King Saud University

College of Engineering

IE – 462: "Industrial Information Systems"

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Chapter 3

Data Modeling and Design – p3 – Case Study

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Lesson Overview

- Introduction – (p1)
- E-R Diagram – (p2)
- **Case Study – (p3)**

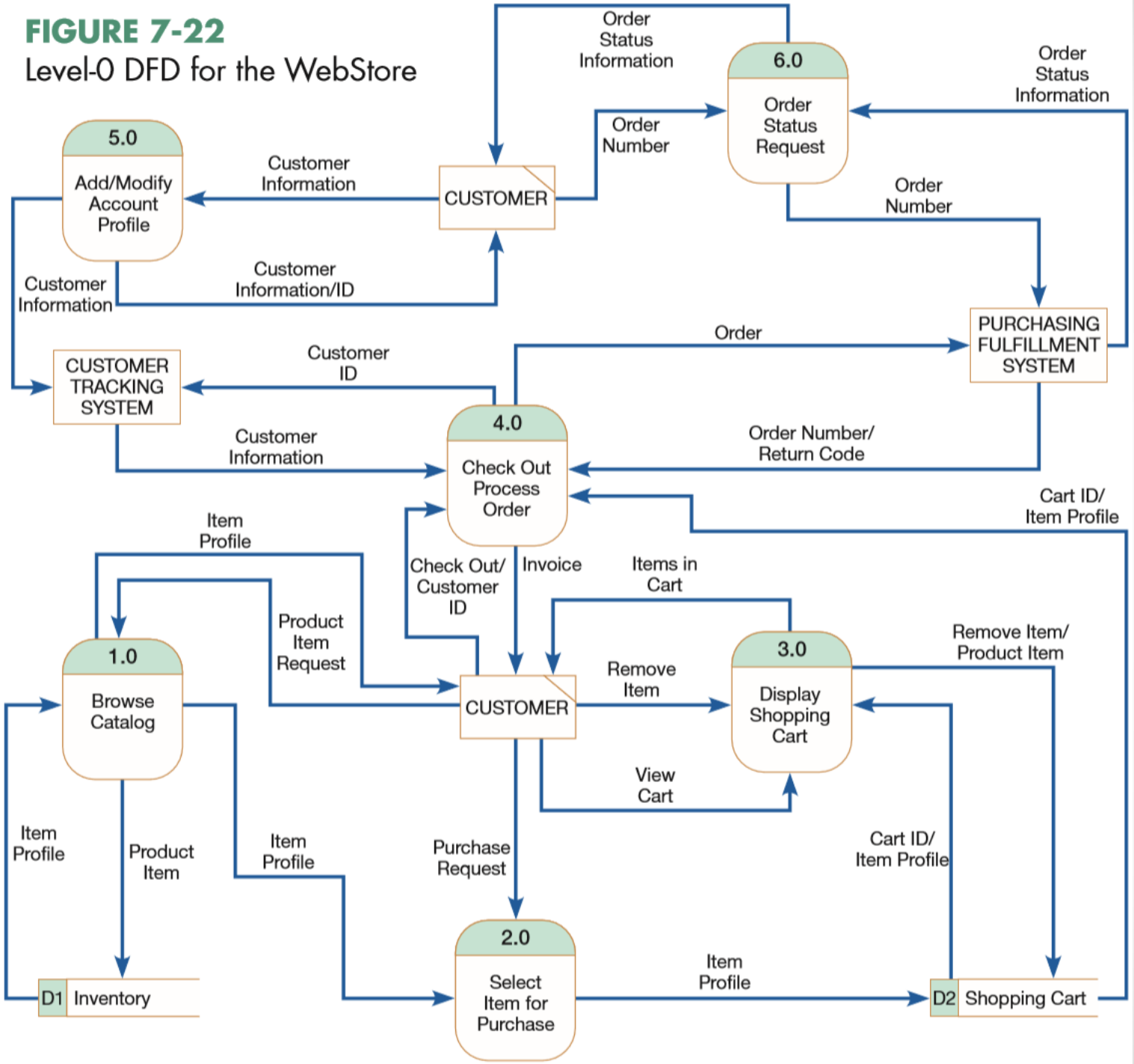
Case Study – Electronic Commerce Application – Conceptual Data Modeling for "Pine Valley Furniture" WebStore

E-R Diagram: PVF Furniture Webstore

Background:

- Remember, senior systems analyst (Jim Woo):
  - First, completed JAD (Joint Application Design) session
  - Then created DFD for webstore system
- He was then asked to develop a conceptual data model for the WebStore

FIGURE 7-22
Level-0 DFD for the WebStore



E-R Diagram: PVF Furniture Webstore

Conceptual Data Modeling Plan:

- He developed conceptual data model for WebStore using following steps:
  1. Identify general categories of information using:
     - Information from JAD session
     - Additional information from DFD (data stores, data flows)
  2. Carefully examine each data category using the DFD:
     - Determine unique data flows within each data category
     - Record source and destination of all data flows
  3. Construct E-R diagram for WebStore:
     - Determine system unique entities
     - Identify interrelationships among entities
     - Draw E-R diagram (with entities)

E-R Diagram: PVF Furniture Webstore

1. **Identify general categories of information:**
   - Information from JAD session
     - Table 8-2 shows a summary of *customer* and *inventory* information identified during the JAD session
     - Identify information the WebStore needed to capture, store, and process
   - Additional info from DFD (data stores, data flows)
     - data stores (strong candidates to become entities in ERD):
       - Inventory (D1)
       - Shopping Cart (D2)
     - examine data flows from DFD for other possible *sources* for entities:
       - Order
       - Temporary User/System Messages

E-R Diagram: PVF Furniture Webstore

TABLE 8-2 Customer and Inventory Information for the WebStore

Home Office Customer	Student Customer	Inventory Information
Name	Name	SKU
Doing Business as (company's name)	School	Name
Address	Address	Description
Phone	Phone	Finished Product Size
Fax	E-Mail	Finished Product Weight
E-Mail		Available Materials
		Available Colors
		Price
		Lead Time

E-R Diagram: PVF Furniture Webstore

1. **Identify general categories of info.** (cont.)**:**
   - Analysis resulted in the identification of 5 general categories of information:
     - Customer
     - Inventory
     - Order
     - Shopping Cart
     - Temporary User/System Messages

E-R Diagram: PVF Furniture Webstore

2. **Examine each category using the DFD:**
   - o List for each data category (Table 8-3):
     - each of its data flows, and
     - corresponding description
   - o List for each data category (Table 8-4):
     - source and destinations for each *unique* data flow
   - o Purpose of these two tables:
     - document WebStore's requirements
     - what information was needed to move from point to point

TABLE 8-3 Data Category, Data Flow, and Data Flow Descriptions for the WebStore

Data Category/Data Flow	Description
Customer-Related	
Customer ID	Unique identifier for each customer (generated by Customer Tracking System)
Customer Information	Detailed customer information (stored in Customer Tracking System)
Inventory-Related	
Product Item	Unique identifier for each product item (stored in Inventory Database)
Item Profile	Detailed product information (stored in Inventory Database)
Order-Related	
Order Number	Unique identifier for an order (generated by Purchasing Fulfillment System)
Order	Detailed order information (stored in Purchasing Fulfillment System)
Return Code	Unique code for processing customer returns (generated by/stored in Purchasing Fulfillment System)
Invoice	Detailed order summary statement (generated from order information stored in Purchasing Fulfillment System)
Order Status Information	Detailed summary information on order status (stored/generated by)
Shopping Cart	
Cart ID	Unique identifier for shopping cart
Temporary User/System Messages	
Product Item Request	Request to view information on a catalog item
Purchase Request	Request to move an item into the shopping cart
View Cart	Request to view the contents of the shopping cart
Items in Cart	Summary report of all shopping cart items
Remove Item	Request to remove item from shopping cart
Check Out	Request to check out and process order

TABLE 8-4 Data Category, Data Flow, and the Source/Destination of Data Flows within the WebStore DFD

Data Flow	From/To
Customer-Related	
Customer ID	From Customer to Process 4.0
	From Process 4.0 to Customer Tracking System
	From Process 5.0 to Customer
Customer Information	From Customer to Process 5.0
	From Process 5.0 to Customer
	From Process 5.0 to Customer Tracking System
	From Customer Tracking System to Process 4.0
Inventory-Related	
Product Item	From Process 1.0 to Data Store D1
	From Process 3.0 to Data Store D2
Item Profile	From Data Store D1 to Process 1.0
	From Process 1.0 to Customer
	From Process 1.0 to Process 2.0
	From Process 2.0 to Data Store D2
	From Data Store D2 to Process 3.0
	From Data Store D2 to Process 4.0
Order-Related	
Order Number	From Purchasing Fulfillment System to Process 4.0
	From Customer to Process 6.0
	From Process 6.0 to Purchasing Fulfillment System
Order	From Process 4.0 to Purchasing Fulfillment System
Return Code	From Purchasing Fulfillment System to Process 4.0
Invoice	From Process 4.0 to Customer
Order Status	From Process 6.0 to Customer
	From Purchasing Fulfillment System to Process 6.0
Shopping Cart	
Cart ID	From Data Store D2 to Process 3.0
	From Data Store D2 to Process 4.0
Temporary User/System Messages	
Product Item Request	From Customer to Process 1.0
Purchase Request	From Customer to Process 2.0
View Cart	From Customer to Process 3.0
Items in Cart	From Process 3.0 to Customer
Remove Item	From Customer to Process 3.0
	From Process 3.0 to Data Store D2
Check Out	From Customer to Process 4.0

E-R Diagram: PVF Furniture Webstore

3. **Construct E-R diagram for WebStore:**

   o Jim decided that unique entities for E-R diagram:

   - Customer
   - Inventory
   - Order

   o Note, all 3 meet entity criteria: person, event, or object (*which is which?*)

E-R Diagram: PVF Furniture Webstore

3. **Construct E-R diagram for WebStore** (cont.)**:**

   o Remaining two categories:

   - Temporary User/System Messages:

     o not permanently stored items

     o not person/event/object

     o ⇒ *should not* be an entity in model

E-R Diagram: PVF Furniture Webstore

3. **Construct E-R diagram for WebStore** (cont.)**:**

   o Remaining two categories (cont.):

   - Shopping Cart:

     o temporarily stored item (for at least duration of a customer's visit to the WebStore), and

     o can be considered an object

     o Process 4.0 (Check Out Process Order) moves *Shopping Cart* contents to the *Purchasing Fulfillment System*, where order details are stored

     o ⇒ *should be* an entity in model

E-R Diagram: PVF Furniture Webstore

3. **Construct E-R diagram for WebStore** (cont.)**:**

   o Summary of required entities for E-R diagram:

   - Customer
   - Inventory
   - Order
   - Shopping Cart

E-R Diagram: PVF Furniture Webstore

3. **Construct E-R diagram for WebStore** (cont.)**:**

   o Identify interrelationships among 4 four entities:

   1. CUSTOMER – SHOPPING CART relationship
      - Each Customer *owns* 0 or 1 Shopping Cart instances
      - Each Shopping Cart instance *is owned by* one and only one Customer

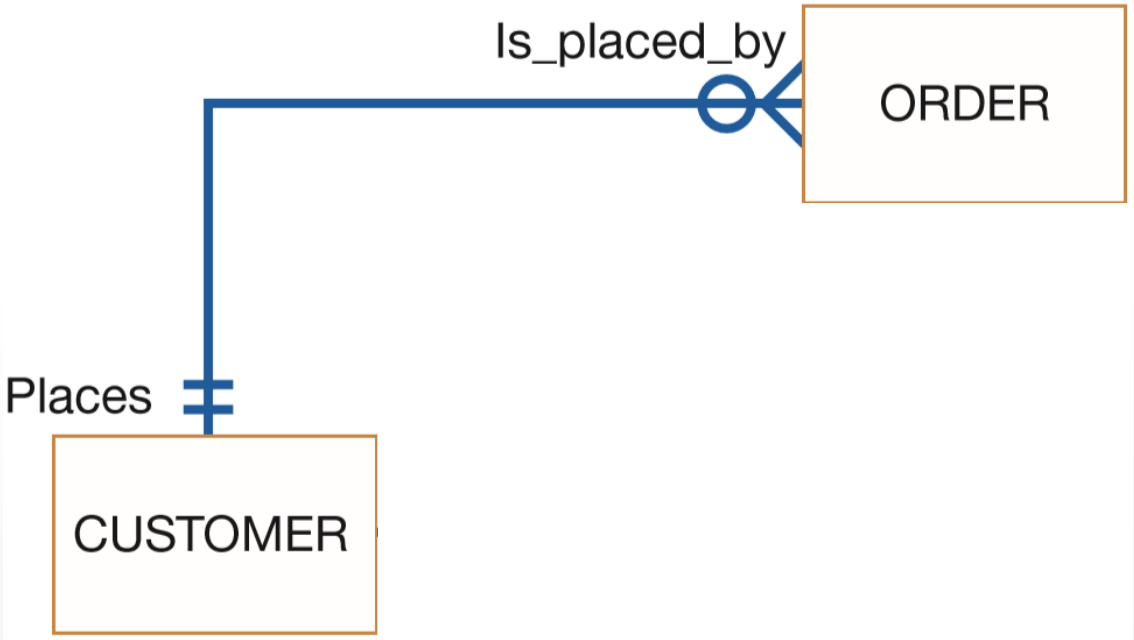
E-R Diagram: PVF Furniture Webstore

3. Construct E-R diagram for WebStore (cont.)**:**

o Interrelationships among 4 four entities (cont.):

2. CUSTOMER – ORDER relationship

- Each Customer *places* zero to many Orders
- Each Order *is placed by* one and only one Customer



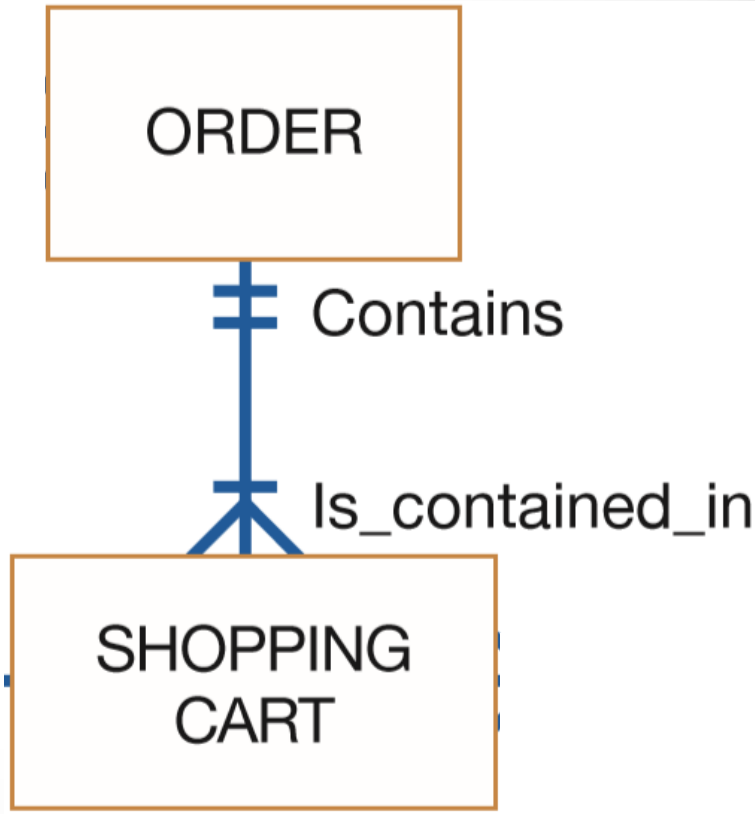
E-R Diagram: PVF Furniture Webstore

3. Construct E-R diagram for WebStore (cont.)**:**

o Interrelationships among 4 four entities (cont.):

3. ORDER – SHOPPING CART relationship

- Each Order
  contains
  one to many
  Shopping Cart instances
- Each
  Shopping Cart instance
  is contained in
  one and only one
  Order



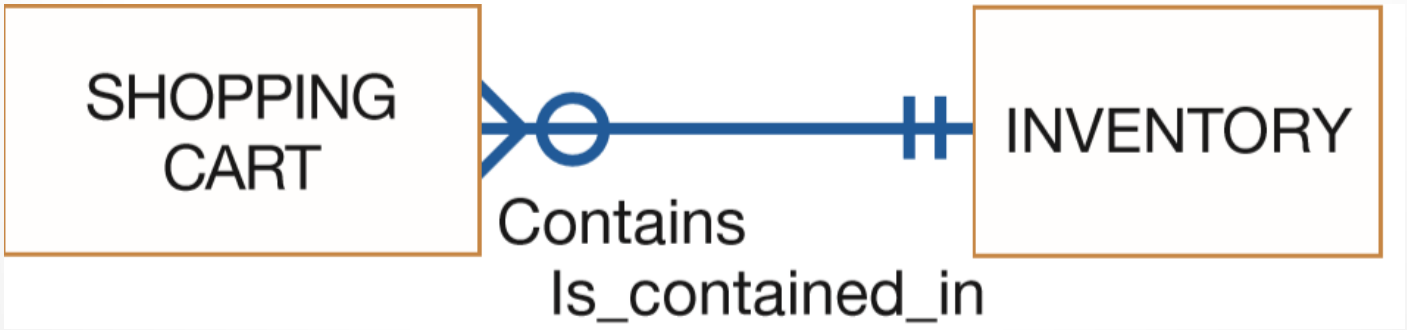
E-R Diagram: PVF Furniture Webstore

3. Construct E-R diagram for WebStore (cont.)**:**

o Interrelationships among 4 four entities (cont.):

4. SHOPPING CART – INVENTORY relationship

- Each Shopping Cart instance *contains* one and only one Inventory item
- Each Inventory item *is contained in* zero or many Shopping Cart instances



E-R Diagram: PVF Furniture Webstore

3. Construct E-R diagram for WebStore (cont.)**:**

o Draw E-R diagram (with entities):

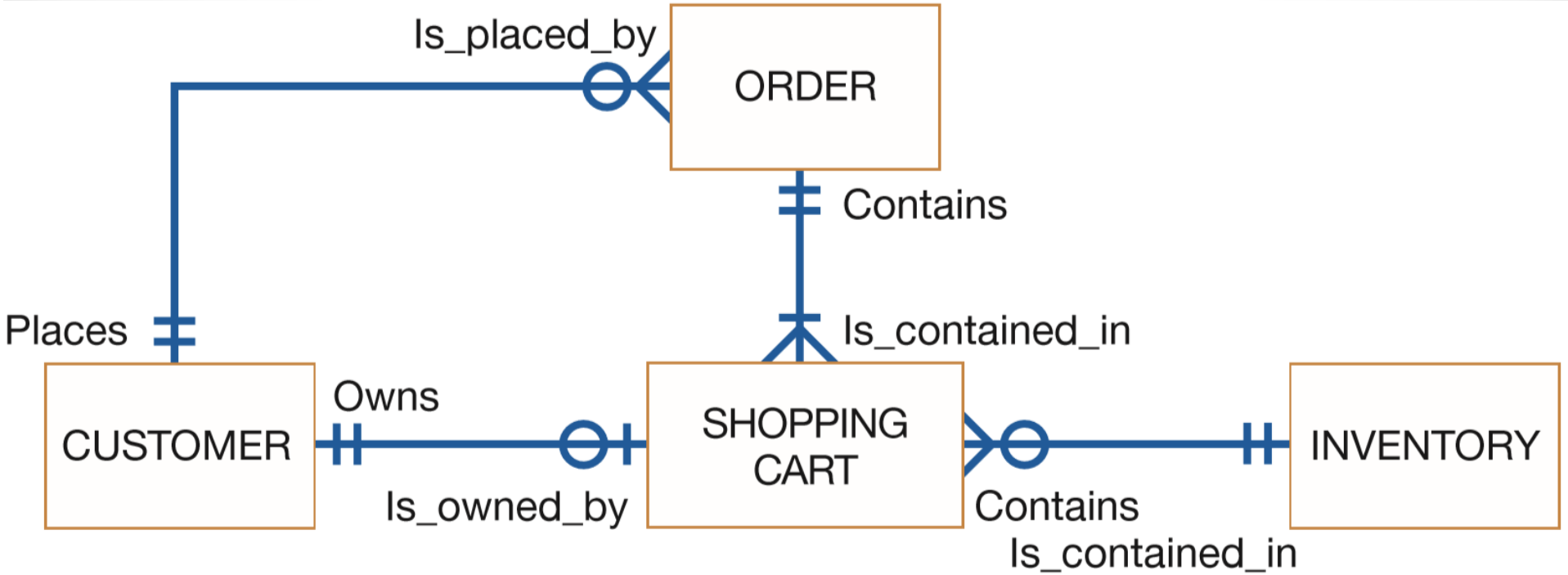


FIGURE 8-22
E-R diagram for the WebStore system

E-R Diagram: PVF Furniture Webstore

3. **Construct E-R diagram for WebStore** (cont.)**:**

   o Draw E-R diagram (with entities) – cont.:

   - Q: Can you now apply the E-R diagram to the Sample Customer Form?
   - Jim can then list specific attributes for each entity
   - then compare these lists with existing inventory, customer, and order database tables

Gathering Info. for Conceptual Data Modeling

FIGURE 8-4
Sample customer form

PVF CUSTOMER ORDER

ORDER NO: 61384 CUSTOMER NO: 1273

NAME: Contemporary Designs
ADDRESS: 123 Oak St.
CITY-STATE-ZIP: Austin, TX 28384

ORDER DATE: 11/04/2014 PROMISED DATE: 11/21/2017

PRODUCT NO	DESCRIPTION	QUANTITY ORDERED	UNIT PRICE
M128	Bookcase	4	200.00
B381	Cabinet	2	150.00
R210	Table	1	500.00

Videos to Watch

- **Entity Relationship Diagram (ERD) Tutorial - Part 1**
  https://youtu.be/QpdhBUYk7Kk
- **Entity Relationship Diagram (ERD) Tutorial - Part 2**
  https://youtu.be/-CuY5ADwn24
- **Entity-Relationship Diagrams** (another system)
  https://youtu.be/c0_9Y8QAstg
- **Entity Relationship Diagram (ERD) Training Video**
  https://youtu.be/-fQ-bRllhXc

Sources

- **Modern Systems Analysis and Design**. Joseph S. Valacich and Joey F. George. Pearson. Eighth Ed. 2017. Chapter 8.