Department of Electrical, Computer, & Biomedical Engineering

Faculty of Engineering & Architectural Science

Ryerson University

Course Title:	Fundamentals of Data Engineering
Course Number:	COE 848
Semester/Year (e.g.F2016)	W2021

Instructor:	Dr. Faezeh Ensan

Assignment/Lab Number:	3
Assignment/Lab Title:	Database Design

Submission Date:	March 2, 2021
Due Date:	March 2, 2021

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Design of the Project:

The objective of this data base is to document the various product orders via an e-commerce company like Amazon. Amazon has been known for quite some time now for it's commercial success in it's e-commerce operations dealing with millions of products everyday Using the ERD created in lab 2, the basic structures of the tables were created. Using NetBeans application, the database was constructed.
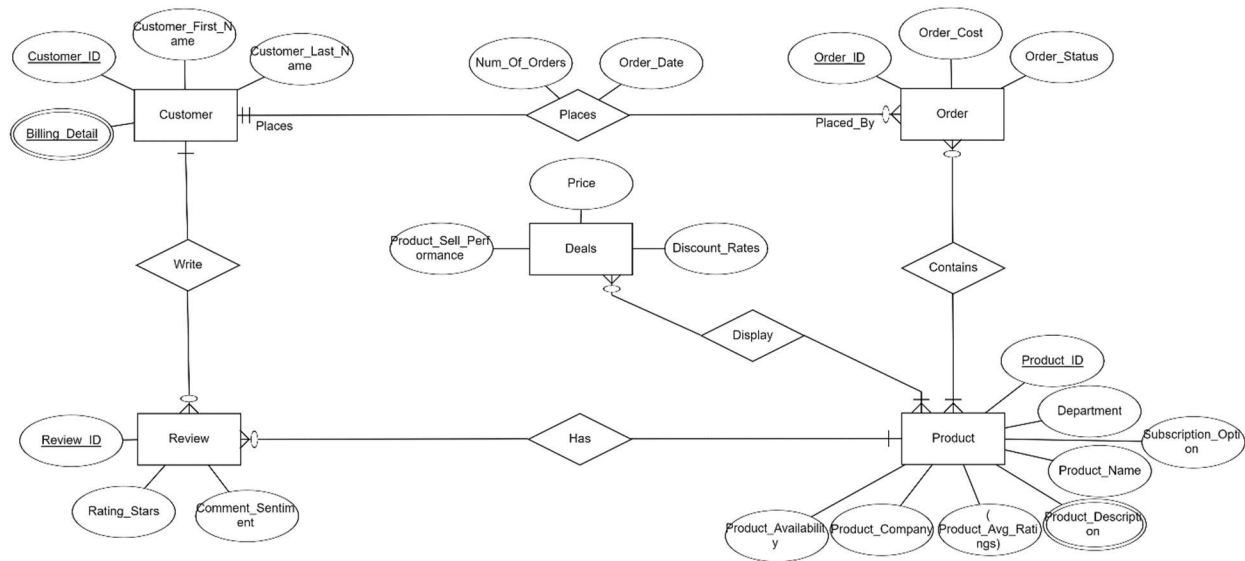

Figure 1: Entity-Relationship Diagram (ERD) of an e-commerce platform such as Amazon

Using Figure 1, the database schema was created in which primary keys will be <u>underlined</u> and foreign keys will be **bolded**. The relationships with the entities are also discussed.

```sql
1
2  PRAGMA foreign_keys = OFF;
3  BEGIN TRANSACTION;
4
5  -- ENTITY Table: Customer
6  CREATE TABLE Customer (
7      Customer_ID SMALLINT UNSIGNED NOT NULL AUTO_INCREMENT,
8      Customer_First_Name VARCHAR (50),
9      Customer_Last_Name VARCHAR (50),
10     PRIMARY KEY (Customer_ID)
11             );
12
13 -- ENTITY Table: Order
14 CREATE TABLE Order_Des (
15     Order_ID SMALLINT UNSIGNED NOT NULL,
16     Customer_ID INTEGER NOT NULL,
17     Order_Cost INTEGER,
18     Order_Status VARCHAR (50),
19     PRIMARY KEY (Order_ID),
20     CONSTRAINT fk_order_des FOREIGN KEY (Customer_ID) REFERENCES Customer (Customer_ID)
21
22        );
23
24 --ENTITY Table: Product
25 CREATE TABLE Product (
26     Product_ID SMALLINT UNSIGNED NOT NULL AUTO_INCREMENT,
27     Order_ID INTEGER NOT NULL,
28     Department VARCHAR (50),
29     Subscription_Option BOOLEAN,
30     Product_Name VARCHAR (100),
31     Product_Description VARCHAR (255),
32     Product_Avg_Ratings INTEGER,
33     Product_Company VARCHAR (50),
34     Product_Availability BOOLEAN,
35     PRIMARY KEY (Product_ID),
36     CONSTRAINT fk_product FOREIGN KEY (Order_ID) REFERENCES Order_Des (Order_ID)
37
38             );
39
40 -- ENTITY Table: Deals
41 CREATE TABLE Deals (
42     Deal_ID SMALLINT UNSIGNED NOT NULL,
43     Product_ID INTEGER NOT NULL,
44     Product_Sell_Performance VARCHAR (255),
45     Price INTEGER,
46     Dicount_Rates INTEGER,
47     PRIMARY KEY (Deal_ID),
48     CONSTRAINT fk_deal FOREIGN KEY (Product_ID) REFERENCES Product (Product_ID)
49
50        );
51
52 -- ENTITY Table: Review
53 CREATE TABLE Review (
54     Review_ID SMALLINT UNSIGNED NOT NULL,
55     Customer_ID INTEGER NOT NULL,
56     Rating_Stars INTEGER,
57     Comment_Sentiment VARCHAR (50),
58     PRIMARY KEY (Review_ID),
59     CONSTRAINT fk_review FOREIGN KEY (Customer_ID) REFERENCES Customer (Customer_ID)
60
61        );
62
63
64
65 -- MULTIVALUED Table: Billing_Detail
66 CREATE TABLE Billing_Detail (
67     Billing_ID SMALLINT UNSIGNED NOT NULL,
68     Customer_ID INTEGER NOT NULL,
69     Street_Num INTEGER,
70     Street_Name VARCHAR (50),
71     Postal_Code VARCHAR (50),
72     City VARCHAR (50),
73     Province VARCHAR (50),
74     Country VARCHAR (50),
75     PRIMARY KEY (Billing_ID),
76     CONSTRAINT fk_bill FOREIGN KEY (Customer_ID) REFERENCES Customer (Customer_ID)
77        );
78
79
80 -- MULTIVALUED Table: Product_Description
81 CREATE TABLE Product_Description (
82     Description_ID SMALLINT UNSIGNED NOT NULL,
83     Product_ID INTEGER NOT NULL,
84     Product_Description VARCHAR (255),
85     PRIMARY KEY (Description_ID),
86     CONSTRAINT fk_Product_ID FOREIGN KEY (Product_ID) REFERENCES Product (Product_ID)
87        );
88
89
90 -- RELATIONSHIP Table: Places
91 CREATE TABLE Places (
92     Customer_ID INTEGER REFERENCES Customer (Customer_ID) ON UPDATE RESTRICT NOT NULL,
93     Order_ID INTEGER REFERENCES Orders_Des (Order_ID) ON UPDATE RESTRICT NOT NULL,
94     Num_Of_Orders INTeger UNIQUE NOT NULL,
95     Order_date INTeger UNIQUE NOT NULL
96        );
97
98 -- RELATIONSHIP Table: Contains
99 CREATE TABLE Contains_ (
100    Order_ID INTEGER REFERENCES Orders_Des (Order_ID) ON UPDATE RESTRICT NOT NULL,
101    Product_ID INTEGER REFERENCES Product (Product_ID) ON UPDATE RESTRICT NOT NULL
102       );
103
104 -- RELATIONSHIP Table: Display
105 CREATE TABLE Display_ (
106    Deal_ID INTEGER REFERENCES Deals (Deal_ID) ON UPDATE RESTRICT NOT NULL,
107    Product_ID INTEGER REFERENCES Product (Product_ID) ON UPDATE RESTRICT NOT NULL
108       );
109
110 -- RELATIONSHIP Table: Has
111 CREATE TABLE Has_ (
112    Product_ID INTEGER REFERENCES Product (Product_ID) ON UPDATE RESTRICT NOT NULL,
113    Review _ID INTEGER REFERENCES Review (Review_ID) ON UPDATE RESTRICT NOT NULL
114       );
115
116 -- RELATIONSHIP Table: Write
117 CREATE TABLE Write_ (
118    Review _ID INTEGER REFERENCES Review (Review_ID) ON UPDATE RESTRICT NOT NULL,
119    Customer_ID INTEGER REFERENCES Customer (Customer_ID) ON UPDATE RESTRICT NOT NULL
120 );
121
122
123 COMMIT TRANSACTION;
124 PRAGMA foreign_keys = off;
125
126
```

Figure 2: Tables Dump

Entity Data Schemas:

1. Customer(<u>CustomerID</u>, Customer_First_Name, Customer_Last_Name, <u>Billing_Detail</u>):
   The user that browses the product inventory and places an order.
2. Order(<u>Order_ID</u>, **CustomerID**, Order_Cost, Order_Status): The order placed by the user
   and the details.
3. Product(<u>Product_ID</u>, **Order_ID**, Product_Name, Product_Company,
   Product_Description, Product_Avg_Ratings, Subscription_Option, Product_Availability,
   Department): The item ordered by the user based on the rating, reviews, and discounts.
4. Review(<u>Review_ID</u>, **Product_ID**, Rating_Stars, Comment_Sentiment): The product
   feedback as provided by the customer along with the ratings.
5. Deals(<u>Deal_ID</u>, **Review_ID**, Product_Sell_Performance, Price, Discount_Rates): A
   discount-day like event that lists the popular product on sale.

Relationship Data Schemas:

1. Places(Customer to Order) (**Customer_ID**, **Order_ID**, Num_Of_Orders, Order_Date): A
   customer can place none or multiple orders. The order associated to each customer is
   unique and can only be 1 per customer.
2. Contains(Order to Product) (**Order_ID, Product_ID**): An order can contain have 1 or
   many products. A product can contain 0 or many orders.
3. Has(Product to Review) (**Product_ID, Review_ID**): A product has 0 or many reviews. A
   unique review only has 1 product associated.
4. Write(Review to Customer) (**Review_ID, Customer_ID)**: A customer can write 0 or
   many reviews. A review written by the customer is unique and can only be 1.
5. Display(Product to Deals) (**Deal_ID**, **Product_ID**): A deal can display 1 or many
   products. A product can be displayed on 0 or many deals.

Attribute Data Schemas:

<u>Customer:</u>

- Customer_ID: A unique ID assigned to each customer.
- Customer_First_Name: The customer's first name.
- Customer_Last_Name: The customer's last name.
- Billing_Detail: The billing details of the customer.
- Num_Of_Orders: Total number of orders placed by the customer.

<u>Order:</u>

- Order_ID: A unique ID assigned to each order placed.
- Order_Cost: The total cost of the order.
- Order_Date: The date the order was placed.
- Order_Status: The tracking information of the order.

Product:

- Product_ID: A unique ID assigned to each product as part of the inventory/database.
- Product_Name: The name of the product.
- Product_Company: The company that sells the product.
- Product_Description: A short description about the product.
- Product_Avg_Ratings: A five-star rating calculated as an average from the rating stars of the product as part of the reviews.
- Subscription_Option: A binary option selecting 'yes' or 'no' to a subscription service for the product.
- Product_Availability: The availability of the product.
- Department: The department the product belongs to.

Review:

- Review_ID: A unique ID assigned to each review.
- Rating_Stars: The rating stars associated with each review.
- Comment_Sentiment: A one-word review of the product as either: Good, Moderate or Bad.

Deals:

- Product_Sell_Performance: The performance of the best-selling and worst-selling products.
- Price: The price of the products after the applied discount.
- Discount_Rates: A percentage figure of the discount for each product.