Lambton College

Database Design and SQL
2021F CSD 2206 1

Professor: Rachida Amjoun

Term Project

The Shoe Store

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Project Description

Our goal is to design MySQL database system for an e-commerce shoe store. Store requirements have been listed below:

1. Only a registered user can place an order and the order is required to be delivered to a saved address. Orders can be assigned to any shipping vendor that delivers at the given address.
2. Each customer should be able to store multiple addresses and label them like “home”, “work”, “John’s home” etc. Every address has a delivery preference time linked to it. Like, maybe at “home” we can deliver all day long but at “work” we should deliver only between 10am-4pm.
3. An order can have multiple inventory items.
4. Customers will be offered discounts based on the coupon code entered by the user. The discount amount should be divided by percentage and assigned to each item in the order.
5. Each order will have order status assigned to it. Delivery guy, customer service representative or admin will manually update the order status in few case flows. We need to store the latest status for the order with a full history of all status updates. In case of manual status updates, we need to store identification details of the company agent updating the order status.
6. Users should be able to add reviews on the products. The reviews can be anonymous too.
7. Invoice for the order must be generated and emailed to the customer once the order is completely delivered. Order invoice should have information about the product, its unit price, tax amount and total order amount. Invoice number and invoice generation time might also be required for audit purposes.
8. The company has multiple warehouses spread across Canada. Each warehouse houses different inventory items, and it is managed by a warehouse manager. Please note that same inventory might be strategically stored at multiple warehouses to improve the delivery time.

Company Overview and Product

Company Name

The Shoe Store

Company Overview/Description

We aim to launch the ultimate destination for footwear and lifestyle, being host to a wide array of shoe merchandise collection including sneakers, formals, outdoor and sports shoes, etc. Our online store brings you the latest shoes that fit everyone's needs.

Product

- Footwear:
  All footwear in the inventory has been categorized into following shoe categories:
    - Sneakers
    - Boots
    - Flip Flops
    - Crocs
    - Slippers
    - Sandals
    - Moccasins
    - Snow Boots
- Footwear Accessories
  We are also home to all kind of footwear care products that will help our customers to take care of their shoes better. Some in-store shoe care products are shoe shiner spray, leather cream, shoe care kit and shoe brushes. We also have personalization accessories like shoe insole, shoe travel bags, shoelaces etc.

Product Attributes

All stock keeping unit (SKU) will have following attributes in the database:

1. sku_id: id assigned to each sku
2. name: name of the product.
3. type: type of product: Shoe or Accessory
4. size: (*optional*) size can be US shoe size like (8, 8.5, 9, 9.5 etc.) if the sku is of type shoe else the size would be one of S (small), M (medium), L (large). If the size is Null, then that means that product comes in universal size.
5. brand: company of the product
6. gender: (*optional*) gender can M(male), F(female) or Null, if the product is unisex.
7. color: (*optional)* color of product
8. price: price before taxes per unit
9. ankle_height: shoe height. Low by default

Customer Sales Invoice

INVOICE

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THE SHOW STORE

Date:	Dec 8, 2021
Due Date:	Dec 24, 2021
PO Number:	#1125
Balance Due:	**$0.00**

Bill To:
39 COPPER LEAF STREET,KITCHENER,N2E3T4,,ON CANADA

Ship To:
39 COPPER LEAF STREET,KITCHENER,N2E3T4,,ON CANADA

Item	Quantity	Rate	Amount
JORDAN MAN BLACK SIZE 10	1	$200.00	$200.00
NIKE_AIR WOMEN WHITE SIZE 7	1	$150.00	$150.00
JIMMY_CHOO WOMEN GREY SIZE 8	1	$985.00	$985.00

Subtotal:	$1,335.00
Tax (13%):	$173.55
Total:	$1,508.55
Amount Paid:	$1,508.55

Notes:
replace item within 15 days of your purchase if needed

Terms:
due date is 25 dec 2021

Figure 1: Sample Invoice

ERD Including M:M Relationships

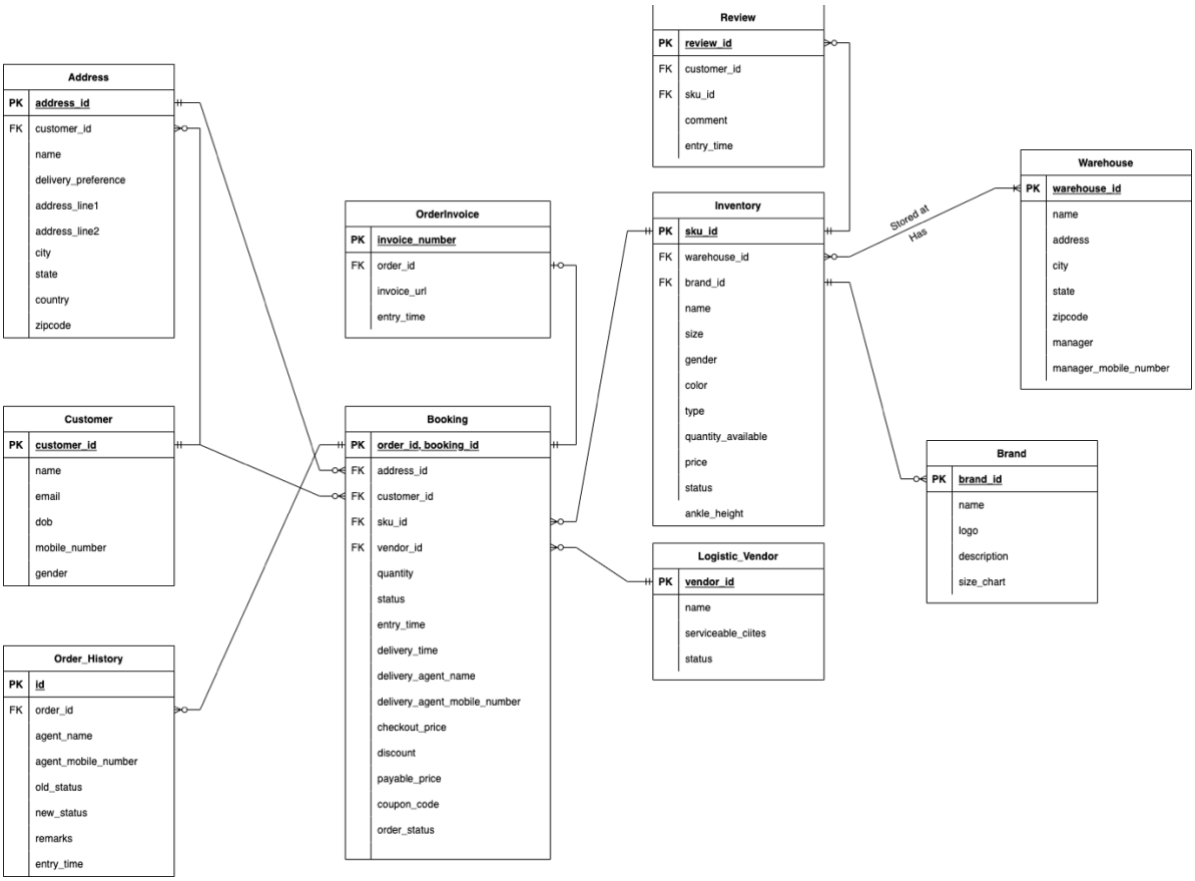


Figure 2: ERD with M:M relationships

ERD M:M Relationships Resolved

Our database model has only one many to many relationships between inventory and warehouse.

Inventory must be stored at 1 or many warehouses.

Also, a warehouse has 0 to many boxes of same inventory

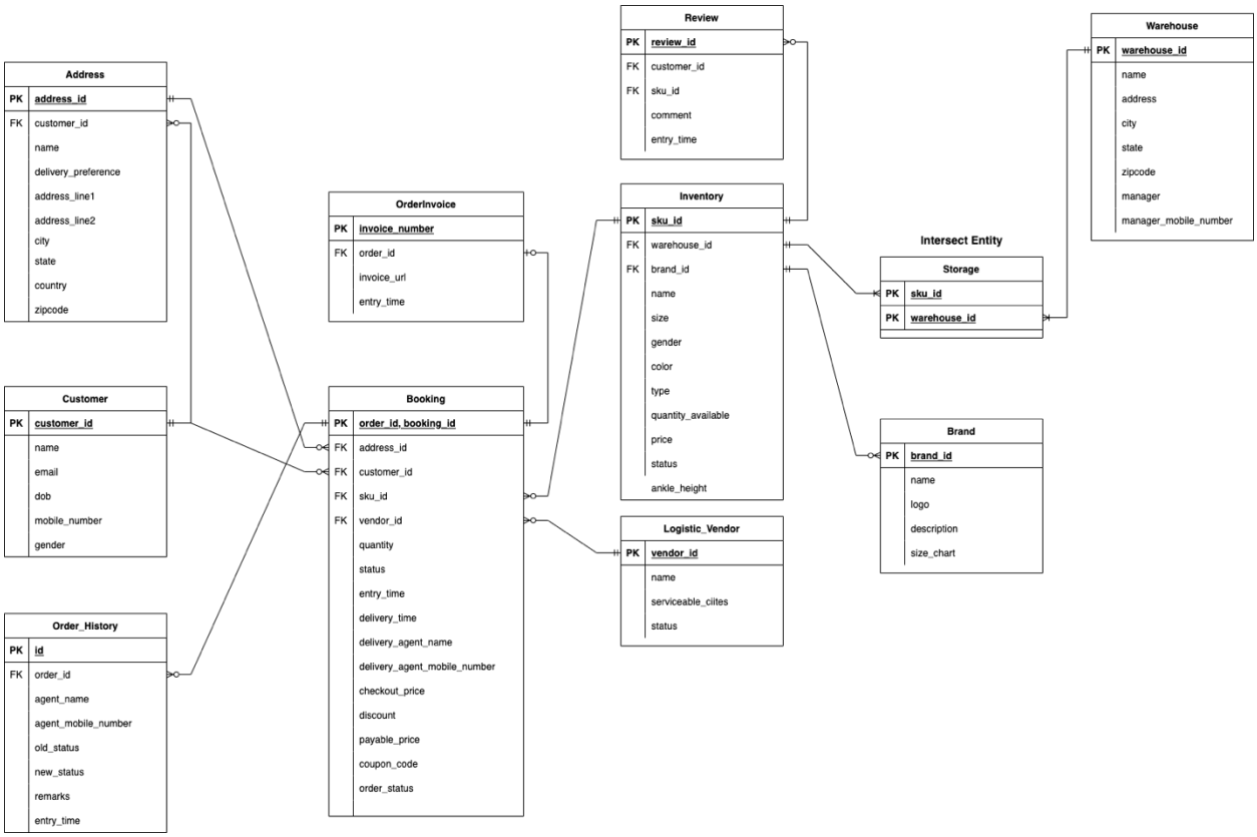


Figure 3: ERD without M:M relationship

ER Language

- Each customer may have zero to many addresses saved in their account.
- Every address must be assigned to one and only one customer.
- Each address may have zero to many orders delivered.
- A booking must have one and only one address assigned to it.
- A customer may have zero to many bookings.
- Each booking must be placed by one and only one customer.
- Each booking may have zero to many entries in order history
- Every order history must be assigned to only one booking.
- A booking might have zero to one order invoice.
- Each order invoice must belong to one and only one booking.
- Every booking must be assigned to one and only one logistic vendor.
- A logistic vendor may be assigned zero to many bookings.

- An inventory may have zero to many reviews.
- A review must be for one and only one inventory.
- Each inventory items must be manufactured by one and only one brand.
- A brand may have zero to many items in the inventory.
- Each warehouse must have one to many storage stacks.
- Each inventory item may be stored at zero to many storage stacks.
- A storage stack must belong to one and only one warehouse and each storage stack must belong to one and only item in inventory.

Relational Model

We have defined a few Enum data types in our database. All Enums are listed below and will be used as a reference in the document.

ENUMS:

1. *gender*: (“male”,” female”, “other”)
2. *delivery_preference*: ('morning(7-11am)', 'afternoon(10am-4pm)','evening(4pm-9pm)' 'allday(7am-9pm)')
3. *inventory_type:* ("sneakers", "boots", "flip flops", "crocs", "slippers", "sandals", "moccasins", "snow boots", “accessories”)
4. *status:* ('active', 'inactive')
5. *shoe_ankle_height:* (“low”, “medium”, “high”)
6. *order_status:* ('placed', 'ready_to_ship', 'shipped', 'out_for_delivery', 'delivered')
7.

All tables (entities) have been mentioned below with all column names (attributes), their data types and constraints on each column.

1.

Customer (Details of the customers)					
Key Types	**Optionality**	**Column Name**	**Data Type**	**Length/Format**	**Default Value**
pk	*	customer_id	integer/decimal	(5,0)	
	*	name	varchar	50	
uk	*	email	varchar	50	
	*	dob	date	YYYY-MM-DD	
	O	mobile_number	integer/decimal	(10,0)	NULL
	O	gender	ENUM- gender		NULL

2.

Address (Address details for customer addresses)					
Key Types	**Optionality**	**Column Name**	**Data Type**	**Length/Format**	**Default Value**
pk	*	address_id	integer/decimal	(5,0)	
fk	*	customer_id	integer/decimal	(5,0)	
	O	name	varchar	50	Address
	*	delivery_preference	ENUM-delivery_preference	YYYY-MM-DD	
	*	address_line1	varchar	50	
	O	address_line2	varchar	50	NULL
	*	city	varchar	20	
	*	state	varchar	20	
	*	country	varchar	20	
	*	zipcode	varchar	6	

3.

Brand (Company of the inventory product)					
Key Types	**Optionality**	**Column Name**	**Data Type**	**Length/Format**	**Default Value**
pk	*	brand_id	integer/decimal	(5,0)	
	*	name	varchar	50	
	O	logo	varchar	100	NULL
	O	brand_description	varchar	500	NULL
	O	size_chart	varchar	100	NULL

4.

Inventory					
Key Types	**Optionality**	**Column Name**	**Data Type**	**Length/Format**	**Default Value**
pk	*	sku_id	integer/decimal	(5,0)	
fk	*	brand_id	integer/decimal	(5,0)	
fk	*	warehouse_id	integer/decimal	(5,0)	
	*	name	varchar	50	
	O	size	integer/decimal	(3,1)	NULL
	O	gender	ENUM- gender		NULL
	O	color	varchar	20	NULL
	*	type	ENUM-inventory_type		
	*	quantity_available	integer/decimal	(5,0)	
	*	price	integer/decimal	(5,2)	
	*	status	ENUM- status		
	O	ankle_height	ENUM- shoe_ankle_height		

5.

Logistic Vendor (Procurement and shipping vendors)					
Key Types	**Optionality**	**Column Name**	**Data Type**	**Length/Format**	**Default Value**
pk	*	vendor_id	integer/decimal	(5,0)	
	*	name	varchar	50	
	*	serviceable_cities	varchar	1000	
	*	status	ENUM- status		

6.

Booking					
Key Types	**Optionality**	**Column Name**	**Data Type**	**Length/Format**	**Default Value**
pk	*	booking_id	integer/decimal	(5,0)	
pk	*	order_id	integer/decimal	(5,0)	
fk	*	customer_id	integer/decimal	(5,0)	
fk	*	address_id	integer/decimal	(5,0)	
fk	*	sku_id	integer/decimal	(5,0)	
	*	quantity	integer/decimal	(5,0)	
fk	O	vendor_id	integer/decimal	(5,0)	NULL
	*	order_status	ENUM-order_status		
	O	entry_time	integer/decimal	(10,0)	UNIX_TIMESTAMP()
	O	delivery_time	integer/decimal	(10,0)	NULL
	O	delivery_agent_name	varchar	50	NULL
	O	delivery_agent_mobile_number	integer/decimal	(10,0)	NULL
	*	checkout_price	decimal	.2f	

7.

Order History (Maintain log of all status updates)					
Key Types	**Optionality**	**Column Name**	**Data Type**	**Length/Format**	**Default Value**
pk	*	id	integer/decimal	(5,0)	
fk	*	Booking_id	integer/decimal	(5,0)	
	O	agent_name	varchar	20	NULL
	O	agent_mobile_number	integer	(10,0)	NULL
	O	old_status	ENum: order_status		NULL
	*	new_status	ENum: order_status		NULL
	O	remarks	varchar	100	
	O	entry_time	integer	(10,0)	UNIX_TIMESTAMP()

8.

Review					
Key Types	**Optionality**	**Column Name**	**Data Type**	**Length/Format**	**Default Value**
pk	*	review_id	integer/decimal	(5,0)	
fk	O	customer_id	integer/decimal	(5,0)	NULL
fk	*	sku_id	integer/decimal	(5,0)	
	*	review	varchar	1000	
	O	entry_time	integer	(10,0)	UNIX_TIMESTAMP()

9.

Warehouse					
Key Types	**Optionality**	**Column Name**	**Data Type**	**Length/Format**	**Default Value**
pk	*	warehouse_id	integer/decimal	(5,0)	
	*	name	varchar	50	
	*	address	varchar	1000	
	*	state	varchar	20	
	*	city	varchar	20	
	*	zipcode	integer	(6,0)	
	O	manager	varchar	50	NULL
	O	manager_mobile_number	integer	(100,0)	NULL

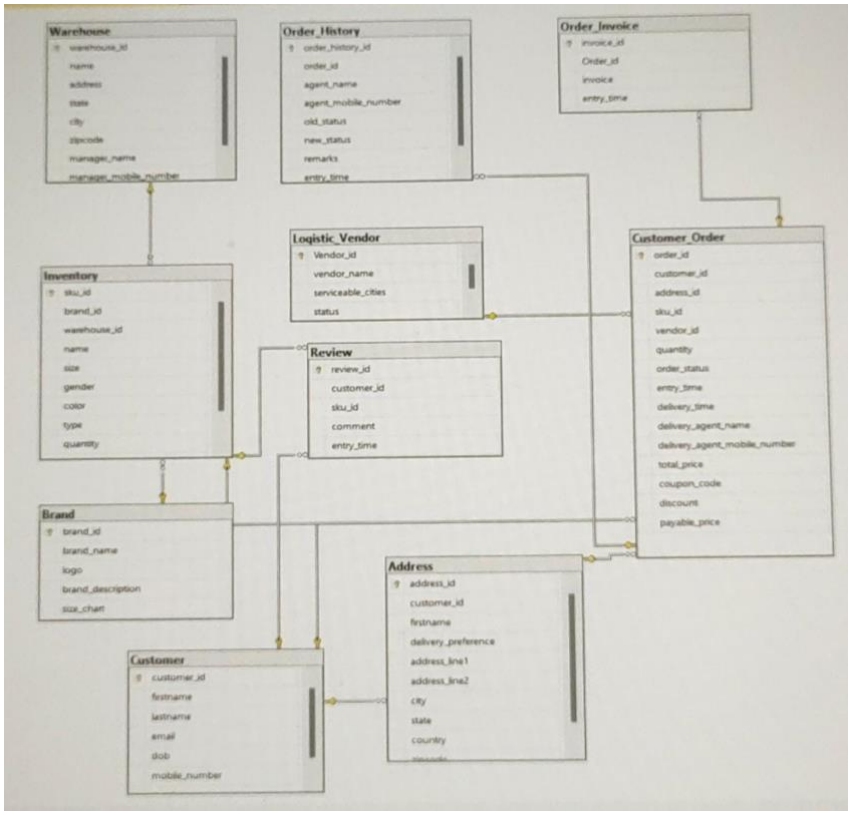
10.

Warehouse					
Key Types	**Optionality**	**Column Name**	**Data Type**	**Length/Format**	**Default Value**
pk	*	warehouse_id	integer/decimal	(5,0)	
	*	name	varchar	50	
	*	address	varchar	1000	
	*	state	varchar	20	
	*	city	varchar	20	
	*	zipcode	integer	(6,0)	
	O	manager	varchar	50	NULL
	O	manager_mobile_number	integer	(100,0)	NULL

11.

Order Invoice					
Key Types	**Optionality**	**Column Name**	**Data Type**	**Length/Format**	**Default Value**
pk	*	invoice_number	integer/decimal	(5,0)	
fk	*	order_id	integer/decimal	(5,0)	
	*	invoice_url	varchar	100	
	O	entry_time	integer	(10,0)	UNIX_TIMESTAMP( )

Relational Schema



Business Rules and Constraints

- **Business Rule**: Only a registered user can place an order.

Constraint: *customer_id* column in Booking/Order table has been set to **Not Null** and **Foreign Key**, that references the customer_id primary key column in Customer table.

Same "not null" and "foreign key" constraint has been enforced on multiple columns in different tables in the database. I have mentioned a few business rules and constraints used to enforce them, down below:

1. **Business Rule**: The order is required to be delivered to a saved address.

Constraint: *address_id* column in Booking/Order table has been set to **Not Null** and **Foreign Key**, that references the customer_id primary key column in Address table.

2. **Business Rule**: Orders can be assigned to any shipping vendor that delivers at the given address.

Constraint: *vendor_id* column in Booking/Order table has been set to **Not Null** and **Foreign Key**, that references the vendor_id primary key column in Logistic Vendor table.

3. **Business Rule**: Users should be able to add reviews on the products. The reviews can be anonymous too.

Constraint: *customer_id* column in Review table has been set to **Foreign Key**, that references the customer_id primary key column in Customer table. The column is optional with a **Default** value as **Null.** This will enable users to add anonymous review to the products.

Meanwhile, *sku_id* column in Review table has been set to **Not Null** and **Foreign Key**, that references the sku_id primary key column in Inventory table, which means having a product item is mandatory to add review.

- **Business Rule**: A customer can have 1 account per email. This is done to avoid duplicate accounts.

Constraint: *email* column in Customer table has been set to **Not Null** and **Unique Key**, that ensures that no duplicate values of email exists in the table.

There are other attributes that have been constrained to be unique, most of them are primary key, so we don't have to enforce the Unique and Not Null constraint explicitly.

Example: *Invoice Number* should be ***unique*** *and* **not null.** So, *invoice_number* column is being used as **Primary Key** in order invoice table.

- **Business Rule**: order_status should be one of these ('placed', 'ready_to_ship', 'shipped', 'out_for_delivery', 'delivered')

Constraint:

```
Add constraint order_status_ck
CHECK order_status IN ('placed', 'ready_to_ship', 'shipped',
'out_for_delivery', 'delivered')
```

The above check constraint clause, will make sure that only valid order status gets entered into the order_status column .Similar checks has been applied on other columns like *inventory_status*, *gender* etc.