E-Commerce Database System Design

March 2019

Topics:

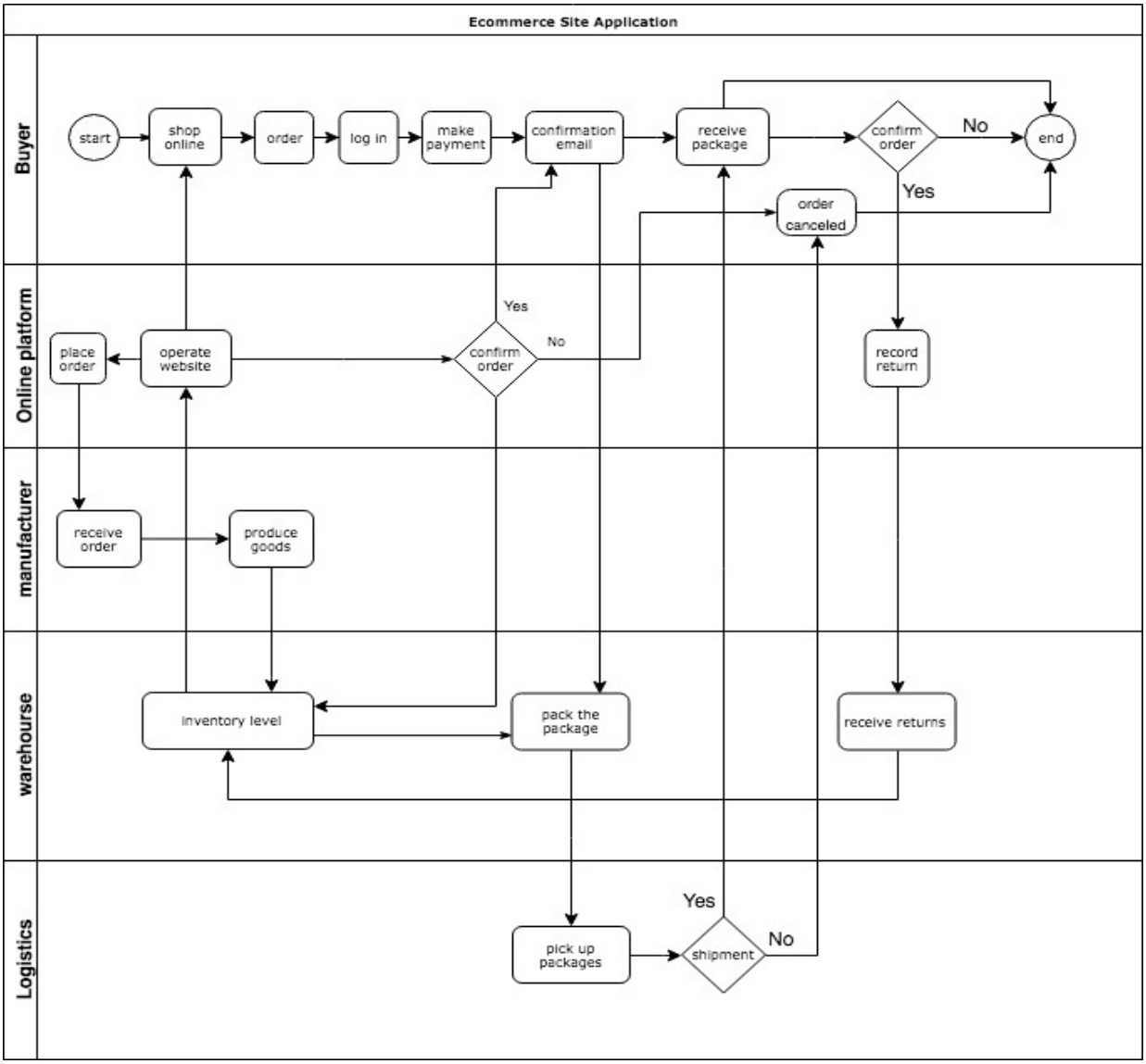
- Swim Lane Diagram
- User Types & Roles
- Logical Model
- Entity Relationship Diagram (ERD)
- Metrics & Visualization
- Triggers & Procedures

I. Business Application: Ecommerce Site Application

The main purpose of this e-commerce is selling self-owned brand products online. The company has world widely suppliers and owns a warehouse to store the inventory. This e-commerce does not have any offline channels. All the buying orders are received through the main website. The products belong to the same vertical, the types of products vary greatly. Customers browse through the website and add desired products to the cart. Then they checkout if they wish to purchase the products. After the payment process is completed, the order is submitted to the backend of the website, waiting to be executed. The workers pack the products according to the orders and get them ready for shipment.

II. Enumerate Types of Users

- Swim Lane Diagram:



III. User Types & Roles:

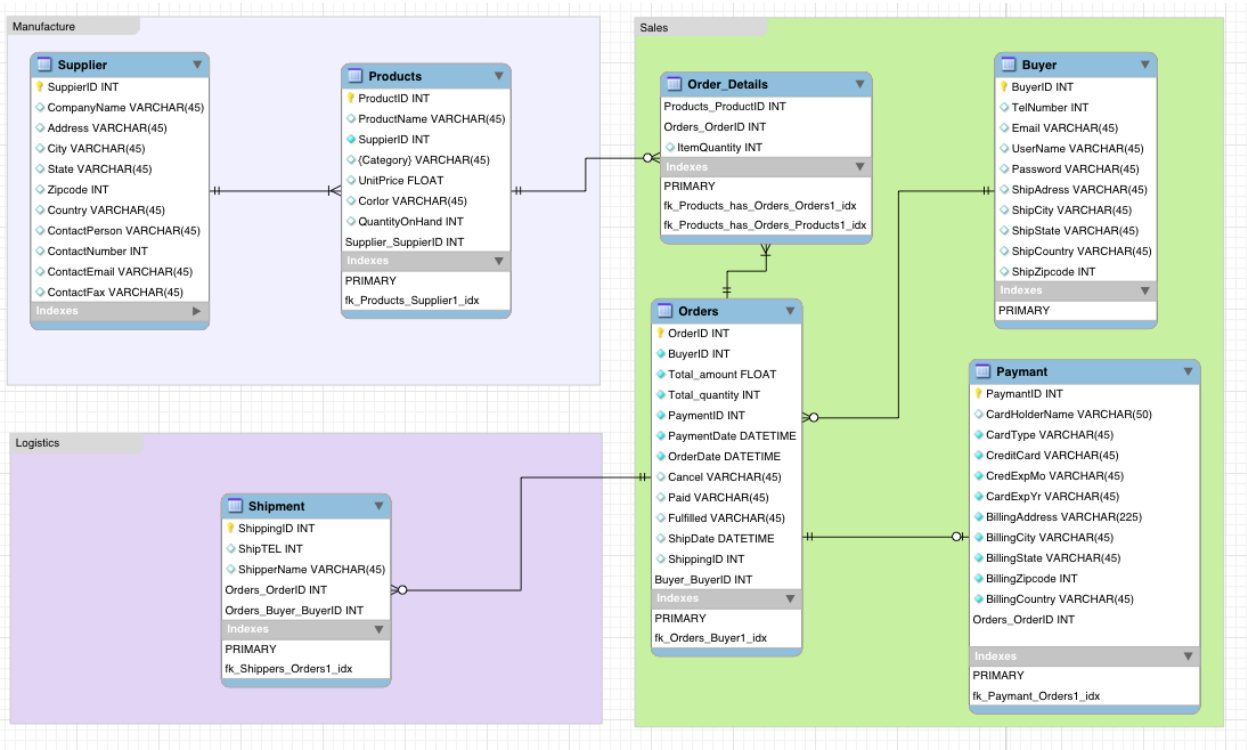
- **Buyer**:
    - register user ID, search items, order and make payment on the e-commerce site. Orders need to be inserted by orderID and should include information about this buyer.

- **Online platform (administrator)**:
    - create/update/delete items on the website, manage customer orders.
- **Manufacturer**:
    - needs to push product quantity information back to the online platform, contact information for manufacturer needs to be fetched when company needs to communicate with manufacturer.
- **Warehouse**:
    - (Inventory) need to create/update/delete items according to new shipments and orders
- **Logistics**:
    - manage ship request and complete shipment. Need to refer back to Orders table and update information on tracking and shipping status

IV. Logical model:

- Entity: Supplier, Products, Buyer, Orders, Payment, Shipment
- Relationship: Supplier and Products is one to many, Products and Orders is many to many, Orders and Buyers is one to many, Orders and Payment is one to one, Orders and Shipment is one to many.
- Cardinality: Supplier must provide at least one product and one product must provide by a supplier. One product may have zero or many orders and an order must have some products. An order must have a buyer, but a buyer might have or not have some orders. An order may be paid but a payment must belong to an order. An order might have many shipments, but a shipment must base on an order.

V. Entity Relationship Diagram



VI. Enumerate Use Cases for the application

1) Seller would like to know the most popular payment method among buyers through buyer ID and count (payment method).

   Answer: JCR

CardType	pop...
JCR	3
Visa	3
America Express	2
Discover	2

2) Seller would like to know the most ordered products.

   Answer: Beauty

ProductName	sum(ItemQua...
Beauty	91
Lotion	86
Primer	81
Sets	59
Remover	26
Shampoo	11
Moisturizer	9

3) Seller would like to know which region has the most orders through ShipZipcode and OrderID.

   Answer: Singapore

ShipCountry	bestsell
Singapore	2
Christmas Island	1
Finland	1
Guinea-Bissau	1
Liberia	1
Marshall Islands	1
Mongolia	1
Morocco	1

4) Buyer would like to find out what they ordered through Order ID.

BuyerID	ProductName
12714972662	Remover
26350935579	Beauty
42711312958	Sets
50345881058	Beauty
67711139299	Moisturizer
72330070747	Shampoo
75521050479	Lotion
81921795835	Primer
89264121725	Sets

5) Seller would like to know when the order was shipped through Buyer ID and Shipdate.

BuyerID	ShipDate
12714972662	2018-08-06
26350935579	2018-05-10
42711312958	2018-06-16
50345881058	2018-07-03
67711139299	2018-10-19
72330070747	2018-02-27
75521050479	2018-07-10
81921795835	2018-09-05
89264121725	2018-05-22

6) Seller would like to find out how many orders are placed by a single customer through Order ID.

BuyerID	count(*)
12714972662	1
26350935579	1
42711312958	1
50345881058	1
67711139299	1
72330070747	1
75521050479	1
81921795835	1
89264121725	1

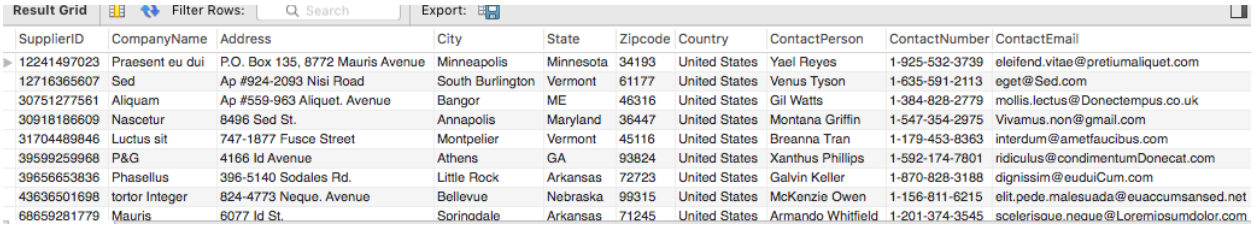
7) Seller would like to know how many different products they have through Product ID.

ProductName	cou...
Beauty	2
Lotion	2
Sets	2
Moisturizer	1
Primer	1
Remover	1
Shampoo	1

8) Seller would like to know who their biggest supplier is through Supplier ID and Quantity.

SupplierID	bigs
12241497023	1
12716365607	1
30751277561	1
30918186609	1
31704489846	1
39599259968	1
39656653836	1
43636501698	1
68659281779	1

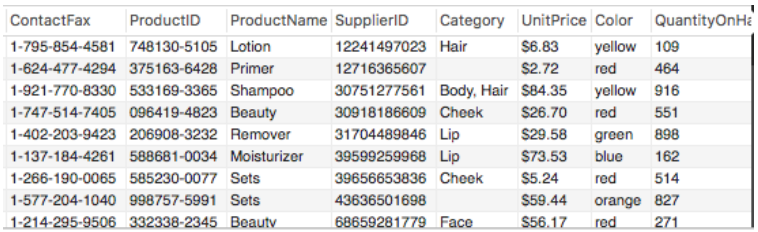
9) Seller would like to look up a product's manufacturer through Supplier ID.



Result Grid | Filter Rows: | Search | Export:

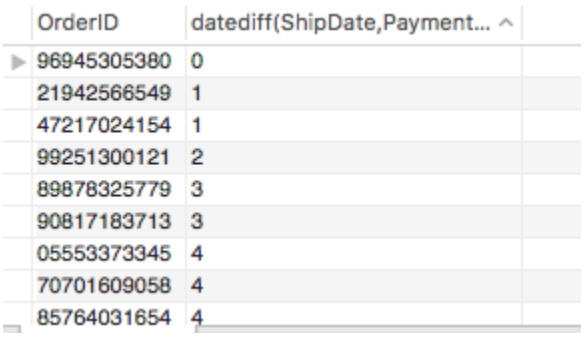
SupplierID	CompanyName	Address	City	State	Zipcode	Country	ContactPerson	ContactNumber	ContactEmail
12241497023	Praesent eu dui	P.O. Box 135, 8772 Mauris Avenue	Minneapolis	Minnesota	34193	United States	Yael Reyes	1-925-532-3739	eleifend.vitae@pretiumaliquet.com
12716365607	Sed	Ap #924-2093 Nisi Road	South Burlington	Vermont	61177	United States	Venus Tyson	1-635-591-2113	eget@Sed.com
30751277561	Aliquam	Ap #559-963 Aliquet. Avenue	Bangor	ME	46316	United States	Gil Watts	1-384-828-2779	mollis.lectus@Donectempus.co.uk
30918186609	Nascetur	8496 Sed St.	Annapolis	Maryland	36447	United States	Montana Griffin	1-547-354-2975	Vivamus.non@gmail.com
31704489846	Luctus sit	747-1877 Fusce Street	Montpelier	Vermont	45116	United States	Breanna Tran	1-179-453-8363	interdum@ametfaucibus.com
39599259968	P&G	4166 Id Avenue	Athens	GA	93824	United States	Xanthus Phillips	1-592-174-7801	ridiculus@condimentumDonecat.com
39656653836	Phasellus	396-5140 Sodales Rd.	Little Rock	Arkansas	72723	United States	Galvin Keller	1-870-828-3188	dignissim@euduiCum.com
43636501698	tortor Integer	824-4773 Neque. Avenue	Bellevue	Nebraska	99315	United States	McKenzie Owen	1-156-811-6215	elit.pede.malesuada@euaccumsansed.net
68659281779	Mauris	6077 Id St.	Springdale	Arkansas	71245	United States	Armando Whitfield	1-201-374-3545	scelerisque.neque@Loremipsumdolor.com

continue...



ContactFax	ProductID	ProductName	SupplierID	Category	UnitPrice	Color	QuantityOnHa
1-795-854-4581	748130-5105	Lotion	12241497023	Hair	$6.83	yellow	109
1-624-477-4294	375163-6428	Primer	12716365607		$2.72	red	464
1-921-770-8330	533169-3365	Shampoo	30751277561	Body, Hair	$84.35	yellow	916
1-747-514-7405	096419-4823	Beauty	30918186609	Cheek	$26.70	red	551
1-402-203-9423	206908-3232	Remover	31704489846	Lip	$29.58	green	898
1-137-184-4261	588681-0034	Moisturizer	39599259968	Lip	$73.53	blue	162
1-266-190-0065	585230-0077	Sets	39656653836	Cheek	$5.24	red	514
1-577-204-1040	998757-5991	Sets	43636501698		$59.44	orange	827
1-214-295-9506	332338-2345	Beauty	68659281779	Face	$56.17	red	271

10) Seller would like to know how fast products are shipped through OrderID, payment date and Ship date.



OrderID	datediff(ShipDate,Payment...
96945305380	0
21942566549	1
47217024154	1
99251300121	2
89878325779	3
90817183713	3
05553373345	4
70701609058	4
85764031654	4

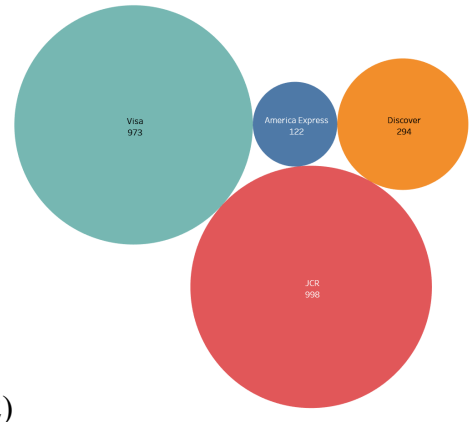
VII. Business Metrics

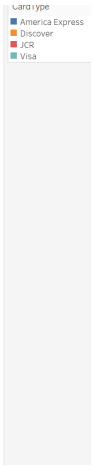
- Total Revenue
    - Summation of all order values.
- Average Order Value
    - Average dollar amount per order.
- Regional Sales Value & Quantity
    - Compare sales value and quantity on a regional basis. Which country has the largest order quantity? Which country has the highest order value?

    - Demonstrate by Tableau's regional graph (1)
- Popular Payment Methods
    - Which payment methods have the largest transaction amount?
    - Demonstrate by Tableau's graph (2)
- Popular Products
    - Which product has the highest quantity sold?
    - Demonstrate by Tableau's bar graph (3)
- Order Processing Time
    - The time difference between order date and ship date. We would like to keep the order processing time under 5 days.
    - Demonstrate by Tableau's bar graph (4)
- Inventory Level
    - Quantity of each products on hands. We need to keep a sufficient amount of inventory in the warehouse. The threshold we set is 100 pieces.
    - Demonstrate by Tableau's bar graph (5)

(1)

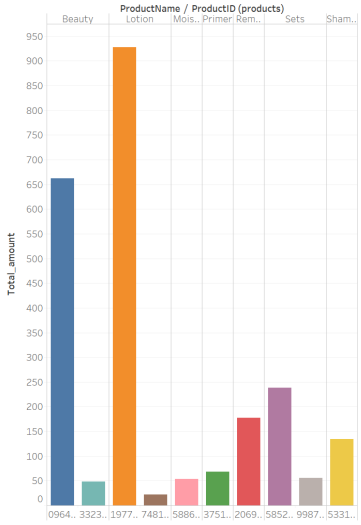
Payment

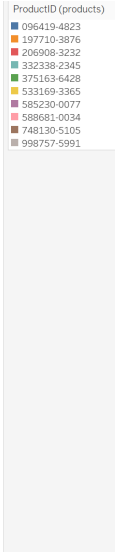




(2)

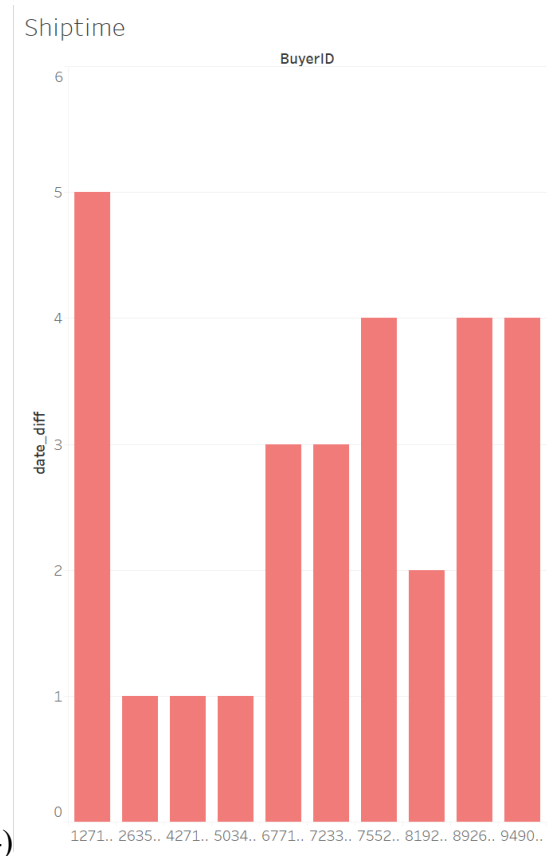
Best selling product



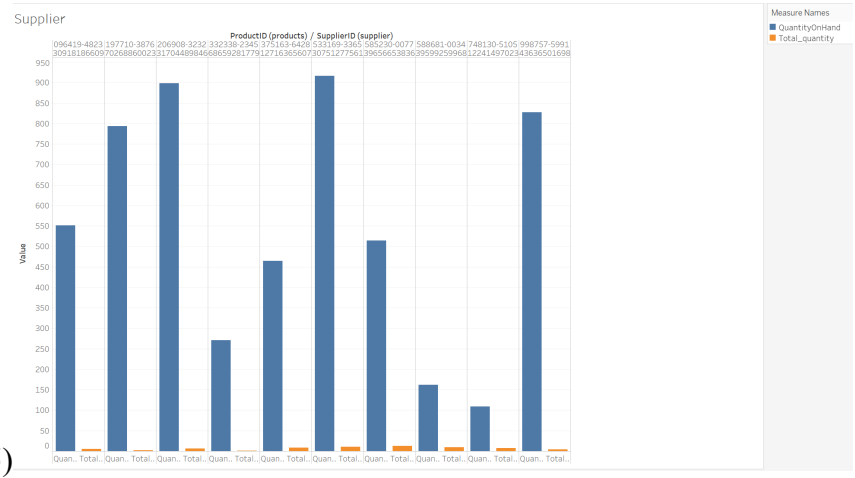


(3)

(4)



(5)



VIII. Triggers & Procedures

The after insert trigger is to alarm if the new product inserted is in low stock. If the "QuantityOnHand" is less than 100, the Product information will be showed on the new table called Stockcheck

```
DELIMITER $$
insert into Products_1(ProductID, ProductName, SupplierID, Category, UnitPrice, Color, QuantityOnHand)
values('096419-4825', 'Sets', '43636501699', '', '$60.44', 'orange', 50)
;
$$

DELIMITER $$
select * from stockcheck;
$$
```

Result Grid | Filter Rows: Search | Export:

ProductID	Stocklevel
096419-4825	Low-stock

The procedure is an update procedure to update new price change, including new price parameter and key parameter (ProductID).

An after update trigger is to insert new price information into a table called price_update. In this table, you can check the price update details and the time price change occurred.

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Result Grid | Filter Rows: Search | Export:

ProductID	old_price	new_price	change_date
096419-4823	$26.70	$96	2019-03-04 00:00:00
096419-4823	$96	$97	2019-03-04 00:00:00
096419-4823	$97	$100	2019-03-04 00:00:00

VIIII. Project Summary

In this project, we had the chance to imagine what it would look like to run an eCommerce company. First, we identified the main departments necessary to run the company as well as various attributes in each department. Then, we have to consider multiple real-life scenarios to validate the practicality of our attributes. Lastly, we discussed business functions and metrics to come up with queries and triggers to implement in our database.