



San José State
UNIVERSITY

CMPE 226 Project Report

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Submitted to:

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1. Application Introduction

We have implemented an e-commerce web application. The functionalities of this application include daily operations of a typical e-commerce website. User can sign up and login into the web site, view and browse products from product catalog, purchase products. User can also see his profile details and details on the orders placed by him. User does not need to login to browse products. However, we have implemented session to keep track of products purchase by the customer. There is an administrator aspect of this website. Admin can login and view order details, customer details, product details. Admin dashboard also displays the sales analytics information. Admin can view total sales for each product category and come to a conclusion on which category is the most or least popular. Admin can also view and analyze the sales report for entire year and can zoom in or expand it to view monthly and daily sales information. Admin can drill up and drill down the quarterly sales pie chart to see daily and monthly sales. The technology stack we have used for implementing this application is Node.js, HTML, CSS bootstrap, JQuery, SQL, MongoDB and Amazon RDS SQL database. As a result of various operations performed by the user or administrator on the web application interface, various SQL query operations are performed in the background.

We have used almost all the relational and NOSQL database concept like primary keys, Foreign keys, mapping 1:M, M:N, 1:1 relationships, referential integrity constraints, mapping candidate keys, multivalued attributes, relational database constraints and 3NF normalization. We have also used nested queries, table join operations, and object relational mapping (ORM) concepts. For supporting analytical processing, we have used star schema. As a part of OLAP, we have used drill up and drill down, slice and dice and pivot operations as well. On admin dashboard, admin can different kinds of sales analytics. We have tried to make the analytics charts fast and responsive. The data rendered on these charts is fetched from star schema so no complex join queries are required for displaying sales analytics. For inserting data into fact tables, we have written an SQL script job which can be run frequently. We chose to use NoSQL database for product catalog because product catalog can be huge and can contain enormous amount of unstructured data.

2. Technology Stack:

Technology stack used for this project was as follow:

- Node.js, Express.js
- JQuery, HTML, CSS, BootStrap
- Mongoose ORM
- MongoDB(MongoLab on Cloud)
- AWS RDS MySQL Database
- Data Exchange Format: JSON

3. Data used for the application

Customers/Users data: Customer data was generated using applications sign up functionality. Some sample customer data was downloaded from <https://www.briandunning.com>

Node.js web services has been written to store customer signup data to database.

Product data: Product data was taken from <https://www.amazon.com>. For representational purpose, product attributes data and images were also downloaded from amazon.com

Orders data: Orders data was generated using application's order API. A Java program was written to generate order data.

4. Overview of Data Models:

4.1 Operational Data Model:

Operational Data Model contains the tables which hold the data to support daily operations of an ecommerce application. These come under OLTP operations.

Following tables are used:

- **userinfo:** In this table, Customer's login credential information is stored. CustomerId in this table is a foreign key. Email attribute is unique. Customer uses this information for login purpose.
- **customers:** In this table, customer's profile information is stored. E.g. firstname, lastname, email, phone, zipcode etc.
- **products:** In this table, Product's information is stored.
- **category:** In this table, category information of a product is stored.
- **orders:** In this table, order related information is stored.
- **orderdetails:** In this table, detailed information regarding an order is stored. which includes ProductId, Orderid, TotalPrice and Quantity.
- **suppliers:** In this table, supplier information is stored.
- **shippers:** In this table, shipper information is stored.
- **admin:** In this table, Admin's login credential information is stored

4.2 Cardinalities:

- One customer can place many Orders
- Many Products can come under one Category
- One Order can have one Payment
- One Order can be shipped by one Shipper
- One Product can have one Suppliers
- One Order can have one OrderDetail

4.3 Analytical Data Model:

For analytical operations, we have created a star schema which contains 5 dimension tables and 2 fact tables.

We have created 5 dimension tables and they are populated in following ways:

- **Customer:** Using Surrogate key as CustomerKey and using 4 other columns from Customer table of original relations schema.
- **Shipper:** Using Surrogate Key ShpiperKey and using 2 other columns from Shipper table of original relations schema.
- **Product:** Using Surrogate Key ProductKey and using 4 other columns from Product table of original relations schema.
- **Category:** Using Surrogate Key CategoryKey and using 2 other columns from Category table of original relations schema.
- **Supplier:** Using Surrogate Key SupplierKey and using 2 other columns from Supplier table of original relations schema.

We have created 2 fact tables

- **Sales fact table:** This fact table is populated using surrogate keys following 4 dimension tables Customer, Shipper, Product, s foreign keys and using two additional facts: UnitsSold, TotalSales.
- **Purchase fact table:** This fact table is populated using surrogate keys of following 3 dimension tables Product, Category, Supplier and two additional facts PurchaseDate and TotalUnitsPurchased.

5. ER Diagram

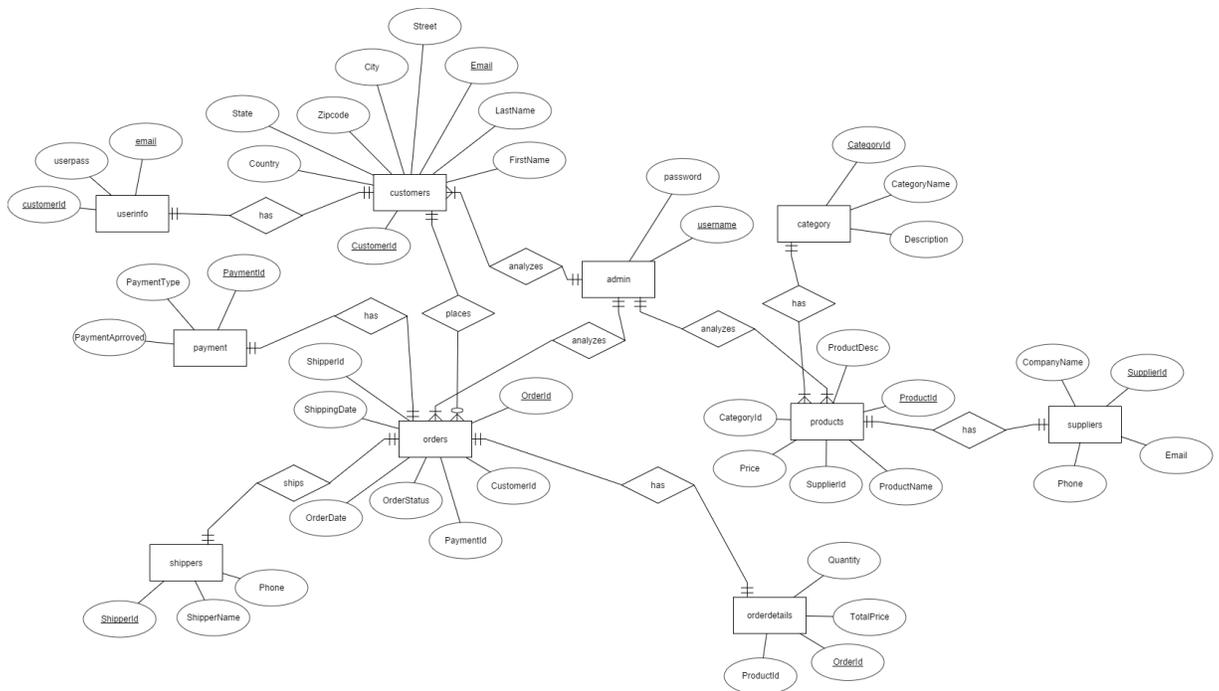


Image 5.1 - ER Diagram

6. Relational Schema

The relational schema was implemented on MySQL deployed on Amazon AWS RDS. It has all the online transaction processing (OLTP) tables required for the application.

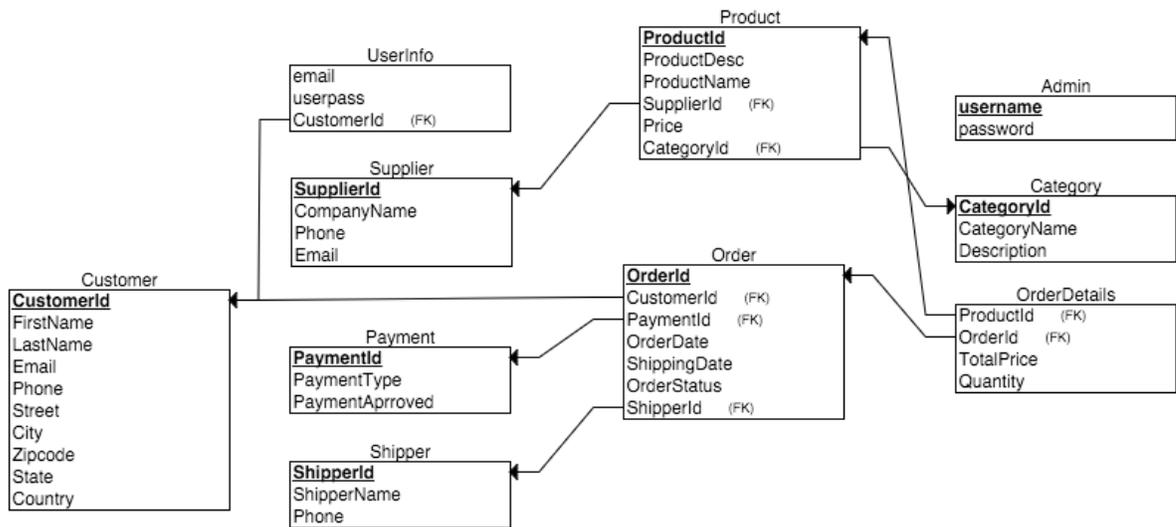


Image 6.1 - Relational Schema

7. Star Schema

The star schema was also implemented on AWS RDS Mysql. This schema served all the analytical processing requirements.

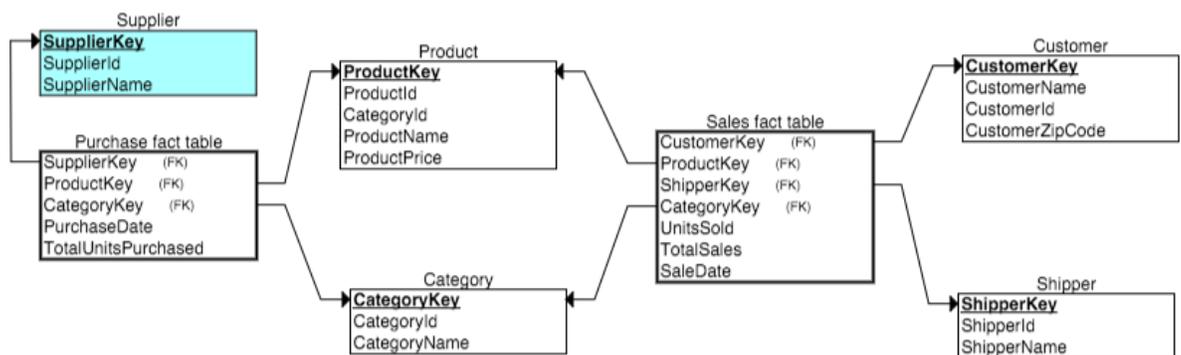


Image 7.1: Star Schema

8. MongoDB NoSQL Product Catalog example

```
{
  "_id": {
    "$oid": "5653b239e4b0f53a6dd30067"
  },
  "productName": "Iphone 6s",
  "category": "Electronics",
  "identifier": "1",
  "shortDesc": "4.7 inch Silver 16 GB",
  "price": 600,
  "imageUrl": "http://i.imgur.com/iS4dua7.jpg",
  "details": {
    "Technology": "GSM / CDMA / HSPA / EVDO / LTE",
    "Dimensions": "138.3 x 67.1 x 7.1 mm (5.44 x 2.64 x 0.28 in)",
    "Weight": "143 g (5.04 oz)",
    "SIM": "Nano-SIM",
    "Type": "LED-backlit IPS LCD, capacitive touchscreen, 16M colors",
    "Size": "4.7 inches (~65.6% screen-to-body ratio)",
    "Resolution": "750 x 1334 pixels (~326 ppi pixel density)",
    "Multitouch": "Yes",
    "Protection": "Ion-strengthened glass, oleophobic coating",
    "OS": "iOS 9, upgradable to iOS 9.1",
    "Chipset": "Apple A9",
    "CPU": "Dual-core 1.84 GHz Twister",
    "GPU": "PowerVR GT7600 (six-core graphics)"
  }
}
```

Image 8.1: Product Catalog Mongo Document

9. Screen Shots

9.1 Home Page:

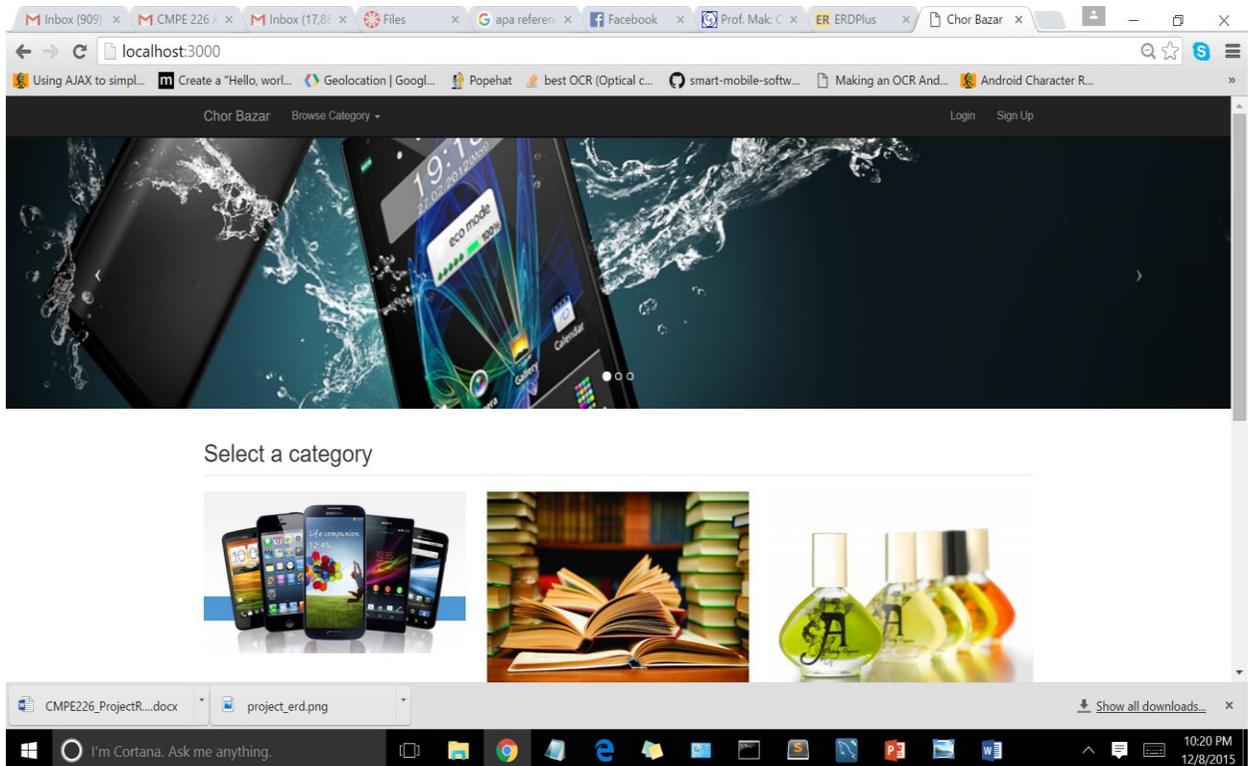


Image 9.1 - Home page

9.2 Customer login

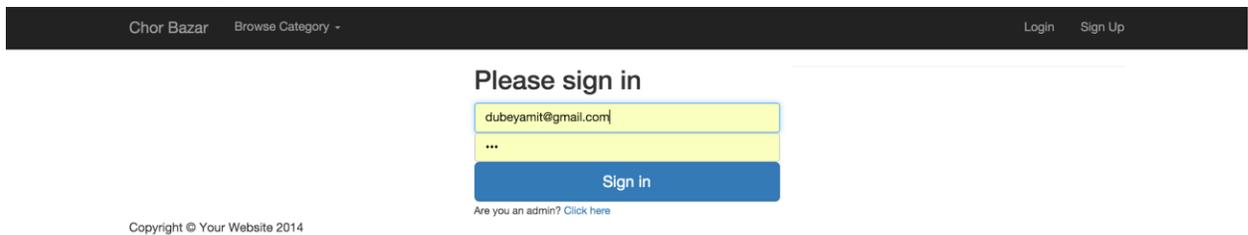


Image 9.2 - Customer Login

9.3 Customer Sign up:

Sign Up

Firstname

Lastname

Phone

Street

City

Zipcode

State

Country

Email

Password

Image 9.3 - Customer Registration Form

9.4 Browse Products:

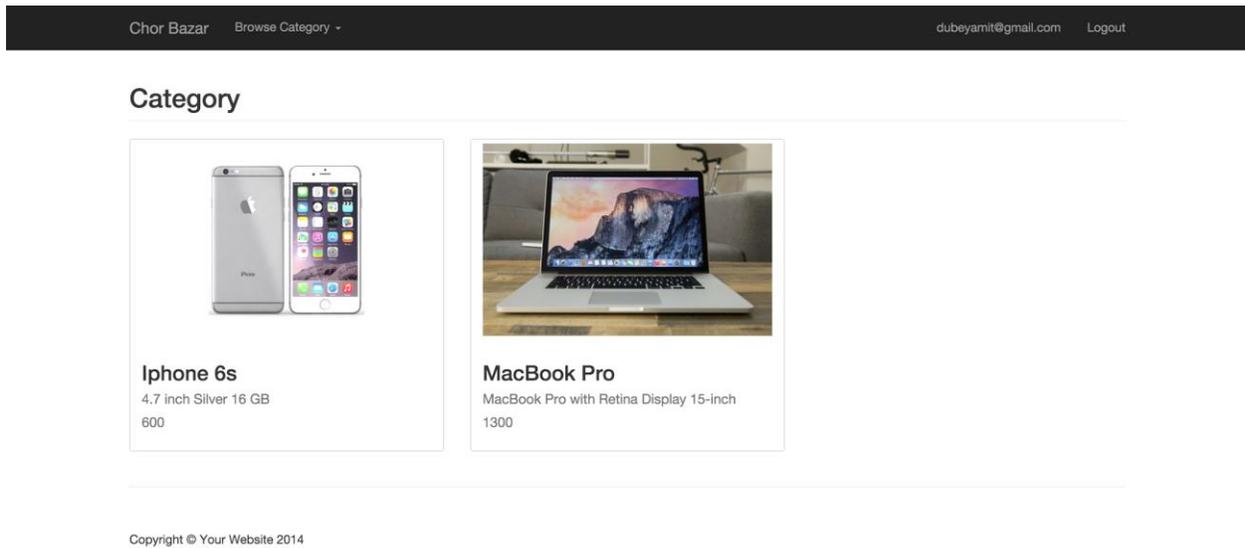


Image 9.4 - Category browse view

9.5 View Product Details:

Chor Bazar [Browse Category](#) dubeyamit@gmail.com [Logout](#)



Product Details

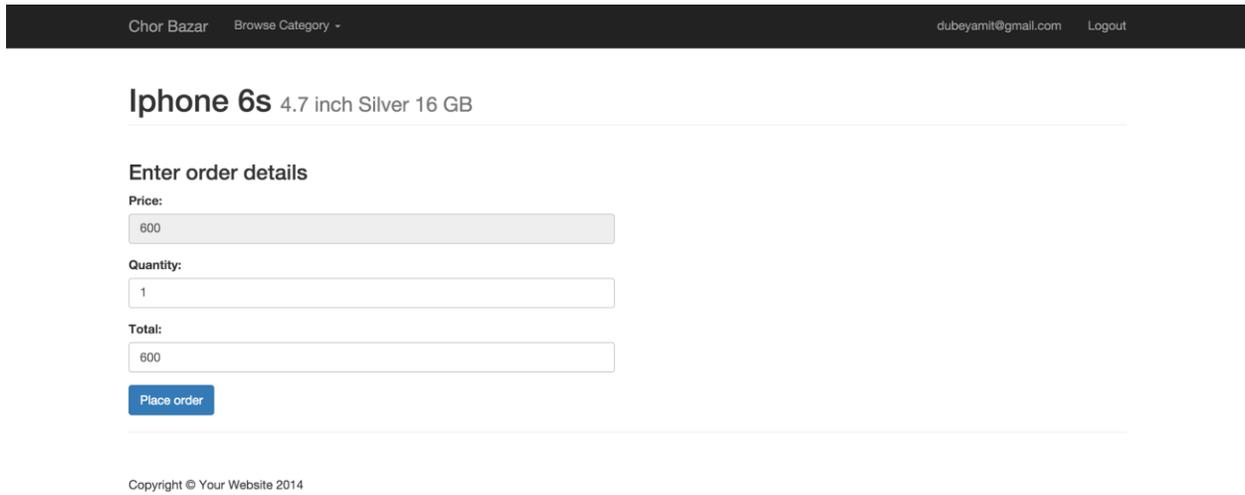
Price: 600

Technology	GSM / CDMA / HSPA / EVDO / LTE
Dimensions	138.3 x 67.1 x 7.1 mm (5.44 x 2.64 x 0.28 in)
Weight	143 g (5.04 oz)
SIM	Nano-SIM
Type	LED-backlit IPS LCD, capacitive touchscreen, 16M colors
Size	4.7 inches (~65.6% screen-to-body ratio)
Resolution	750 x 1334 pixels (~326 ppi pixel density)
Multitouch	Yes
Protection	Ion-strengthened glass, oleophobic coating
OS	iOS 9, upgradable to iOS 9.1
Chipset	Apple A9
CPU	Dual-core 1.84 GHz Twister
GPU	PowerVR GT7600 (six-core graphics)

[BUY](#)

Image 9.5 - Product Detail View

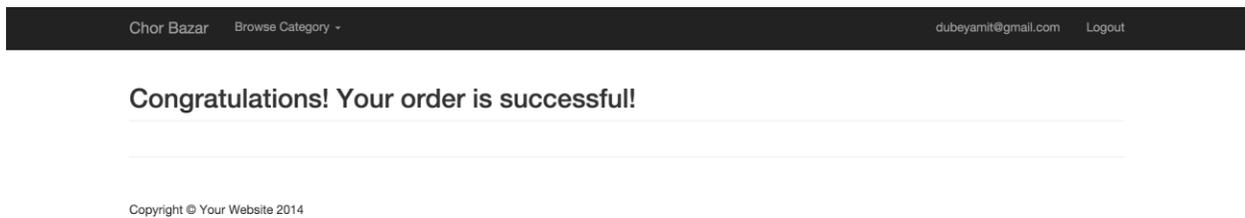
9.6 Buy Product:



The screenshot shows a product page for an iPhone 6s. At the top, there is a dark navigation bar with the text "Chor Bazar" and "Browse Category" on the left, and "dubeyamit@gmail.com" and "Logout" on the right. Below the navigation bar, the product name "Iphone 6s 4.7 inch Silver 16 GB" is displayed. Underneath, there is a section titled "Enter order details" with three input fields: "Price:" containing the value "600", "Quantity:" containing the value "1", and "Total:" containing the value "600". A blue button labeled "Place order" is positioned below the "Total:" field. At the bottom of the page, there is a small copyright notice: "Copyright © Your Website 2014".

Image 9.6 - Purchase Product View

9.7 Purchase Order Successful:



The screenshot shows a confirmation page with a dark navigation bar at the top, identical to the previous image, containing "Chor Bazar", "Browse Category", "dubeyamit@gmail.com", and "Logout". The main content area features a large heading that reads "Congratulations! Your order is successful!". Below this heading, there is a horizontal line and a small copyright notice at the bottom: "Copyright © Your Website 2014".

Image 9.7 - Successful Purchase View

9.8 View your orders:

Chor Bazar dubeyamit@gmail.com Logout

Order Information

Show 10 entries Search: 107

OrderId	OrderDate	ShippingDate	orderStatus	PaymentId	ShipperId
1069	Mon Aug 03 2015 00:00:00 GMT-0700 (PDT)	Mon Aug 03 2015 00:00:00 GMT-0700 (PDT)	Pending	1077	1
1078	Mon Feb 23 2015 00:00:00 GMT-0800 (PST)	Mon Feb 23 2015 00:00:00 GMT-0800 (PST)	Pending	1086	1

Showing 1 to 2 of 2 entries (filtered from 113 total entries)

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Image 9.8 - Customer's Order Information View

9.9 View my profile Information:

Chor Bazar dubeyamit@gmail.com Logout

Customer Information

CustomerId	3
FirstName	Amit
LastName	Dubey
Phone	2147483647
Email	dubeyamit@gmail.com
Street	1700 N 1st St
City	San Jose
Zipcode	95112
State	CA
Country	USA

Image 9.9 - Customer's Personal Information View

9.10 Admin Login

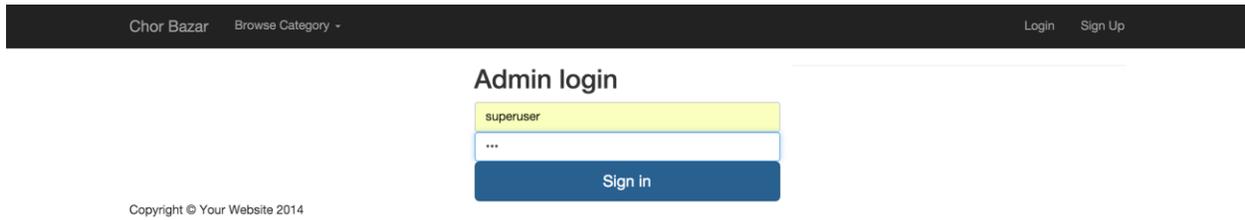


Image 9.10 - Admin Login Page

9.11 Admin Dashboard:

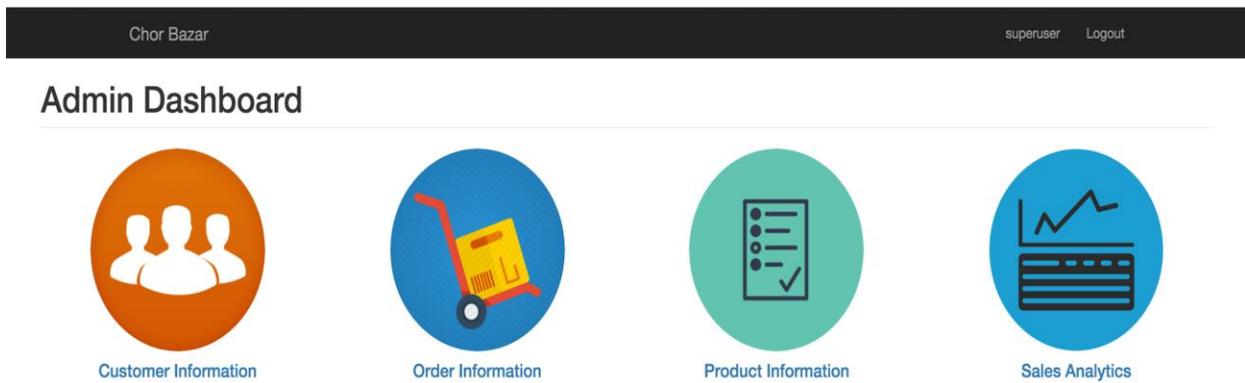


Image 9.11 - Admin Dashboard

9.12 View/Search all customer's Information:

CustomerId	FirstName	LastName	Phone	Email	Street	City	Zipcode	State	Country
1	Harshad	Kulkarni	2147483647	harshkonline@gmail.com	101 E San FernanoSt	San Jose	95112	CA	USA
2	Prashant	Rohill	888888	prohilla@gmail.com	101 E San FernanoSt	San Jose	95112	CA	USA
3	Amit	Dubey	2147483647	dubeyamit@gmail.com	1700 N 1st St	San Jose	95112	CA	USA
4	Lenna	Paprocki	907	lenna@gmail.com	639 Main St	Anchorage	99501	AK	USA
5	Mattie	Poquette	602	mattie@aol.com	73 State Road 434 E	Phoenix	85013	AZ	USA
6	John	Lenon	2147483647	johnlennon@gmail.com	33 South Street	New York	10005	NY	USA
7	Simona	Morasca	419	simona@morasca.com	3 Mcauley Dr	Ashland	44805	OH	USA
8	Kris	Marrier	410	kris@gmail.com	228 Runamuck Pl #2808	Baltimore	21224	MD	USA
9	Alisha	Slusarski	732	alisha@slusarski.com	3273 State St	Middlesex	8846	NJ	USA
10	Angella	Cetta	808	angella.cetta@hotmail.com	185 Blackstone Bldge	Honolulu	96817	HI	USA
11	John	Day	2147483647	johnd@gmail.com	101 E San Fernando St	San Jose	95112	CA	USA

Image 9.12 - Admin's Customer Information View

9.13 View/Search All Orders Information:

Chor Bazar superuser Logout

Order Information

Show entries Search:

Orderid	Productid	Quantity	Total Order Price	OrderDate	ShippingDate	orderStatus	PaymentId	CustomerId	Shipperid
12	3	1	38	Mon Nov 30 2015 00:00:00 GMT-0800 (PST)	Tue Dec 01 2015 00:00:00 GMT-0800 (PST)	Pending	20	4	1
13	4	1	38	Mon Nov 30 2015 00:00:00 GMT-0800 (PST)	Tue Dec 01 2015 00:00:00 GMT-0800 (PST)	Pending	21	3	1
14	14	1	10	Mon Nov 30 2015 00:00:00 GMT-0800 (PST)	Tue Dec 01 2015 00:00:00 GMT-0800 (PST)	Pending	22	7	1
15	9	1	140	Mon Nov 30 2015 00:00:00 GMT-0800 (PST)	Tue Dec 01 2015 00:00:00 GMT-0800 (PST)	Pending	23	2	1
16	6	2	160	Mon Nov 30 2015 00:00:00 GMT-0800 (PST)	Tue Dec 01 2015 00:00:00 GMT-0800 (PST)	Pending	24	8	1
17	2	1	1300	Mon Nov 30 2015 00:00:00 GMT-0800 (PST)	Tue Dec 01 2015 00:00:00 GMT-0800 (PST)	Pending	25	3	1
18	10	1	59	Mon Nov 30 2015 00:00:00 GMT-0800 (PST)	Tue Dec 01 2015 00:00:00 GMT-0800 (PST)	Pending	26	3	1
19	12	1	60	Mon Nov 30 2015 00:00:00 GMT-0800 (PST)	Tue Dec 01 2015 00:00:00 GMT-0800 (PST)	Pending	27	3	1
20	1	1	600	Mon Nov 30 2015 00:00:00 GMT-0800 (PST)	Tue Dec 01 2015 00:00:00 GMT-0800 (PST)	Pending	28	5	1
21	7	1	24	Mon Nov 30 2015 00:00:00 GMT-0800 (PST)	Tue Dec 01 2015 00:00:00 GMT-0800 (PST)	Pending	29	5	1

Showing 1 to 10 of 1,096 entries

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Image 9.13 - Admin's Order Information

9.14 View/Search All Product's Information:

Chor Bazar
superuser Logout

Product Information

Show entries Search:

ProductId	Product Name	Product Price	Product Description	Product Category Name	Product Category Description
1	iPhone 6s	600	Mobile	Electronics	Handheld
2	Macbook Pro	1300	Laptop	Electronics	Handheld
3	Fallout 4 - PS4	38	PS4 Game	Movies, Music & Games	Movies, Music & Games
4	Call of Duty: Black Ops III - Standard Edition - PlayStation 4	38	PS4 Game	Movies, Music & Games	Movies, Music & Games
5	Star Wars: Battlefront - PlayStation 4	45	PS4 Game	Movies, Music & Games	Movies, Music & Games
6	Nutri Ninja Pro (BL450)	80	Blender	Home, Garden & Tools	Home, Kitchen & Dining,Furniture & Décor, Bedding & Bath
7	BLACK+DECKER TR1278B 2-Slice Toaster, Black	24	Toaster	Home, Garden & Tools	Home, Kitchen & Dining,Furniture & Décor, Bedding & Bath
8	Coaster 100621 Mission Style Dining Table, Burnished Oak Solid Hardwood	320	Dining Table	Home, Garden & Tools	Home, Kitchen & Dining,Furniture & Décor, Bedding & Bath
9	Humans of New York: Stories	140	Book	Books & Audible	Books, Kindle Books, Audiobooks
10	Scents of a Dream: Travels in the World of Coffee	59	Book	Books & Audible	Books, Kindle Books, Audiobooks

Showing 1 to 10 of 14 entries

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Image 9.14 - Admin's Product Information

9.15 View Sales Analytics:

Total Sale for entire year. Admin can analyze the entire sale for a year. By zooming the chart, monthly or daily sales can be observed.

Sales by Category: Admin can analyze sales by product category and figure out most and least popular product categories.

Admin can drill up or drill quarterly down sales.

Admin can see top 5 areas (zip codes) where maximum sales has been recorded.

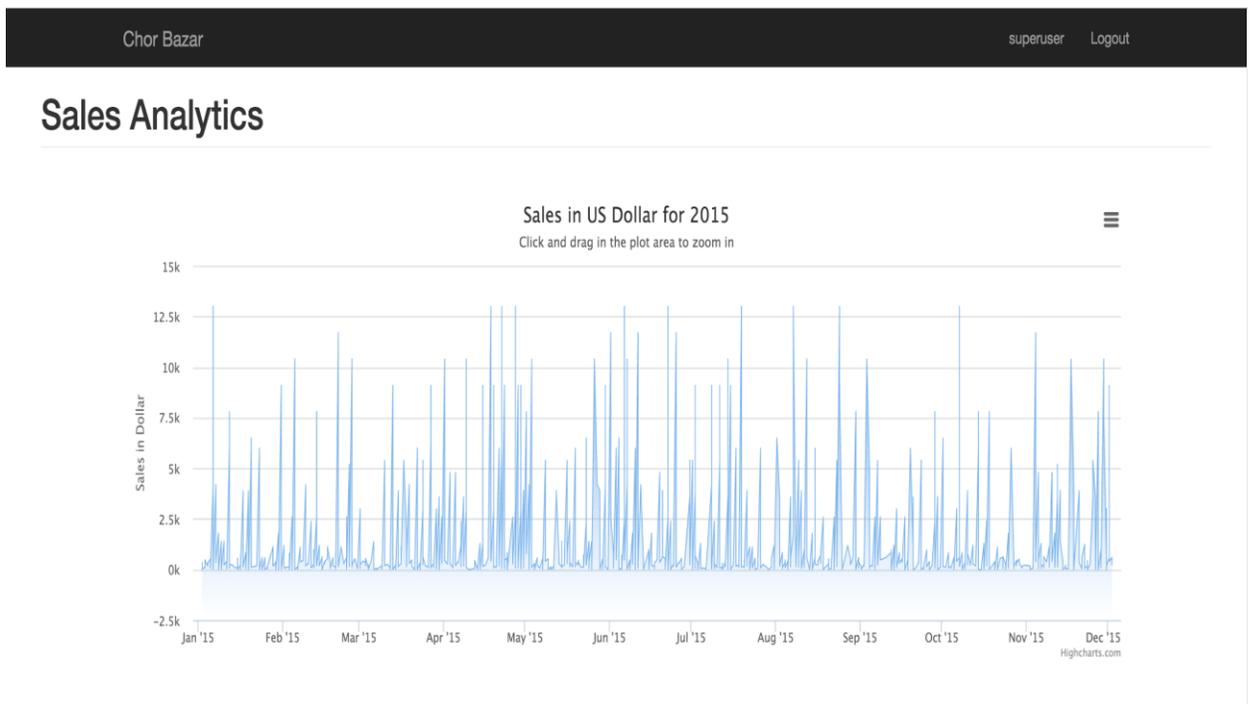
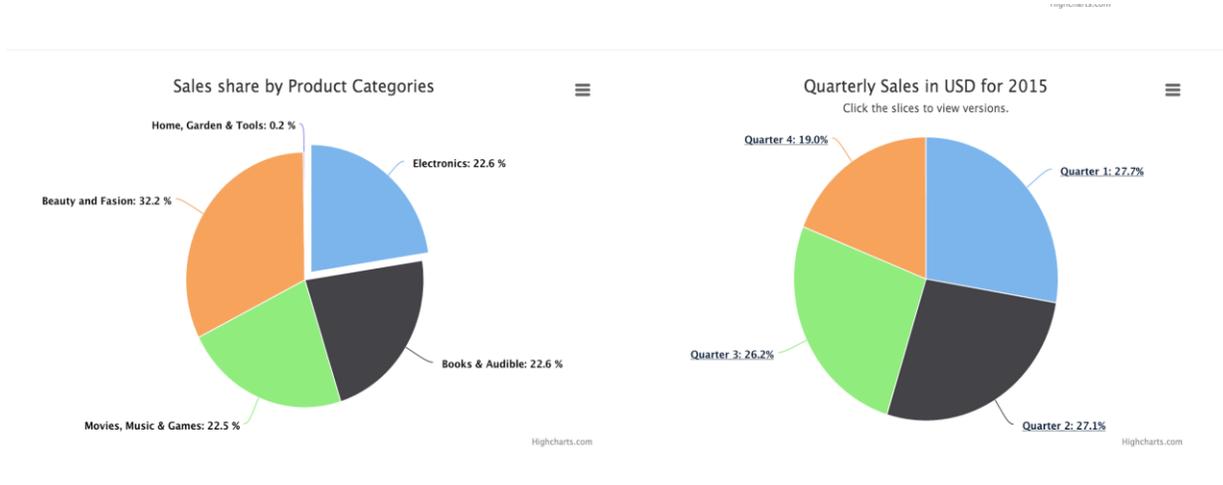


Image 9.15.1 - Admin's Analytics View (Monthly Total Sale)



Top 5 Zipcodes with Max Sale

Image 9.15.2 - Admin's Analytics View (Drillable Pie Charts)

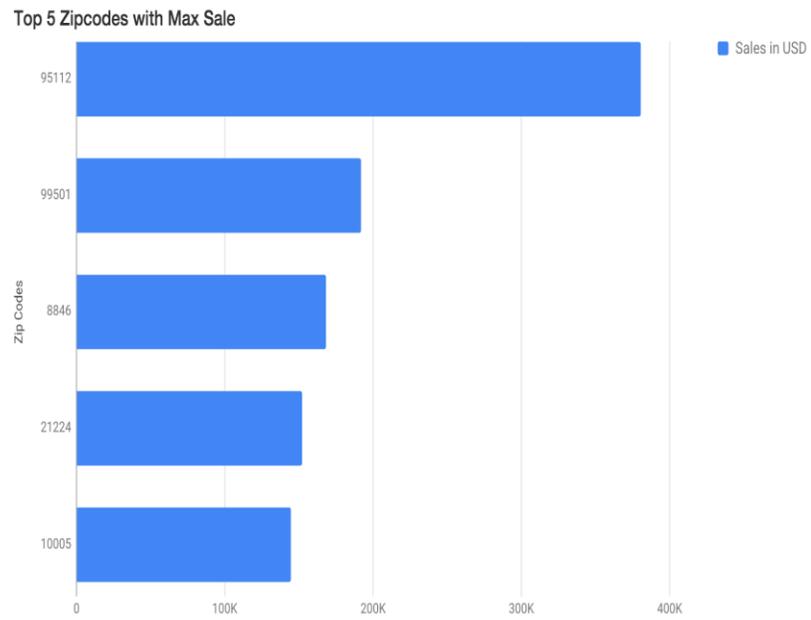


Image 9.15.3 - Admin's Analytics View (Top 5 areas with most sales)

10. Live Application Demo/ Build Instructions:

Build Instructions on local machine:

1. Install Node.js
2. Git clone [git@github.com:amitdubey90/cmpe226Project.git](https://github.com/amitdubey90/cmpe226Project.git)
3. Navigate to cmpe226Project folder.
4. Npm install
5. Npm start
6. Application will be running at localhost:3000

Live Running Demo: Live demo of running application is at

<http://54.174.215.42:3000/>

Demo Customer Login:
Username: harshkonline@gmail.com
Password: 123

Demo Admin login:
Username: superuser
Password: 226