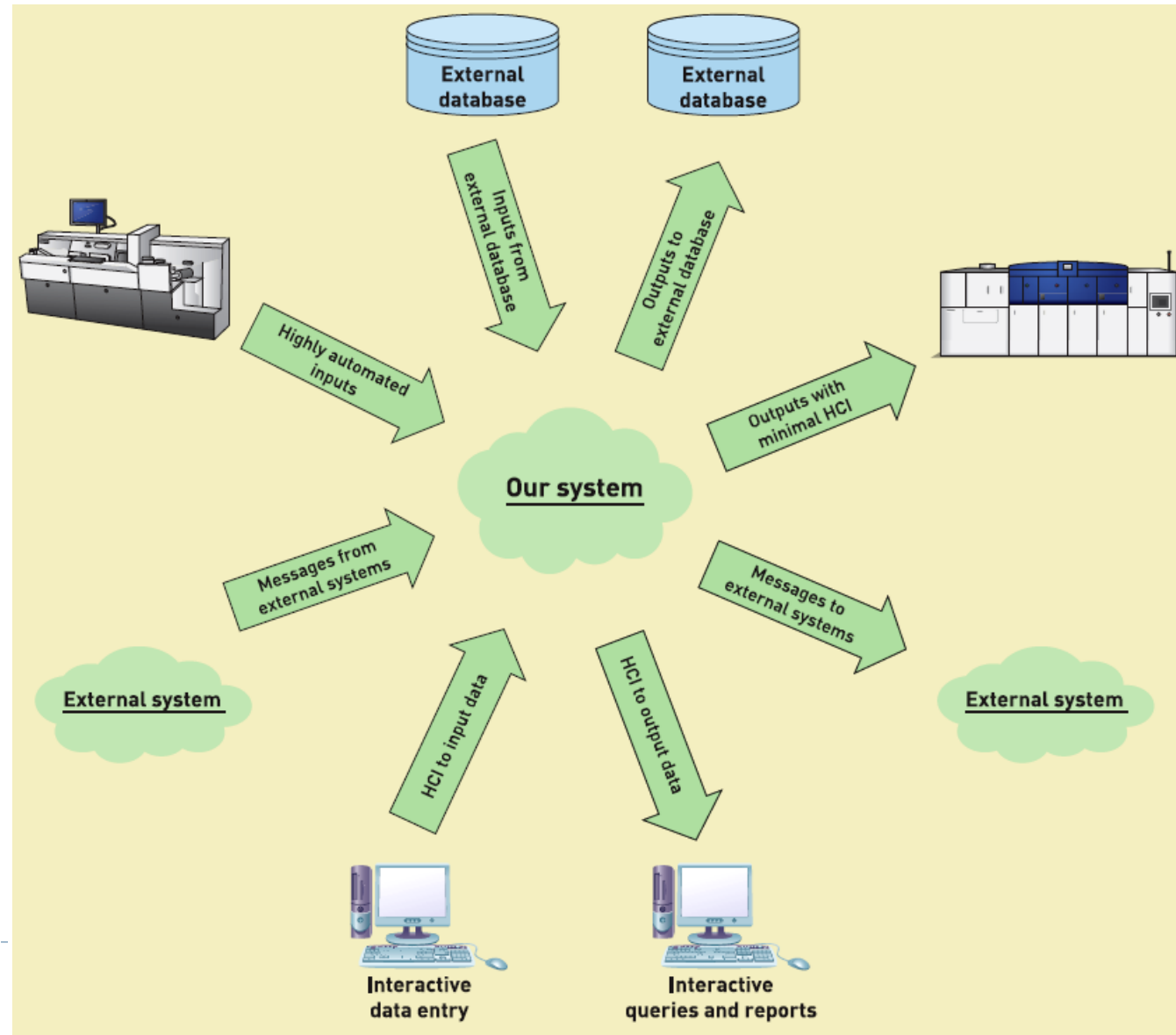
- ▶ These are captured by devices (such as scanners) or generated by persons who start a process that proceeds without further human intervention.
 - ▶ Zip code

- ▶ **Inputs and output to external databases**

- ▶ These can supply input or accept output from a system.
- ▶ Web services



Identifying system interfaces



XML for system interface

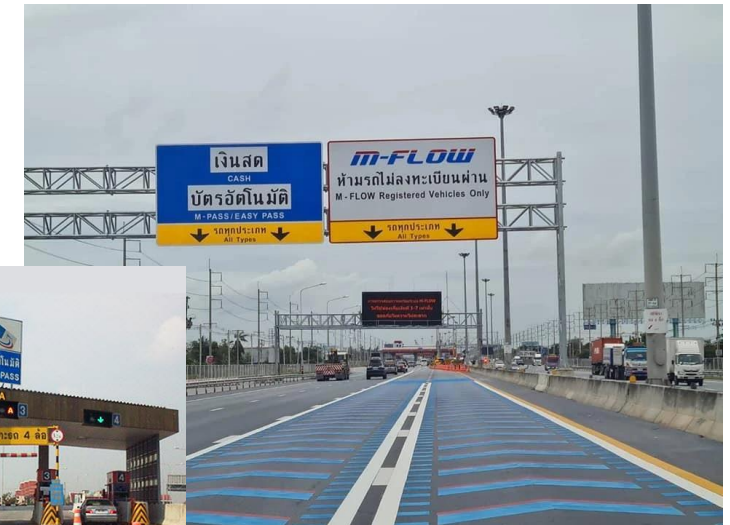
- ▶ Web service
 - ▶ SOAP
 - ▶ RESTful

```
<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>
```

7.2.2 Designing system interface

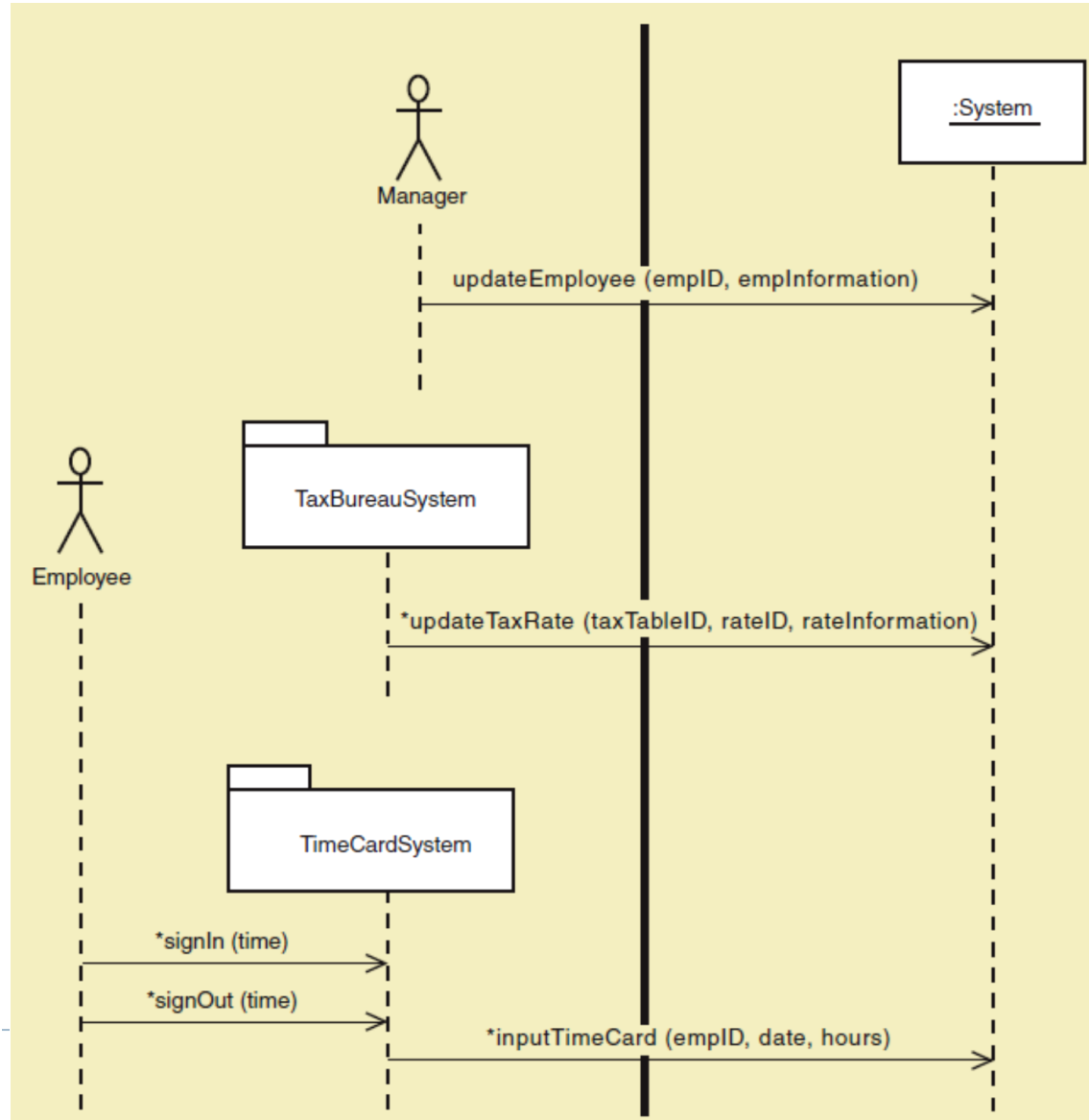
- ▶ Automatic input devices
 - ▶ Magnetic card strip reader
 - ▶ Barcode reader
 - ▶ RFID
 - ▶ OCR (Optical character recognition)
 - ▶ Speech recognition
 - ▶ Touch screen, digitizers (graphic button)
- ▶ Error-free
 - ▶ Avoid human involvement as much as possible
 - ▶ Use electronic devices wherever possible
 - ▶ Validate and correct information at time and location

Electronic road price



7.2.3 Defining the details of system inputs

- ▶ Sequence diagram
- ▶ Details for messages



7.2.4 Designing report, statement and turnaround document

- ▶ **Report types**
 - ▶ Detailed reports
 - ▶ Summary reports
 - ▶ Exception reports (Data + Analysis | Filter)
 - ▶ Executive report
 - ▶ Prediction report (History data + analysis + predict model)

- ▶ **Internal VS External outputs**
 - ▶ Internal documents
 - ▶ External documents
 - ▶ Report for uses by people outside the organization
 - ▶ Statement, notices, stockholder reports
 - ▶ Turnaround documents
 - ▶ External output that include one or more parts intended to be returned by new data or information
 - ▶ Bills



7.2.5 Designing report, statement and turnaround document

- ▶ **Electronic report**
 - ▶ User-interface design technique that enables a user to select summary information and supporting detail.
- ▶ **Graphical and Multimedia presentation**



External output example



Ridgeline Mountain Outfitters—Shopping Cart Order

Customer Name: Fred Westing
Customer Number: 6747222

Order Number: 4673064
Today's Date: May 18, 2013

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

X X X X – X X X X – X X X X – 5 7 8 4

MO YR

Expiration Date 05 / 15

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

Internal output example – detailed control break report

Ridgeline Mountain Outfitters — Products and Items						
ID	Season	Category	Supplier	Unit Price	Special Price	Discontinued
RMO12587	Spr/Fall	Mens C	8201	\$39.00	\$34.95	No
Description 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	Footwe	7993	\$49.95	\$44.89	No
Description 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		

Summary and detailed report

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		
	All	4,839,729	4,897,235	349,234	7,086,198		
Totals			\$ 1,747,368	\$ 1,698,222	\$ 23,391,023		
Women's Clothing	Spring				965,610		
	Summer						
	Fall						
	Winter						
	All						
Totals							

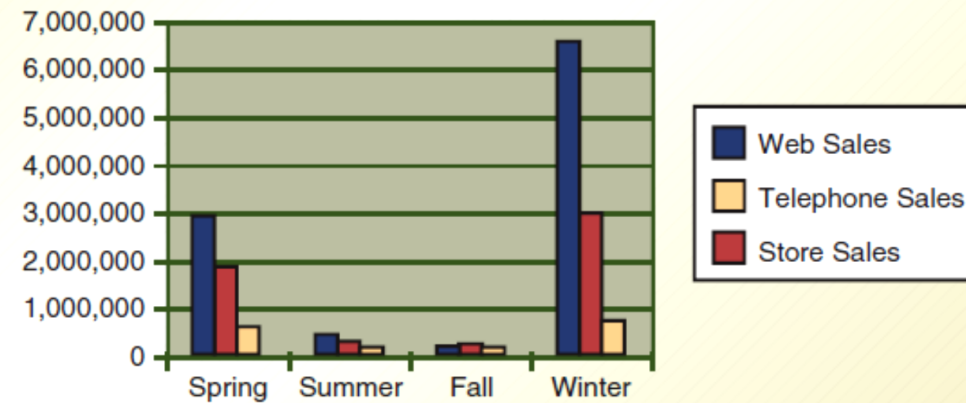
Monthly Sales Detail							
Year	2013	Month	January	Category	Men's Clothing	Season	Winter
Product ID	Product Description		Web Sales	Telephone Sales	Mail Sales	Total Sales	
RMO12987	Winter Parka		\$ 1,490,245	\$ 3,226,948	\$ 337,640	\$ 5,054,833	
RMO13788	Fur-Lined Gloves		149,022	322,695	33,765	505,482	
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	

Graphical output

Men's Clothing Sales - January 2013



Men's Clothing Sales by Season - January 2013



Summary

- ▶ **Two types of interfaces**
 - ▶ User interface
 - ▶ System interface

