

~~CSCI 760 Database Systems~~

~~Database Design Project~~

~~Holt Distributors has determined that a database should be designed to handle the new requirements. A database is needed that will satisfy the following requirements.~~

~~General Description.~~

~~Holt Distributors is a distributor. It buys products from its vendors and sells these products to its customers. The Holt Distributors operation is divided into territories. Each customer is represented by a single sales rep, who must be assigned to the territory in which the customer resides. Although each sales rep is assigned to a single territory, more than one may be assigned to the same territory.~~

~~When a customer places an order, the order is assigned a number. The customer number, the order number, the customer purchase order (PO) number, and date are entered. (Customers can place orders by sending in a purchase order. For orders that are placed in this fashion, the PO number is recorded.) For each part that is ordered, the part number, quantity, and quoted price are entered. (When it is time for the user to enter the quoted price, the price from the master price list for parts is displayed on the screen. If the quoted price is the same as the actual price, no special action is required. If not, the user enters the quoted price.) The order may also contain special charges, for which a description of the charge and the amount of the charge is entered. Finally, an order may include comments, in which case the comment is entered. Following this, a form is printed that is a combination order acknowledgment/picking list. This form, which is shown in Figure 1, is sent to the customer as a record of the order he or she has placed. A copy of the form is also used when the time comes to "pick" the merchandise that was ordered in the warehouse.~~

~~Until the order is filled, it is considered to be an open order. When the order is filled (which may be some time later), it is said to be released. At this point, an invoice (bill) is printed and sent to the customer, and the customer's balance is increased by the amount of the invoice. The order may have been filled completely or it may have been partially filled (for less than the full amount originally requested). In either case, since the goods have been shipped, the order is considered to have been filled and is no longer considered an open order. (Another possibility is to allow back orders when the order cannot be completely filled. In this case, the order would remain open but only for the back-ordered portion. Holt Distributors does not allow back orders, however.) When an invoice (see Figure 2) is generated, the order is removed from the file of open orders. Summary information is stored concerning the invoice (number, date, customer, invoice total, shipping and tax) until the end of the month. Many companies employ~~

basically two methods for accepting payments from customers: open items and balance forward. In the open-item approach, customers make payments on specific invoices. An invoice remains on file until it is completely paid. In the balance forward approach, customers simply have balances. When an invoice is generated, the customer's balance is increased by the amount of the invoice. When a payment is made, the customer's balance is decreased by the amount of the invoice. Holt Distributors uses the balance-forward approach.



Figure 1

At the end of each month, customers' accounts are updated and aged. (The description of month-end processing in the requirements that follow contains details of the update and aging process.) Statements, an aged trial balance (defined under report requirements), a monthly cash receipts journal, a monthly invoice register, and a sales rep commission report are printed. Cash receipts and invoice summary records are then removed from the database. Month-to-date fields are set to zero. If it is also the end of the year, year-to-date fields are set to zero.

Invoice					
5/30/2013		Holt Distributors 146 Nelson Place Bronston, MI 49802		Invoice No. : 11290	
Sold To: Smith Rentals 153 Main Street Suite 102 Grandville, MI 49494		Ship to: A & B Supplies 251 Halton PL. Arendville, MI 49232			
Cust. No.	P.O.No.	Order Date	SLS-REP		
1342	335	05/25/2013	10-Sam Brown		
Item No.	Description	Unit Price	Order-Qty	Ship-Qty	Amount
AT414	Lounge Chair	42.00	6	4	168.00
BT222	Arm Chair	51.00	4	4	204.00
				Shipping	25.00
				Tax	24.50
Comment:				Total:	421.50

Figure 2 _____

~~Transaction Requirements.~~ The following are the transaction requirements.

- ~~1. Enter/edit territories (territory number and name).~~
- ~~2. Enter/edit sales reps (sales rep number, name, address, city, state, ZIP, MTD sales, YTD sales, MTD commission, YTD commission, and commission rate). Each sales rep represents a single territory. (MTD stands for month-to-date and YTD stands for year-to-date.)~~
- ~~3. Enter/edit customers (customer number, name, first line of address, second line of address, city, state, ZIP, MTD sales, YTD sales, current balance, and credit limit). A customer may have a different name and address to which goods will be shipped, called the "ship to" address. Each customer has a single sales rep and resides in a territory. The sales rep must represent the territory in which the customer resides.~~
- ~~4. Enter/edit parts (part number, description, price, MTD and YTD sales, units on hand, units allocated, and reorder point). Units allocated are the number of units that are currently "spoken for"; that is, the number of units of this part that are currently~~

~~present on some open orders. The reorder point is the lowest value acceptable for units on hand without reordering the product.~~

- ~~5. Enter/edit vendors (vendor number, name, address, city, state, ZIP). In addition, for each part supplied by the vendor, enter/edit the part number, the price the vendor charges for the part, the minimum order quantity that the vendor will accept for this part, and the expected lead time for delivery of this part from this vendor.~~
- ~~6. Order entry (order number, date, customer, customer PO number, and the order detail lines). An order detail line consists of a part number, description, number ordered, and quoted price. The system should calculate and display the order total. After all orders for the day have been entered, customer order report (see Figure 1) is printed. In addition, for each part ordered, the units allocated for the part must be increased by the number of units that were ordered~~
7. Invoicing cycle:
 - ~~a. Enter the numbers of the orders to be released. For each order, enter the ship date for invoicing, the shipping charge and tax. Indicate whether the order is to be shipped in full or partially shipped. If it is to be partially shipped, enter the number shipped for each order detail line. The system will generate a unique invoice number for this invoice.~~
 - ~~b. Print invoices for each of the released orders. A sample invoice is shown in Figure 2.~~
 - c. Update files with information from the invoices just printed. For each invoice, the invoice total is added to the current invoice total, the current balance, and MTD and YTD sales for the customer who placed the order. The total is also added to MTD and YTD sales for the sales rep who represents the customer, and the total multiplied by the sales rep's commission rate, is added to MTD commission earned and YTD commission earned. For each part shipped, units on hand and units allocated are decremented by the number of units of the part that were shipped. MTD and YTD sales of the part are increased by the product of the number of units shipped and the quoted price.
 - d. Create invoice summary record for each invoice printed. These records contain the invoice number, date, customer number, sales rep, and invoice total.
 - e. Delete all the released orders.
8. Receive payments on account (customer number, date, amount). Each payment is assigned a number. The amount of the payment is added to the total of current payments for the customer and is subtracted from the current balance of the customer.

Commented [N1]: Customer info. Maybe customer number

Commented [N2]: Rep info. Sales_rep number

~~Report Requirement. The following are the report requirements:~~

1. Territory list. For each territory, list the number and name of the territory, the number, name, and address of each of the sales reps in the territory, and the number, name, and address of each of the customers represented by these sales reps.
2. Customer master list. For each customer, list the number and both the address and the ship-to address. Also list the number, name, address, city, state, and ZIP of the sales rep who represents the customer as well as the number and name of the territory in which the customer resides.
3. Open orders by customer. This report lists open orders organized by customer and is shown in Figure 3.

05/30/2013 Page: 1

**Holt Distributors
Customer Open Order Report**

Cust. No.	Order No.	Item No.	Description	Order Date	Order Qty	Price
1342	12424	AT414	Lounge Chair	04/25/2013	6	42.00
1342	12424	BT222	Arm Chair	04/25/2013	4	51.00
1358	13564	BT203	Bar Table	04/27/2013	2	328.00

Figure 3

4. Open orders by item. This report lists open orders organized by item. sort open orders by item
5. Daily invoice register. For each invoice produced on a given day, list the invoice number, the invoice date, the customer number, the customer name, the sales amount, and the invoice total. A sample of this report is shown in Figure 4.
sort invoices by date

6. Monthly invoice register. The monthly invoice register has the same format as the daily invoice register but includes all invoices for the month.

05/21/2013	Holt Distributors Daily Invoice Register for 05/20/2013		Page: 1
Invoice No.	Customer No.	Customer Name	Invoice Amount
11200	1342	Smith Rentals	329.50

Figure 4

7. Stock status report. For each part, list the part number, description, price, TD and YTD sales, units on hand, units allocated, and reorder point. For each part for which the number of units on hand is less than the reorder point, an asterisk should appear at the far right of the report.
8. Reorder point list. This report has the same format as the stock status report. Other than the title, the only difference is that parts for which the number of units on hand is greater than or equal to the reorder point will not appear on this report.
9. Vendor report. For each vendor, list the vendor number, name, address, city, state, and ZIP. In addition, for each part supplied by the vendor, list the part number, description, the price the vendor charges for the part, the minimum order quantity that the vendor will accept for this part, and the expected lead time for delivery of this part from this vendor.
10. Daily cash receipts journal. For each payment received on a given day, list the number and name of the customer who made the payment, together with the amount of the

payment. A sample of the report is shown in Figure 5.

05/31/2013		Holt Distributors		Page: 1	
Daily Cash Receipts for 05/30/2013					
Payment No.	Customer No.	Customer Name		Payment Amount	
04238	1342	Smith Rentals		3000.00	

Figure 5

11. Monthly cash receipts journal. The monthly cash receipts journal has the same format as the daily cash receipts journal but includes all cash receipts for the month.

~~12. Customer mailing labels.~~

~~13. Statements. Monthly statements are to be produced; a sample is shown in Figure 6.~~

14. Monthly sales rep commission report. For each sales rep, list his or her number, name, address, MTD sales, YTD sales, MTD commission earned, YTD commission earned, and the commission rate.

15. Aged trial balance. The aged trial balance is a report containing the same information that is printed on the statements.

~~Month-End Processing. Month-end processing consists of taking the following actions at the end of each month.~~

~~1. Update customer account information. In addition to the customer's credit limit, the system must maintain the actual balance, current invoice total, and current payment total whenever an invoice is produced or a payment is received. Monthly statements~~

~~are printed.~~

MONTHLY STATEMENT		Holt Distributors		5/31/2013
		146 Nelson Place		
		Bronston, MI 49802		
Cust. No.: 1342				
Smith Rentals				
153 Main Street				
Suite 102				
Grandville, MI 49494				
Inv/Pymt No.	Date	Type	Amount	Balance
11200	5/20/2013	invoice	329.50	1421.50
04238	5/30/2013	payment	3000.00	1578.50CR
11290	5/30/2013	invoice	421.50	1157.00CR
11355	5/31/2013	invoice	1499.00	342.00
Credit Limit	Prev. Balance	Current Invoice	Current Payment	Current Balance
5000.00	1092.00	2250.00	3000.00	342.00
Comment:				

~~Figure 6~~

- ~~The current invoice total is set to zero, the current payment total is set to zero, and the previous balance is set to the current balance in preparation for the coming month.~~
- ~~Print the monthly invoice register and the monthly cash receipts journal.~~
- ~~Print a monthly sales rep commission report.~~
- ~~Zero out all MTD fields. If it also happens to be year end, zero out all YTD fields.~~
- ~~Remove all cash receipts and invoice summary records. (In practice, such records would be moved to historical type of database in order to allow for the possibility of future reference. For the purpose of this illustration, we have disregarded this fact.)~~

Holt Distributors Database Design

- Step 1: Identify entities.

Q: How many entities are needed?

1. Territory

2. Sales Representative

3. Customer

4. Order

5. Item

6. Invoice

7. Payment

8. Vender

Holt Distributors Database Design

- Step 2: Define all relationships

Territory $\leftarrow \rightarrow$ Sales Representative

sales rep belongs to one territory

A territory has many sales representatives. However, a representative works only in a territory.

Customer $\leftarrow \rightarrow$ Sales Representative

a customer belongs to one sales rep

A sales representative will have many customers. However, a customer is assigned to a sales representative.

Customer $\leftarrow \rightarrow$ Payment

a payment belongs to one customer

A customer may make many payments. A payment is, however, for a customer only.

Customer $\leftarrow \rightarrow$ Order

an order belongs to one customer

A customer can place many orders. An order is, however, for a customer only.

Holt Distributors Database Design

- Step 2: Define all relationships (cont'd)

Order $\leftarrow \rightarrow$ Invoice

an invoice belongs to one order

An order receives one invoice. One invoice is for one order.

Order $< >$ Item

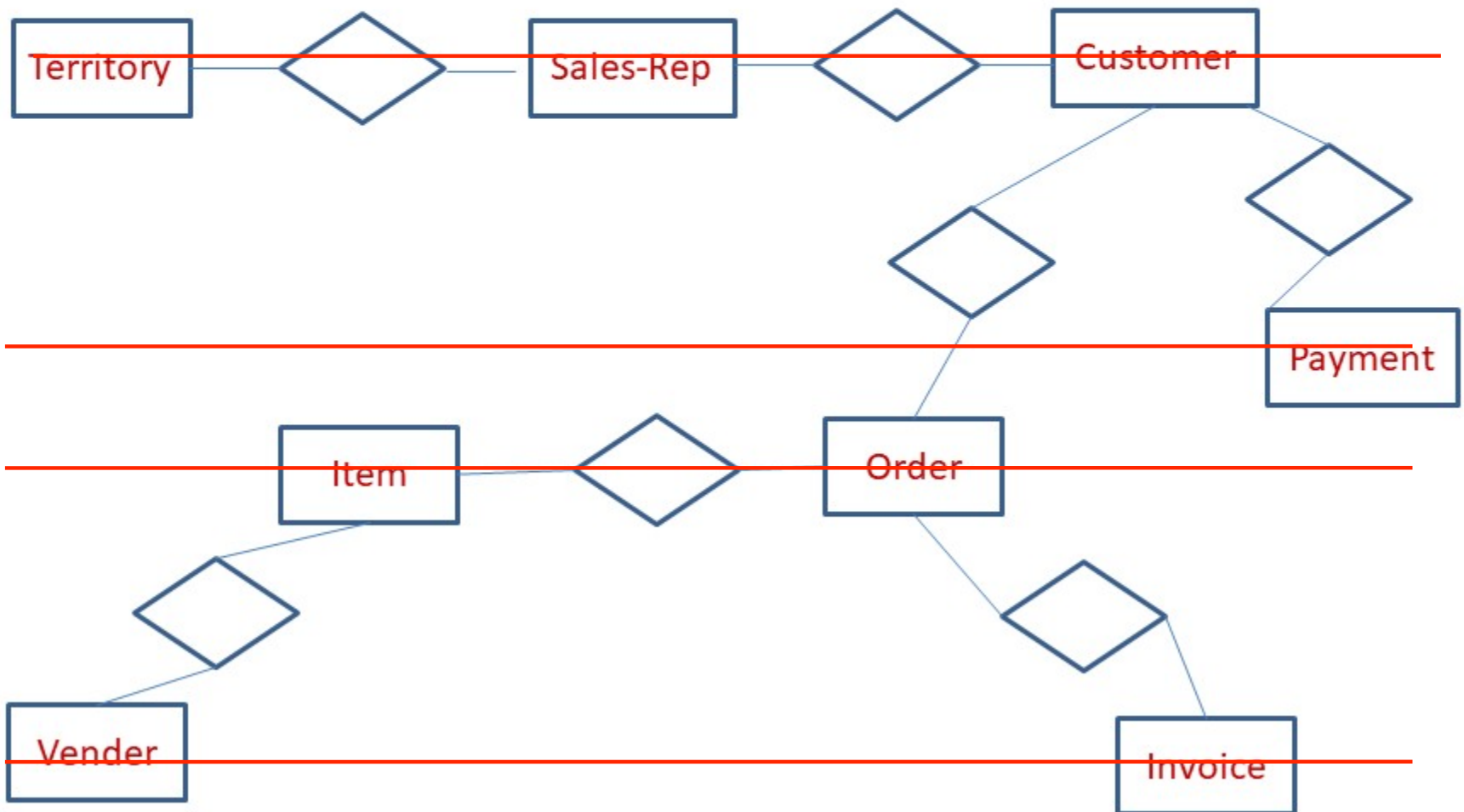
An order can include many items. An item can be requested by many orders.

Item $\leftarrow \rightarrow$ Vender

An item can be supplied by many vendors. A vendor can supply many items.

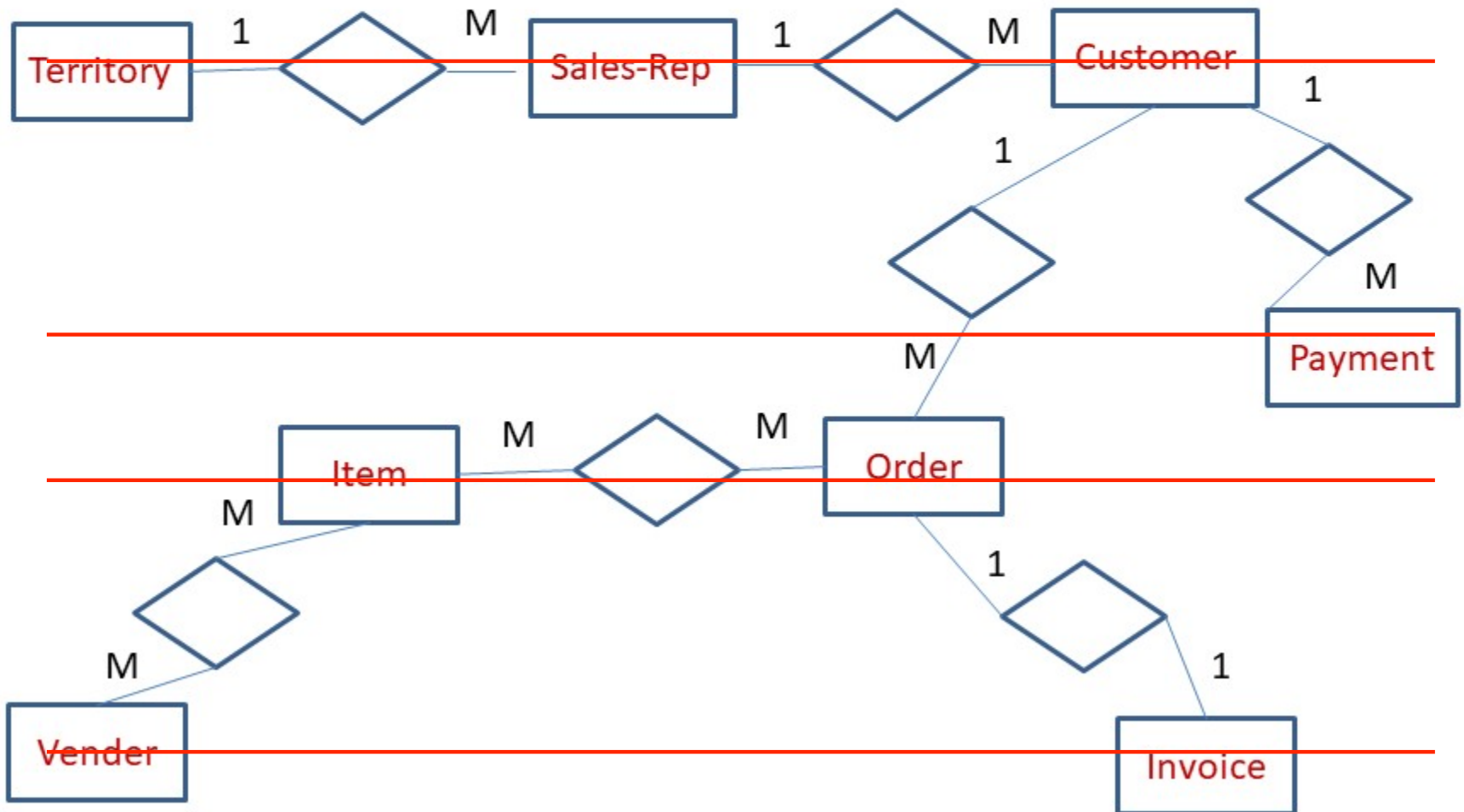
Holt Distributors Database Design

- Step 3: Draw the Entity-Relationship Diagram



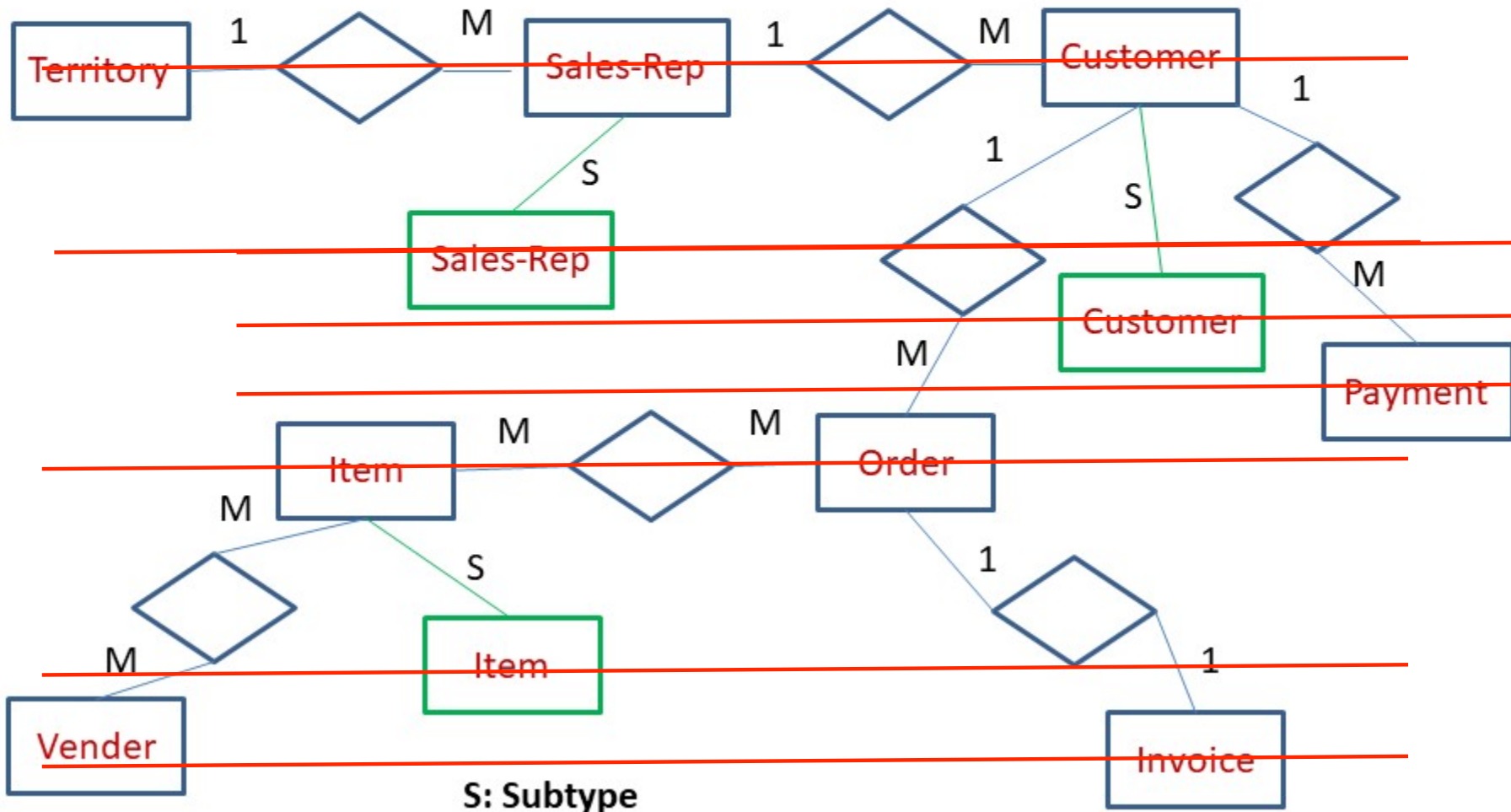
Holt Distributors Database Design

- Step 4: Define the cardinalities



Holt Distributors Database Design

- Step 5: Define the subtypes for some entities



Holt Distributors Database Design

- Step 6: Define the attributes

Customer_Number → Customer_sold_to_name
Customer_sold_to_address_line_1
Customer_sold_to_address_line_2
Customer_sold_to_city
Customer_sold_to_state
Customer_sold_to_zip
Customer_sales_rep_number

Subtype:

Customer_Number → Customer_MTD_sales
Customer_YTD_sales
Customer_balance
Customer_credit_limits
Customer_total_invoice
Customer_payment

Holt Distributors Database Design

- Step 6: Define the attributes

Item_Number → Item_description
Item_price

Subtype:

Item_Number → MTD_sales
YTD_sales
units_on_hand
units_allocated
reorder-point

Invoice_Number → invoice_date
order_number
ship_charge
Tax
total

Holt Distributors Database Design

- Step 6: Define the attributes

order_number → order_date

Customer_sold_to_name

Customer_PO_number

Customer_ship_to_name

Customer_ship_to_address_line_1

Customer_ship_to_address_line_2

Customer_ship_to_city

Customer_ship_to_state

Customer_ship_to_zip

order_Number, item_number → item_quality_order

(filled in when order is entered)

item_quality_shipped

(filled in during invoicing)

item_sales_price

(filled in when order is entered)

Holt Distributors Database Design

- Step 6: Define the attributes

Territory_number → territory_name

sales_rep_number → rep_name
rep_address
rep_city
rep_state
rep_zip
territory_number

Subtype:

sales_rep_number → MTD_sales
YTD_sales
MTD_commission
YTD_commission
Commission_rate

Holt Distributors Database Design

- Step 6: Define the attributes

vender_number → vender_name
vender_address
vender_city
vender_state
vender_zip

Vender_number, item_number → vender_item_price
minimum_order_quality
lead_time

payment_number → customer_number
payment_date
payment_amount