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
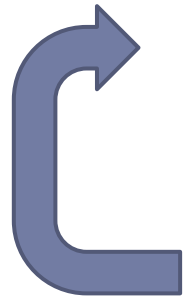 - Focus on user experience

| 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

- Input and output that directly involve a human user/actor.
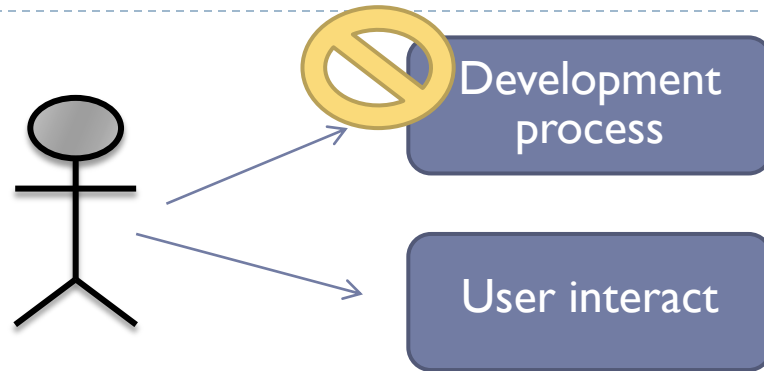- A dialog goes on between actor and system.

7.1 User Interface

7.2 System Interface

- The inputs and outputs that require minimal human intervention.
  - Input captured automatically
  - Output direct to other systems
  - Printed and distributed outputs (Statements reports).

7.1.1 User-center design

Development process

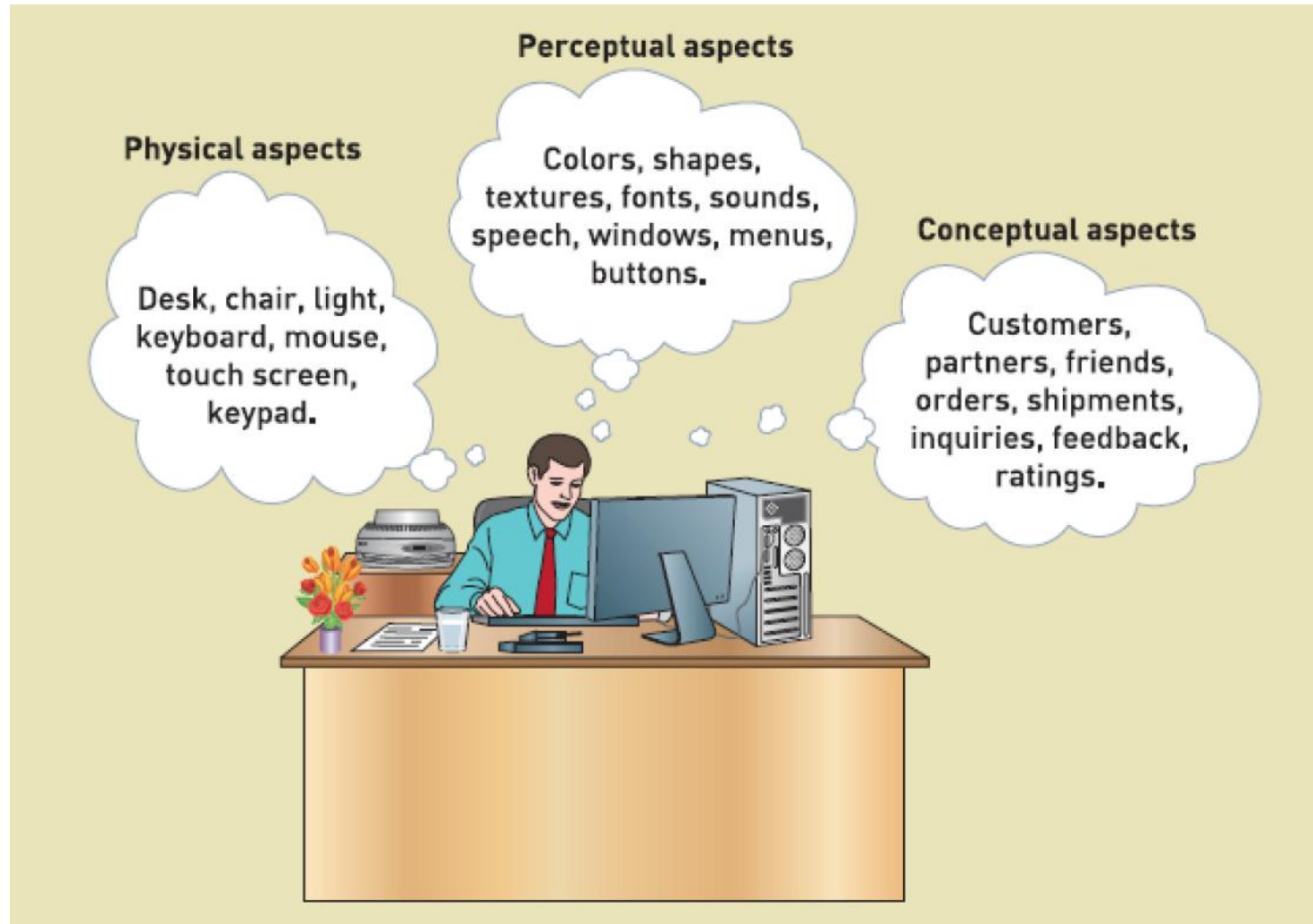User interact

- ▶ **Principles of user centered design**
  - ▶ Focus on their work of user
  - ▶ Evaluate designs to ensure usability
    - ▶ Easy to learn
    - ▶ Easy to use
  - ▶ User iterative 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
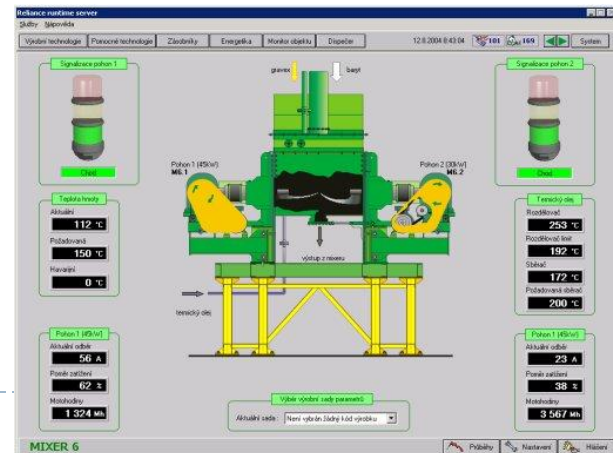
7.1.3 User-interface DESIGN CONCEPT

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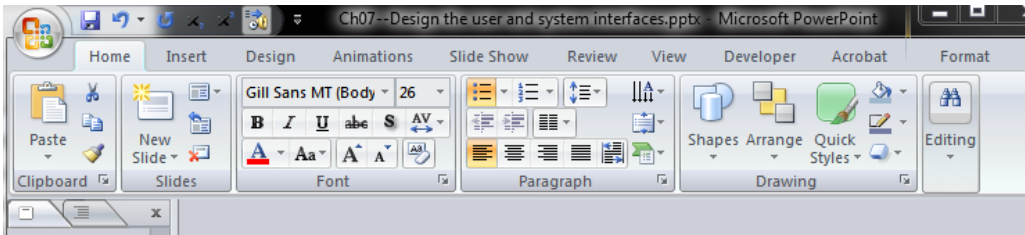
People are creatures of habit. After we learn one way of doing thing, it is difficult to change

- Shortcuts
- Feedback
  - Progress bars, toggle buttons
- Dialogs that yield closure
  - Input sequence, task step
- Error handling
- Easy reversal of action
  - Undo or redu 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

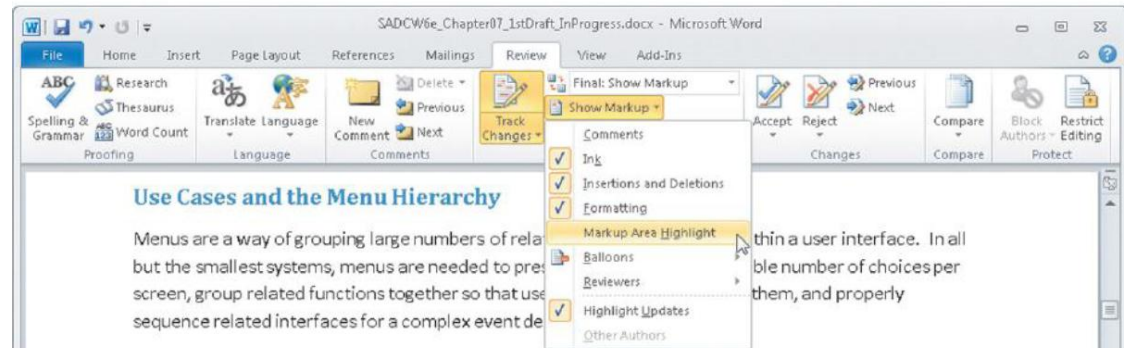| Subsystem	Use Case	Users/Actors
Sales	Search for item	Customer, customer service representative, store sales representative
Sales	View product comments and ratings	Customer, customer service representative, store sales representative
Sales	View accessory combinations	Customer, customer service representative, 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

CRUD

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)	■ 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

Is it can be grouping?

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)

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

- Data entry
  - Text box
  - List box
  - Combo box
  - Radio buttons
  - Checkboxes

- Navigation and support controls
  - Minimize
  - Maximize
  - Close
  - Scroll bars
  - Resize

RMO windows form

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%;}
```
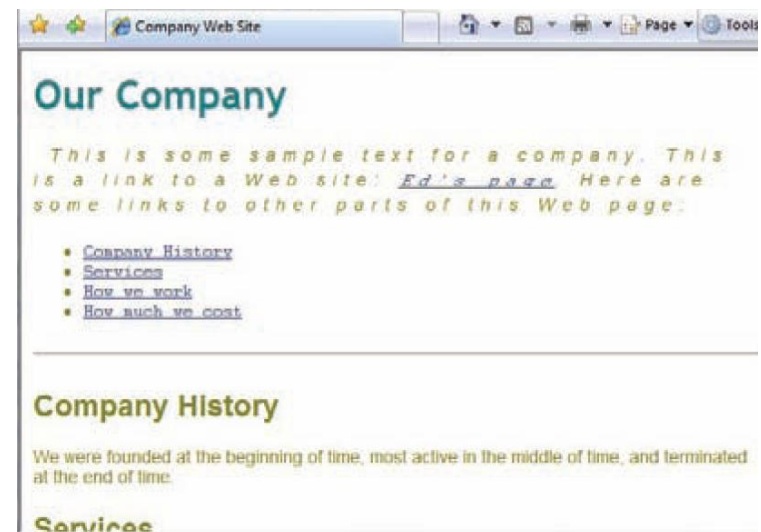
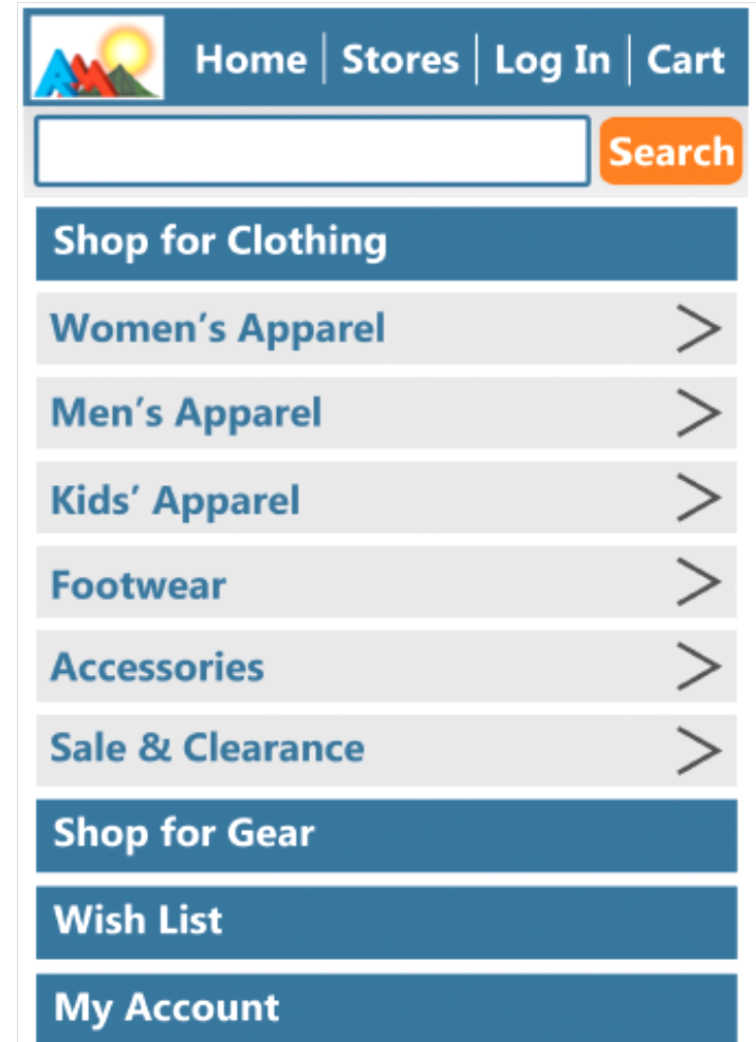# Example: RMO using CSS for consistency
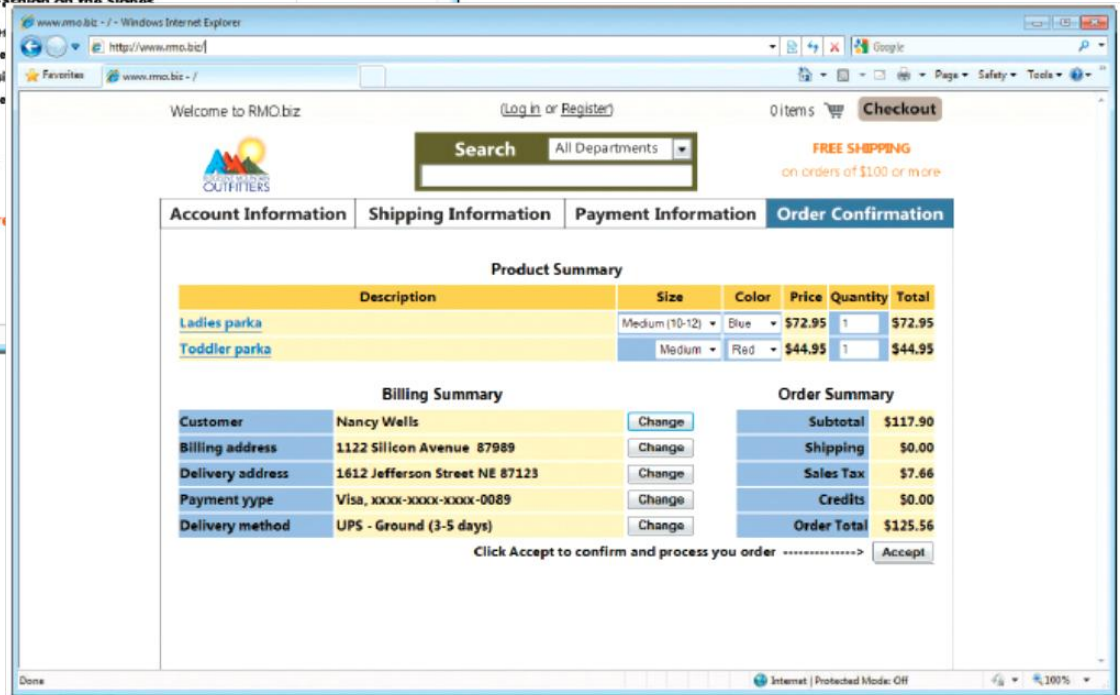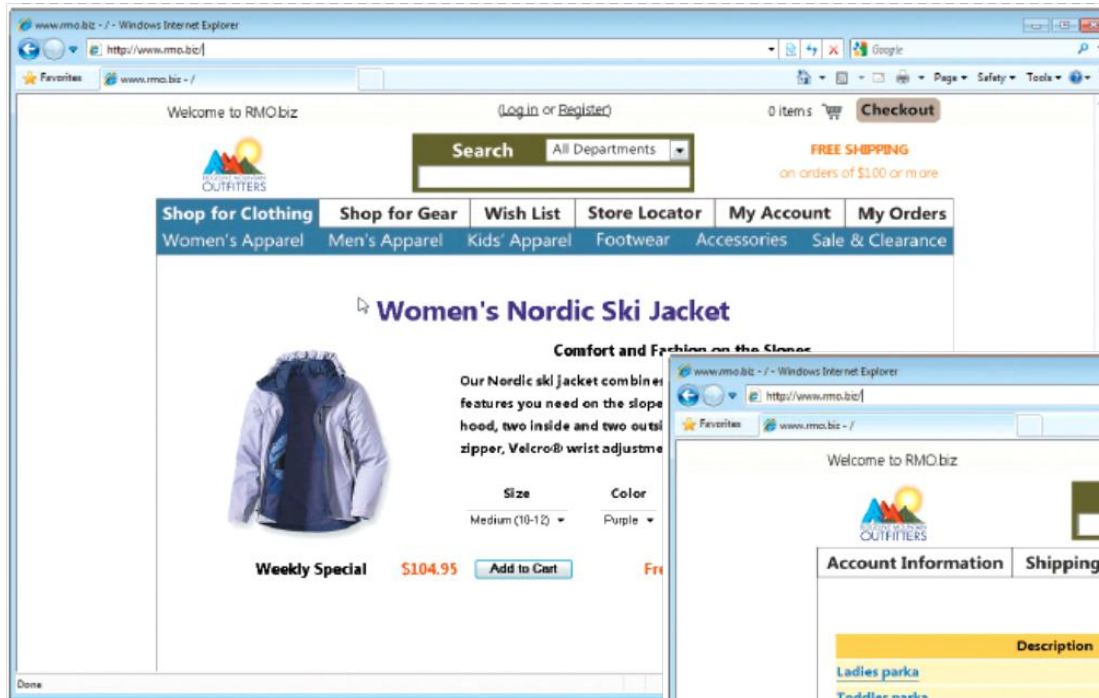
7.1.7 Additional guideline for handheld devices

‣ Challenges

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

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 intervention.
  - 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
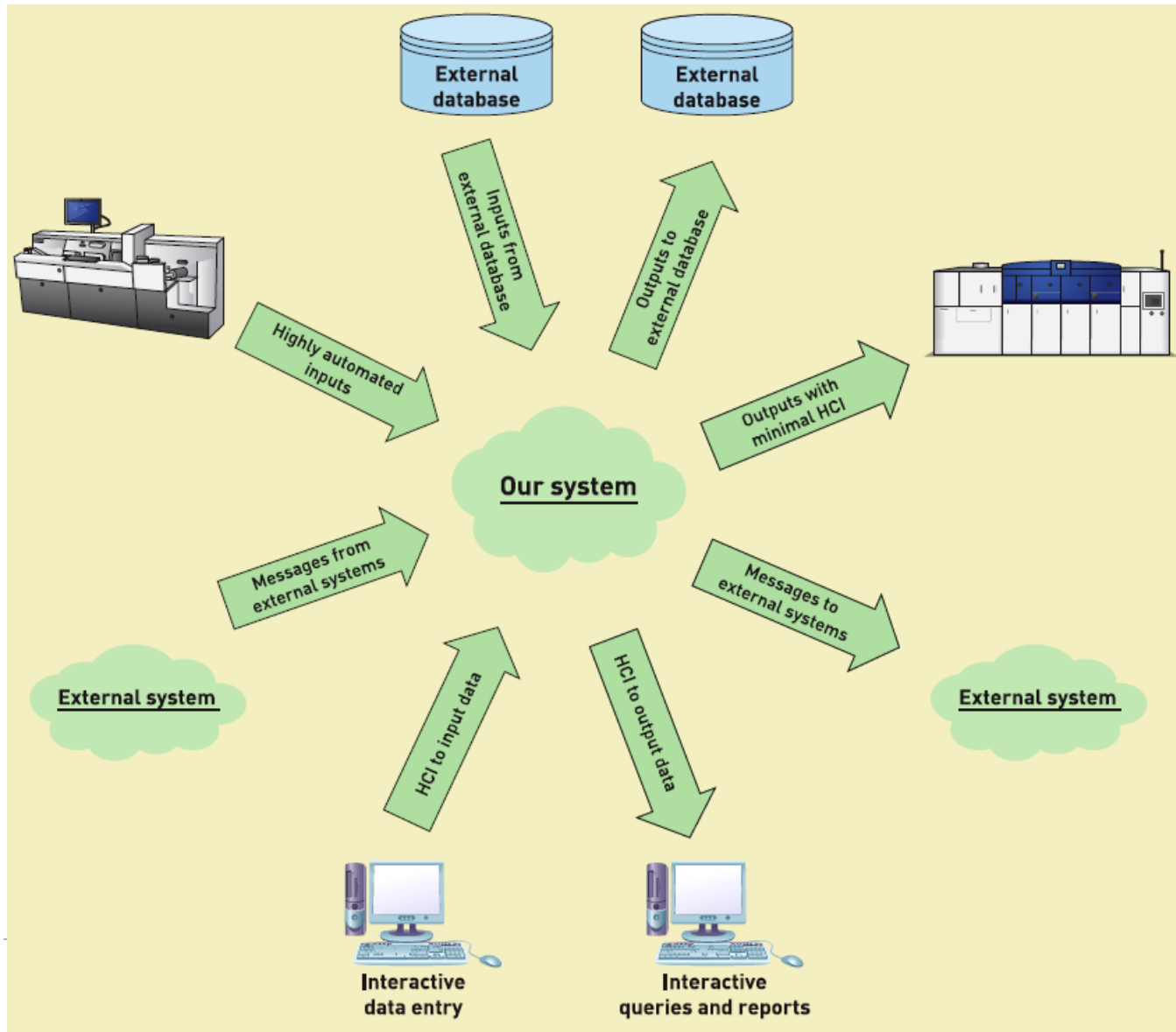
XML for system interface

- **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

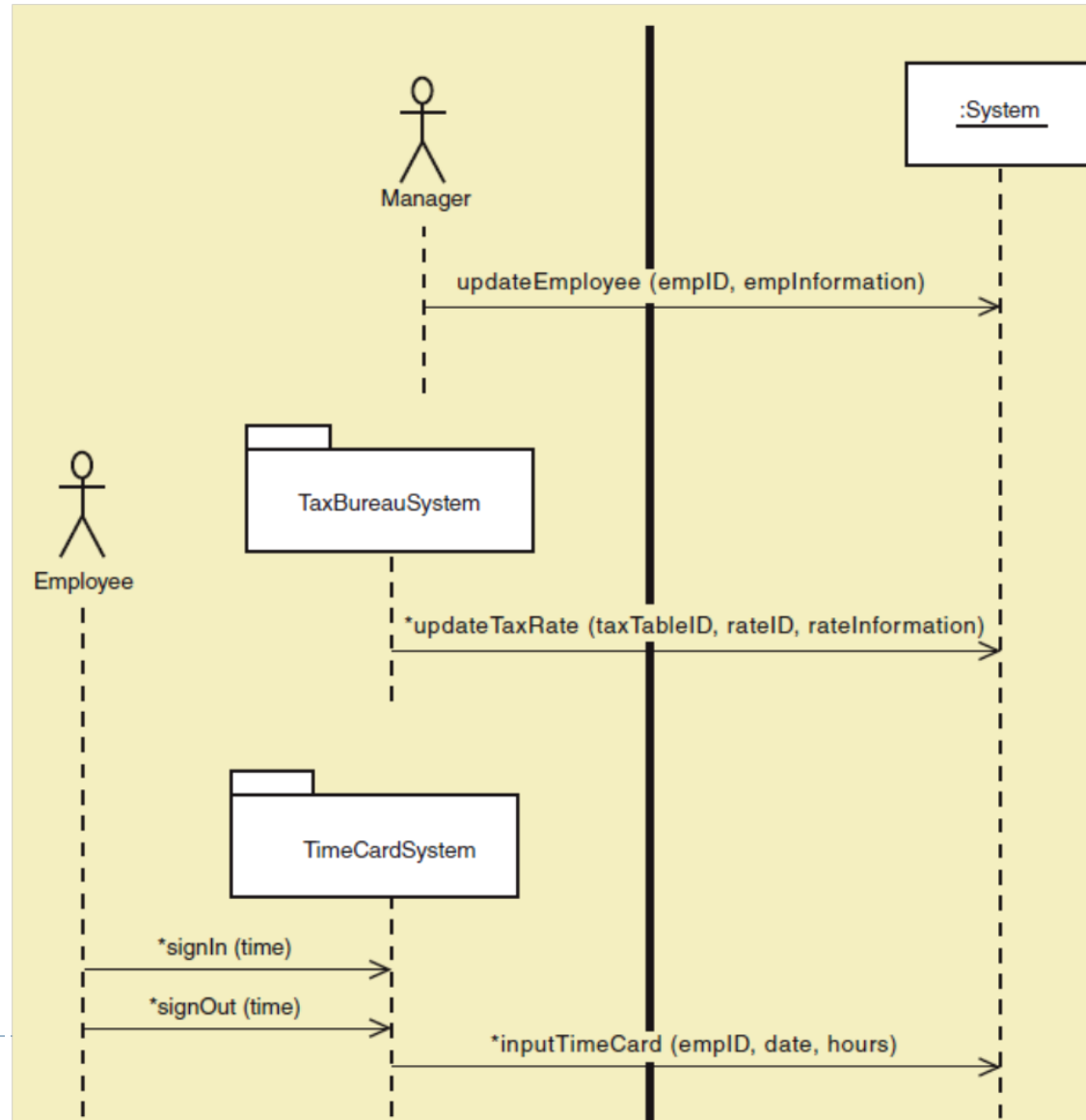 ▸ Touch screen, digitizers (graphic button)

▸ **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

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	1,839,729	4,897,235	349,234	7,086,198
Totals		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
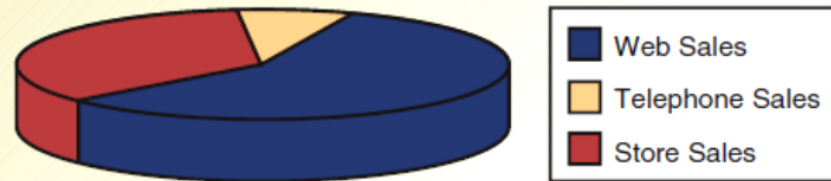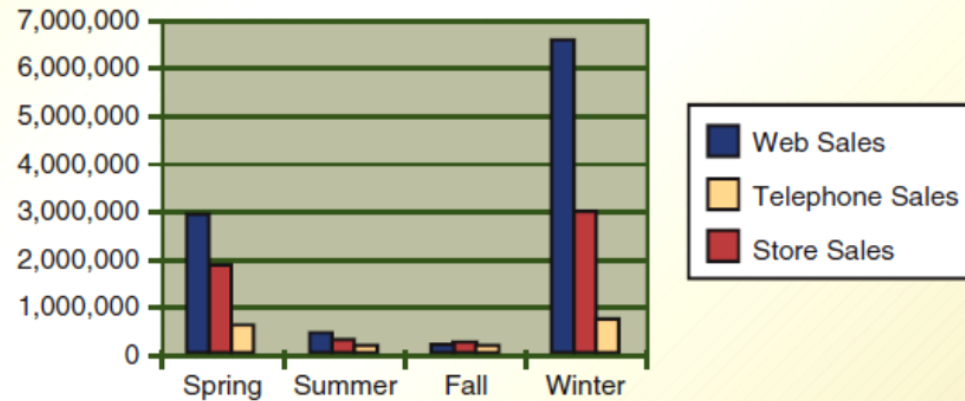
Summary

- Two types of interfaces
  - User interface
  - System interface