

**REALTIME E-COMMERCE APPLICATION BASED  
ON MODERN ANGULARJS FRAMEWORK WITH  
GOOGLE CLOUD FIREBASE BACKEND**

Project submitted in fulfillment of the requirements for the degree of  
Master of Computer Applications

Project report submitted

By

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# **Declaration of Originality and Compliance of Academic Ethics**

I hereby declare that this project contains original work by the undersigned candidate, as a part of his Master of Computer Application (MCA) studies. All Information in this document have been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited referenced all material results that are not original to this work.

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## **ABSTRACT**

This project is a web based shopping system for an existing shop. The project objective is to deliver the online shopping application into web platform.

This project is an attempt to provide the advantages of online shopping to customers of a real shop. It helps buying the products in the shop anywhere through internet by using mobile or laptop. Thus the customer will get the service of online shopping and home delivery from his favorite shop. This system can be implemented to any shop in the locality or to multinational branded shops having retail outlet chains. If shops are providing an online portal where their customers can enjoy easy shopping from anywhere, the shops won't be losing any more customers to the trending online shops such as Flipcart or Amazon. Since the application is available in the phone it is easily accessible and always available.

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## **1 Introduction**

E-commerce is fast gaining ground as an accepted and used business paradigm. More and more business houses are implementing web sites providing functionality for performing commercial transactions over the web. It is reasonable to say that the process of shopping on the web is becoming commonplace.

Online shopping is the process whereby customer directly buy goods from a seller in real-time, without an intermediary service, over the Internet. This project is an attempt to provide the advantages of online shopping to customers of a real shop. It helps buying the products in the shop anywhere through internet by using a laptop or mobile. Thus the customer will get the service of online shopping and home delivery from his favourite shop.

## **2 Project Objective**

The objective of this project is to develop a general purpose e-commerce store where any product (such as foods, books, CDs, computers, mobile phones, electronic items, and home appliances) can be bought from the comfort of home through the Internet. However, for implementation purposes, this paper will deal with an online food store.

An online store is a virtual store on the Internet where customers can browse the catalogue and select products of interest. The selected items will be collected in a shopping cart. At checkout time, the items in the shopping cart will be presented as an order. At that time, more information will be needed to complete the transaction. Usually, the customer will be asked to fill or select a billing address, a shipping address. At checkout time, the items in the shopping cart will be presented as an order. At that time, more information will be needed to complete the transaction whereas the checkout process through payment gateway is out of scope of this project and hence not implemented.

### **3 What is the features of a good E-Commerce site?**

A good e-commerce site should present the following factors to the customers for better usability:

- Knowing when an item was saved or not saved in the shopping cart.
- Returning to different parts of the site after adding an item to the shopping cart.
- Easy scanning and selecting items in a list.
- Effective categorical organization of products.
- Simple navigation from home page to information and order links for specific products.
- Obvious shopping links or buttons.
- Consistent layout of product information.

Another important factor in the design of an e-commerce site is feedback. The Interactive cycle between a user and a web site is not complete until the web site responds to a command entered by the user.

### **4 How to get ready to start?**

Tools and Software used in this project

1. Node.js version
2. Microsoft visual studio code (IDE)
3. Angular4 CLI
4. Firebase
5. AngularFire2
6. Bootstrap



## 4.1 What is Node.js?

Node.js is a platform built on Chrome's JavaScript runtime for easily building fast and scalable network applications. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient, perfect for data-intensive real-time applications that run across distributed devices.

Node.js is an open source, cross-platform runtime environment for developing server-side and networking applications. Node.js applications are written in JavaScript, and can be run within the Node.js runtime on OS X, Microsoft Windows, and Linux.

Node.js also provides a rich library of various JavaScript modules which simplifies the development of web applications using Node.js to a great extent.

Node.js = Runtime Environment + JavaScript Library

### Why we use Node.js?

Following are some of the important features that make Node.js the first choice of software architects.

- **Asynchronous and Event Driven** – All APIs of Node.js library are asynchronous, that is, non-blocking. It essentially means a Node.js based server never waits for an API to return data. The server moves to the next API after calling it and a notification mechanism of Events of Node.js helps the server to get a response from the previous API call.
- **Very Fast** – Being built on Google Chrome's V8 JavaScript Engine, Node.js library is very fast in code execution.
- **Single Threaded but Highly Scalable** – Node.js uses a single threaded model with event looping. Event mechanism helps the server to respond in a non-blocking way and makes the server highly scalable as opposed to traditional servers which create limited threads to handle requests. Node.js uses a single

threaded program and the same program can provide service to a much larger number of requests than traditional servers like Apache HTTP Server.

- **No Buffering** – Node.js applications never buffer any data. These applications simply output the data in chunks.
- **License** – Node.js is released under the MIT license

#### 4.1.1 Installation process

#### How to install Node.js and npm in Windows?

#### **Installation Overview**

Installing Node and NPM is pretty straightforward using the installer package available from the Node.js® web site.

#### **Installation Steps**

1. Download the Windows installer from the Nodes.js® web site.
2. Run the installer (the .msi file you downloaded in the previous step.)
3. Follow the prompts in the installer (Accept the license agreement, click the NEXT button a bunch of times and accept the default installation settings)

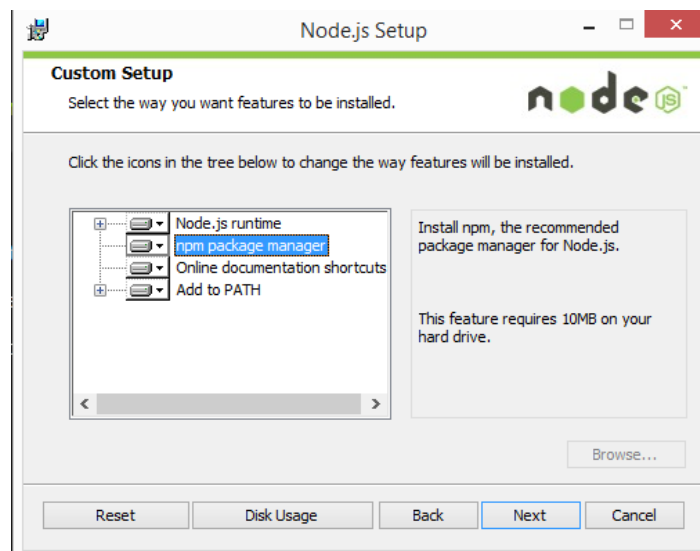


Figure1:Node.js Installation Process

4. **Restart your computer.** You won't be able to run Node.js® until you restart your computer.

## 4.2 Angular4 CLI

Angular4 CLI help us to create prototype of Angular4 application, which works already and follows the best practices. It provides options to create an application, generate the components, serve and test the application. So using angular-cli we can create a prototype and then we can add our custom functionalities to build the application.

Angular4 CLI and generated projects have dependencies that require Node 4 or higher and NPM 3 or higher.

### 4.2.1 Installation Process

**We can install angular CLI using the following command:**

```
npm install -g angular-cli
```

Then for creating and running project:

```
ng new PROJECT_NAME
```

```
cd PROJECT_NAME
```

```
ng serve
```

Then for accessing the application, please navigate to: **<http://localhost:4200/>**.

The application will reload automatically whenever you update the source code.

For adding a new component we just need to run the below command:

```
ng generate component my-new-component
```

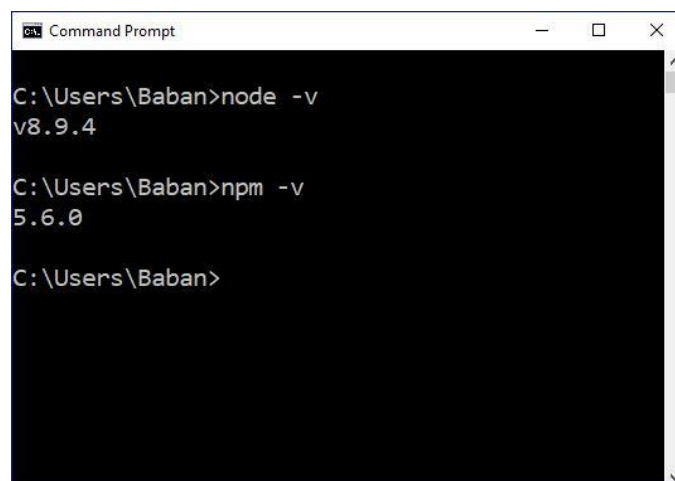
The same way we can create Directive, Pipe, Service, Class, Interface, Enum and Modules.

These are some useful angular4 developer tools, which mostly used and recommended.

## 4.2.2 Installation Checking

Make sure you have Node and NPM installed by running simple commands to see what version of each is installed and to run a simple test program:

- **Test Node.** To see if Node is installed, open the Windows Command Prompt, PowerShell or a similar command line tool, and type `node -v`. This should print a version number, so you'll see something like this `v8.9.4`.
- **Test NPM.** To see if NPM is installed, type `npm -v` in Terminal. This should print NPM's version number so you'll see something like this `5.6.0`



```
Command Prompt
C:\Users\Baban>node -v
v8.9.4

C:\Users\Baban>npm -v
5.6.0

C:\Users\Baban>
```

Figure2: Version of Node.js and npm

## 4.3 Visual Studio Code (IDE)

An open source IDE from Microsoft. Angular 4 application are written in Typescript, which is developed by Microsoft on a larger extend. So this make sense for Visual studio code built in support for Typescript. Visual studio code supports

syntax, error highlighting and autocomplete for Typescript. And there are plenty of other plugins available for building a better development environment.

Main features of Visual studio code are:

1. Debug code right from the editor.
2. Git integration.
3. Code autocomplete and syntax highlighting.
4. Extensive collection of plugins.

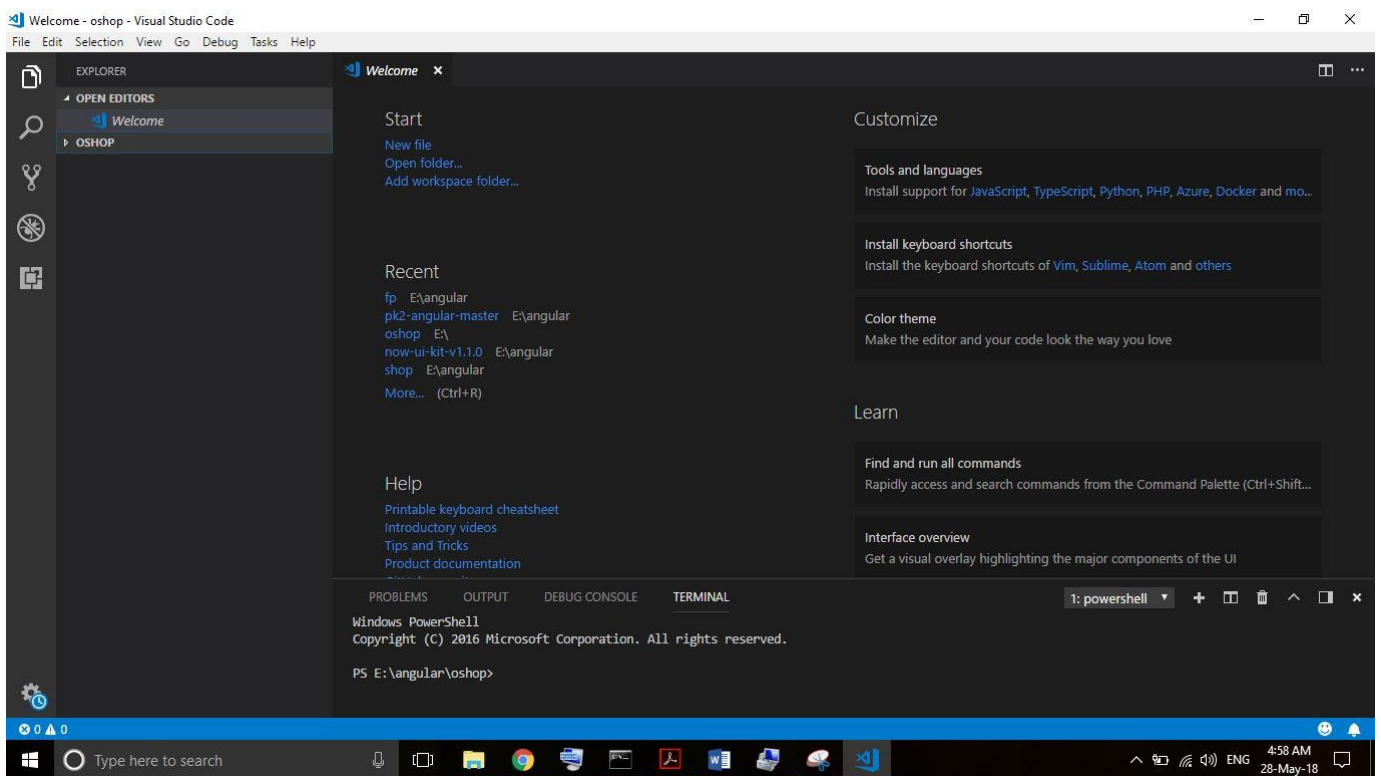


Figure3: Home page of Visual Studio Code

#### **4.4 What is Firebase?**

In short Firebase is platform which allow to build web and mobile applications without server side programming language. You can store user's data on its real-time database which sync data among user's data in no time.

Firebase is a Google product which offers so many useful features. Like

**Real time database, Push notification, Firebase Analytics, Firebase Authentication, Firebase Cloud Messaging, Firebase Storage, Firebase Hosting, Firebase Test Lab For Android, Firebase Crash reporting, Firebase Notification, Firebase App Indexing, Firebase Dynamic link, Firebase Invites, and Firebase Ad words.**

The whole application runs on firebase – Google cloud real-time database as its backend.

#### **Why we have considered Google cloud firebase in our project?**

As far as modern online database platforms are concerned firebase is highly recommended as dynamic database backend with multiple industrial features available through well documented APIs. Firebase provides real-time database triggers, analytics, push notifications, security rules and more technical features in order to help developers built server less applications. It is a JSON based NO-SQL database structure which is very fast and easy on integrations among cross development platforms (Web, Android, iOS etc.) with a single database.

The database triggers have been implemented through JavaScript APIs in angular platform enable the application listen on dynamic database changes. If a product is added/updated/removed from the database, the changes are readily visible from the frontend without reloading the page. For a limited application traffic the usage of firebase database is free and this is the major reason that developers are encourage to build on this platform.

### **4.4.1 Firebase Real-time Database:**

Store and sync data with our NoSQL cloud database. Data is synced across all clients in real-time, and remains available when your app goes offline. The Firebase Realtime Database is a cloud-hosted database. Data is stored as JSON and synchronized in real-time to every connected client. When you build cross-platform apps with our iOS, Android, and JavaScript SDKs, all of your clients share one Realtime Database instance and automatically receive updates with the newest data.

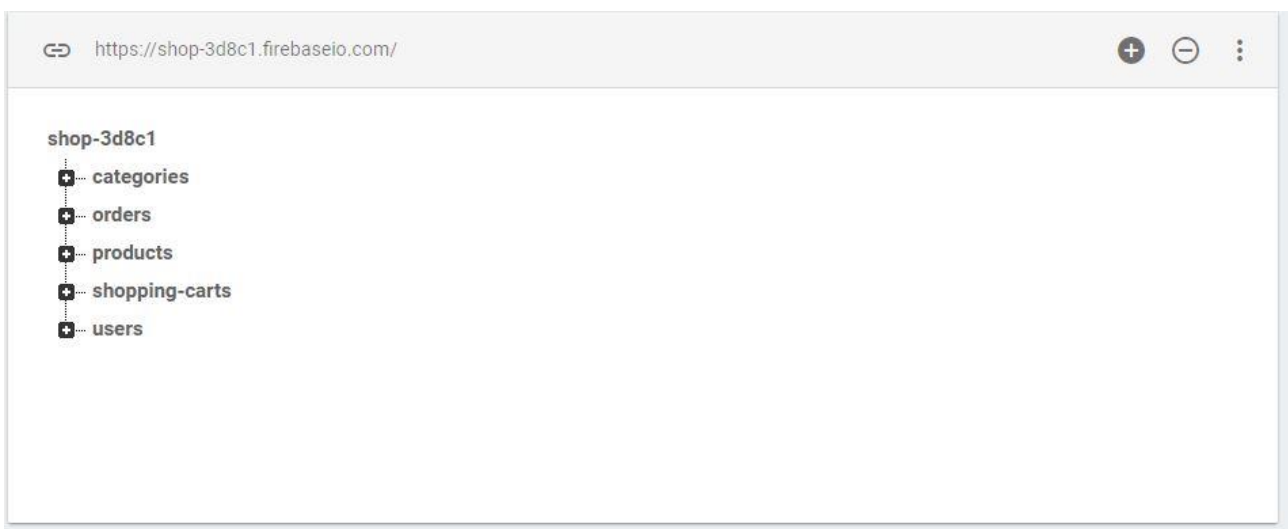


Figure4: My Database Snippet

### **4.4.2 Firebase Authentication:**

Most apps need to know the identity of a user. Knowing a user's identity allows an app to securely save user data in the cloud and provide the same personalized experience across all of the user's devices.

Firebase Authentication provides backend services, easy-to-use SDKs, and ready-made UI libraries to authenticate users to your app. It supports authentication using passwords, phone numbers, popular federated identity providers like Google, Facebook and Twitter, and more.

Firebase Authentication integrates tightly with other Firebase services, and it leverages industry standards like OAuth 2.0 and OpenID Connect, so it can be easily integrated with your custom backend.

Here in this project i used authentication using email-password and the popular federated identity provider Gmail.

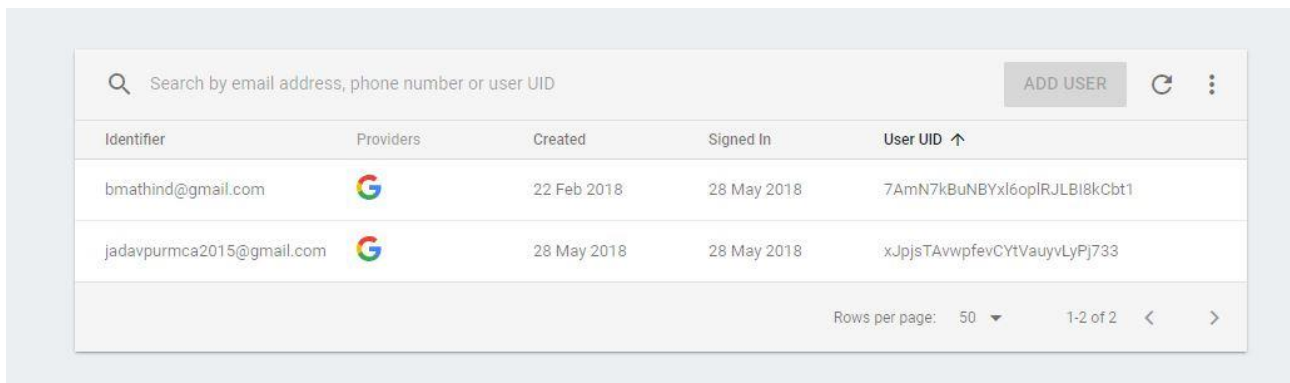


Figure5: Firebase console for authentication

### **4.4.3 Cloud Storage:**

Cloud Storage is built for app developers who need to store and serve user-generated content, such as photos or videos.

Cloud Storage for Firebase is a powerful, simple, and cost-effective object storage service built for Google scale. The Firebase SDKs for Cloud Storage add Google security to file uploads and downloads for your Firebase apps, regardless of network quality. We can use SDKs to store images, audio, video, or other user-generated content. On the server, we can use Google Cloud Storage, to access the same files.

I used this feature for storing images of the products and categories.



#### **4.4.4 Firebase Cloud Messaging:**

Firebase Cloud Messaging (FCM) is a cross-platform messaging solution that lets you reliably deliver messages at no cost.

Using FCM, you can notify a client app that new email or other data is available to sync. You can send notification messages to drive user re-engagement and retention. For use cases such as instant messaging, a message can transfer a payload of up to 4KB to a client app.

#### **How does it work?**

An FCM implementation includes two main components for sending and receiving:

1. A trusted environment such as Cloud Functions for Firebase or an app server on which to build, target, and send messages.
2. An iOS, Android, or web (JavaScript) client app that receives messages.

You can send messages via the Admin SDK or the HTTP and XMPP APIs. For testing or for sending marketing or engagement messages with powerful built-in targeting and analytics, you can also use the Notifications composer.

#### **4.4.5 How to integrate Firebase with Angular 4**

Firebase is a mobile and web application development platform developed by **Google**. We can build our apps very fast, without making complex back-end system. It helps to scale automatically, for even the largest apps. In this Angular 4 Firebase tutorial, we're going to go through the steps to integrate **Firebase** into **Angular 4 App** with AngularFire2 4.0.

#### **I. Technology**

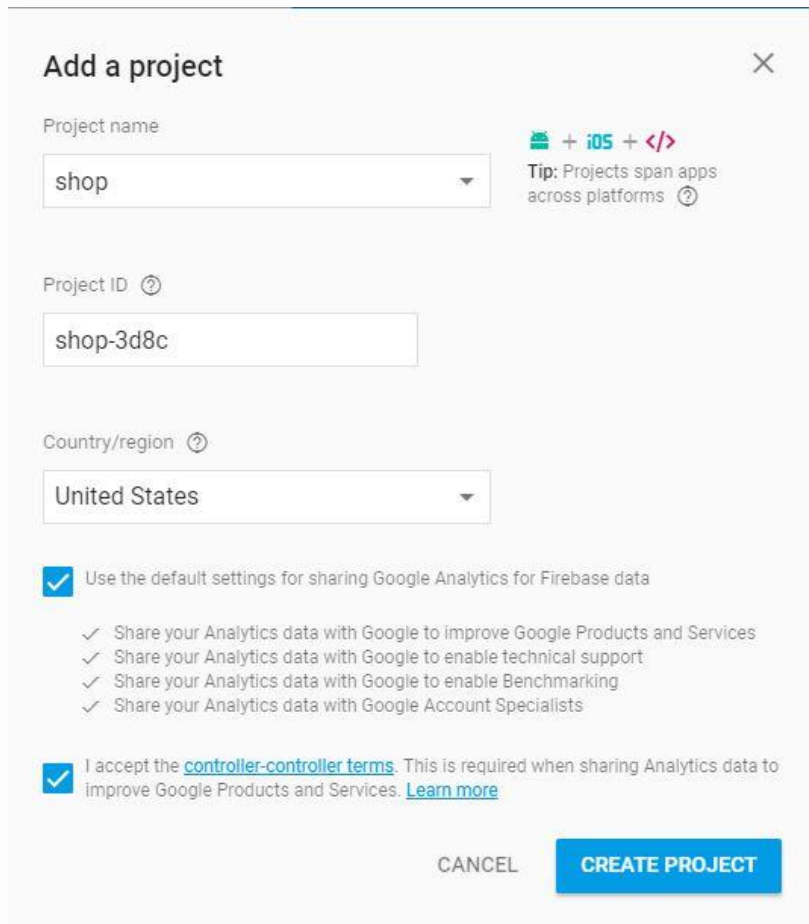
- Angular 4
- AngularFire2 4.0

## II. Step by step

### 1. Set up the Firebase Project

Go to Firebase Console, login with your Google Account, then click on **Add Project**.

Enter **Project name**, select **Country/Region**:



**Add a project** ✕

Project name 📱 + iOS + </>

shop ▼ **Tip:** Projects span apps across platforms ?

Project ID ?

shop-3d8c

Country/region ?

United States ▼

Use the default settings for sharing Google Analytics for Firebase data

- ✓ Share your Analytics data with Google to improve Google Products and Services
- ✓ Share your Analytics data with Google to enable technical support
- ✓ Share your Analytics data with Google to enable Benchmarking
- ✓ Share your Analytics data with Google Account Specialists

I accept the [controller-controller terms](#). This is required when sharing Analytics data to improve Google Products and Services. [Learn more](#)

CANCEL **CREATE PROJECT**

Figure6: Create a project in Firebase

Press **CREATE PROJECT**, browser turns into:

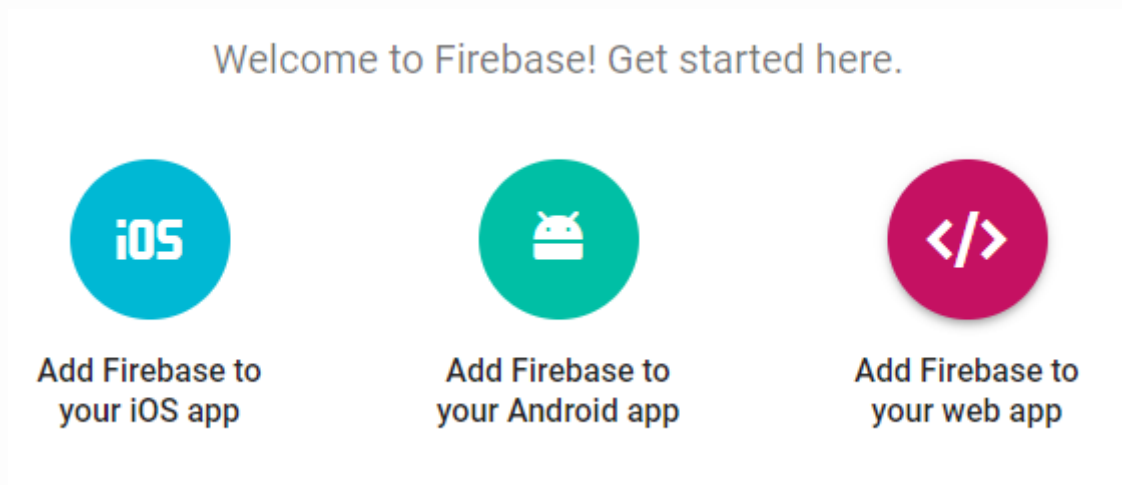


Figure7: Add Firebase to your web app

Click on **Add Firebase to your Web App**, a Popup will be shown:

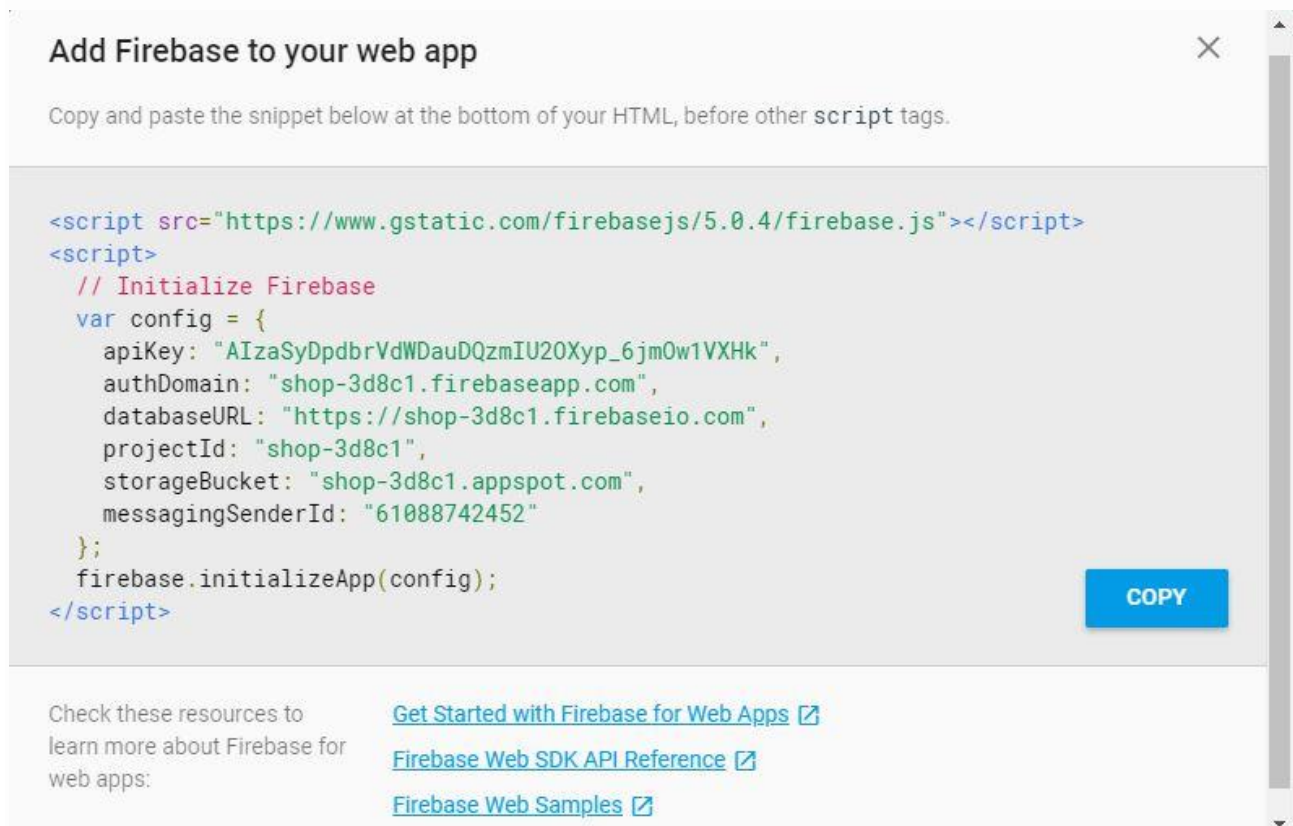


Figure8 : configuration setup

Save the information for later usage.

Choose **Database** in the left (list of Firebase features) -> Tab **RULES**, then change **.read** and **.write** values to **true**:

```
1  {
2  "rules": {
3    ".read": true,
4    ".write": true
5  }
6 }
```

## 2. Install AngularFire2

Before installing AngularFire2, make sure that we have latest version of **Angular-cli** installed. The lowest compatible version is 1.x.x-beta.14. We also need **Typings**, and **TypeScript**.

So, if you don't have these things, try to install them by the following commands:-

```
npm install -g @angular/cli@latest
```

```
npm install @angular/cli --save-dev
```

```
npm install -g typings
```

```
npm install -g typescript
```

### 2.1 Create Angular project

```
ng new <project-name>
```

```
cd <project-name>
```

### 2.2 Install AngularFire2 and Firebase

```
npm install angularfire2 firebase --save
```

### 3. Use AngularFire2 in Angular Project

#### 3.1 Add Firebase config to environments variable

Open `/src/environments/environment.ts`, add your Firebase configuration that we have saved when Popup window was shown...

```
export const environment = {
  production: false,
  firebase: {
    apiKey: "AIzaSyDpdbrVdWDauDQzmIU20Xyp_6jmOw1VXHk",
    authDomain: "shop-3d8c1.firebaseio.com",
    databaseURL: "https://shop-3d8c1.firebaseio.com",
    projectId: "shop-3d8c1",
    storageBucket: "shop-3d8c1.appspot.com",
    messagingSenderId: "61088742452"
  }
};
```

#### 3.2 Setup @NgModule

Open `/src/app/app.module.ts`, import `AngularFireModule` and other `AngularFire2` modules if necessary. Don't forget specify Firebase configuration with `AngularFireModule.initializeApp(firebaseConfig)`:

```
import { NgModule } from '@angular/core';
import { BrowserModule } from '@angular/platform-browser';
import { RouterModule } from '@angular/router';
import { AngularFireModule } from 'angularfire2';

import { environment } from '../environments/environment';
import { AdminModule } from './admin/admin.module';
import { AdminAuthGuard } from './admin/services/admin-auth-guard.service';
import { AppComponent } from './app.component';
import { LoginComponent } from './core/components/login/login.component';
import { CoreModule } from './core/core.module';
import { SharedModule } from './shared/shared.module';
import { ProductsComponent } from
 './shopping/components/products/products.component';
import { ShoppingModule } from './shopping/shopping.module';

@NgModule({
  declarations: [
    AppComponent
```

```

],
imports: [
  BrowserModule,
  SharedModule,
  AdminModule,
  ShoppingModule,
  CoreModule,
  AngularFireModule.initializeApp(environment.firebase),
  RouterModule.forRoot([
    { path: '', component: ProductsComponent },
    { path: 'login', component: LoginComponent },
  ])
],
providers: [
  AdminAuthGuard,
],
bootstrap: [AppComponent]
})
export class AppModule { }

```

## 4.5 What is AngularFire2?

AngularFirestore allows you to work with Cloud Firestore, the new flagship database for mobile app development. It improves on the success of Real-Time Database with a new, more intuitive data model. Cloud Firestore also features richer, faster queries and scales better than Realtime Database.

- **Observable based** - Use the power of RxJS, Angular, and Firebase.
- **Realtime bindings** - Synchronize data in realtime.
- **Authentication** - Log users in with a variety of providers and monitor authentication state in realtime.
- **Offline Data** - Store data offline automatically with AngularFirestore.
- **ngrx friendly** - Integrate with ngrx using AngularFire's action based APIs.

### 4.5.1 How to install angularfire2 in our project?

Inside our project run this following command

```
npm install firebase angularfire2 --save
```

### 4.6 What is Bootstrap?

Bootstrap is a powerful front-end framework for faster and easier web development. It includes HTML and CSS based design templates for common user interface components like Typography, Forms, Buttons, Tables, Navigations, Dropdowns, Alerts, Modals, Tabs, Accordion, Carousel and many other as well as optional JavaScript extensions.

Bootstrap also gives you ability to create responsive layout with much less efforts.

### Advantages of Bootstrap

The biggest advantage of using Bootstrap is that it comes with free set of tools for creating flexible and responsive web layouts as well as common interface components.

Additionally, using the Bootstrap data APIs you can create advanced interface components like Scrollspy and Typeaheads without writing a single line of JavaScript.

Here are some more advantages, why one should opt for Bootstrap:

- **Save lots of time** — you can save lots of time and efforts using the Bootstrap predefined design templates and classes and concentrate on other development work.
- **Responsive features** — Using Bootstrap you can easily create responsive designs. Bootstrap responsive features make your web pages to appear more appropriately on different devices and screen resolutions without any change in markup.
- **Consistent design** — All Bootstrap components share the same design templates and styles through a central library, so that the designs and layouts of your web pages are consistent throughout your development.

- **Easy to use** — Bootstrap is very easy to use. Anybody with the basic working knowledge of HTML and CSS can start development with Bootstrap.
- **Compatible with browsers** — Bootstrap is created with modern browsers in mind and it is compatible with all modern browsers such as Mozilla Firefox, Google Chrome, Safari, Internet Explorer, and Opera.
- **Open Source** — and the best part is, it is completely free to download and use.

## 5 Project Setup with Angular 2 CLI

Now, that the Firebase database is available, the next step is to initiate the Angular 2 sample application. We do that by using the Angular 2 CLI. If you haven't installed the command line interface yet, you first need to execute the following command to make the ng command available on your system:

```
$ npm install -g angular-cli
```

Once the Angular 2 CLI is available we're able to initiate a new Angular 2 project by executing the following command

```
$ ng new angular2fb
```

This creates the project folder *angular2fb* and inside this folder you'll find the following initial project structure:

```
|— README.md
|— angular-cli.json
|— e2e
|— karma.conf.js
|— node_modules
|— package.json
|— protractor.conf.js
```



```
|— src
└─ tslint.json
```

The subfolder *src* is containing the main implementation parts:

```
.
|
|— app
|  |— app-routing.module.ts
|  |— app.component.css
|  |— app.component.html
|  |— app.component.spec.ts
|  |— app.component.ts
|  |— app.module.ts
|  |— index.ts
|  └─ shared
|     └─ index.ts
|— assets
|— environments
|  |— environment.prod.ts
|  └─ environment.ts
|— favicon.ico
|— index.html
|— main.ts
|— polyfills.ts
|— styles.css
|— test.ts
|— tsconfig.json
└─ typings.d.ts
```

To check that the project has been initiated correctly you can now start up the web server by using the ng command in the following way:

**\$ ng serve**

The application should then be accessible at **<http://localhost:4200>** in your browser.

# STUDY OF THE SYSTEM

## MODULES:

The system after careful analysis has been identified to be presented with the following modules and roles. The modules involved are:

- Administrator
- Users

## 5.1 ADMINISTRATOR

The administrator is the super user of this application. Only admin have access into this admin page. Admin may be the owner of the shop. The administrator has all the information about all the users and about all products.

This module is divided into different sub-modules.

1. Manage Products
2. Manage Order

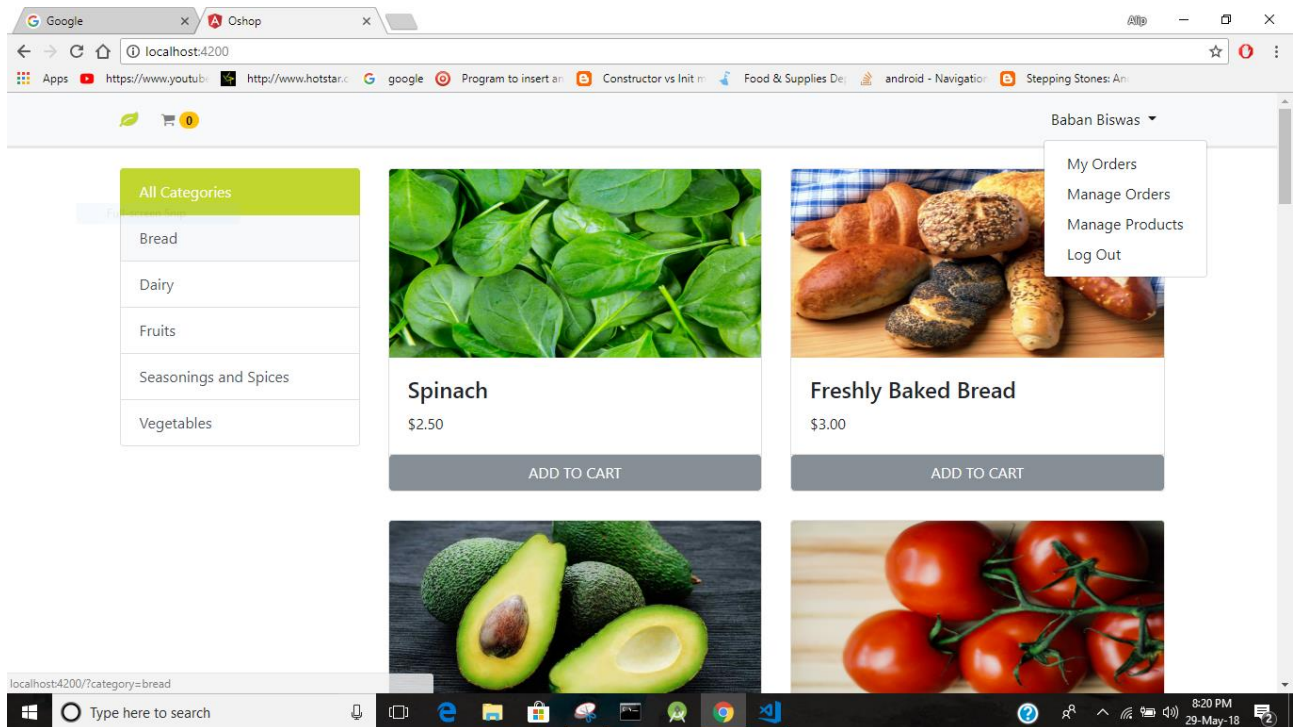


Figure9: Admin Can Manage Order and Manage Product

## 5.1.1 MANAGE PRODUCTS

### ● Add Products

The shopping cart project contains different kind of products. The products can be classified into different categories by name. Admin can add new products into the existing system with all its details including an image.

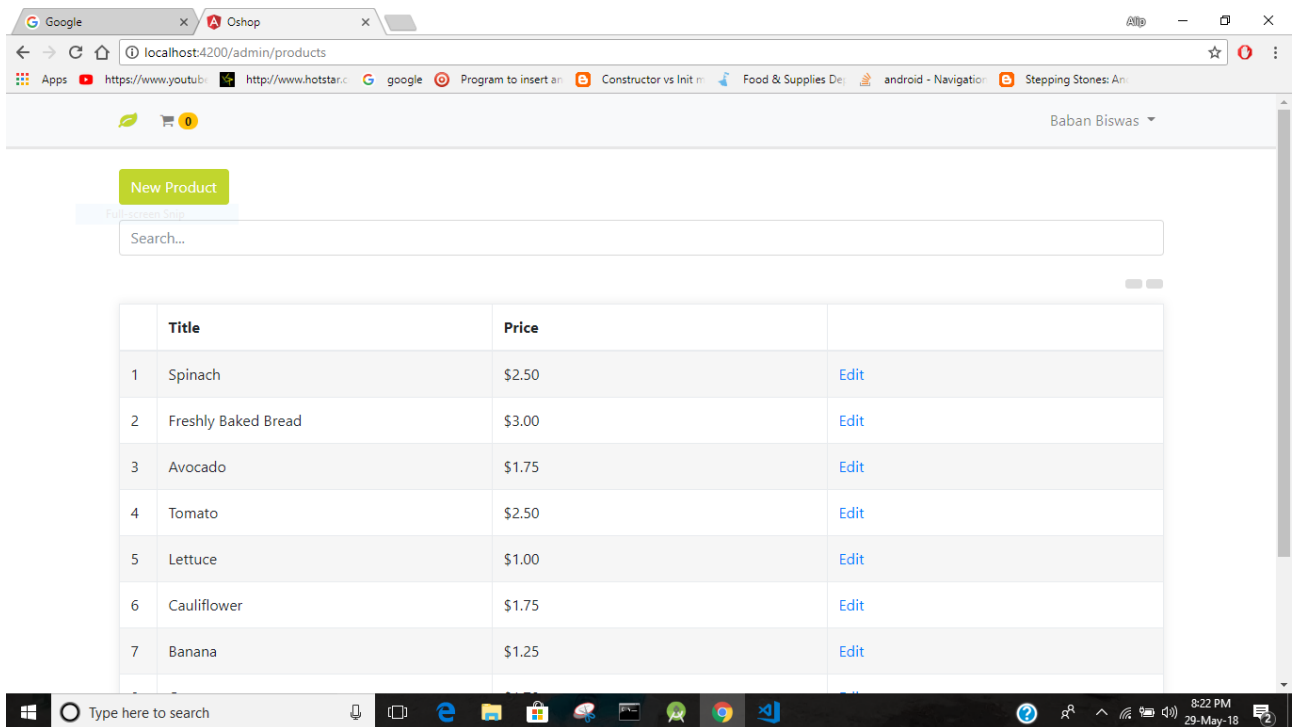


Figure10: Admin can add a new product and edit an existing order

## ● Delete Products

Administrator can delete the products based on the stock of that particular product.

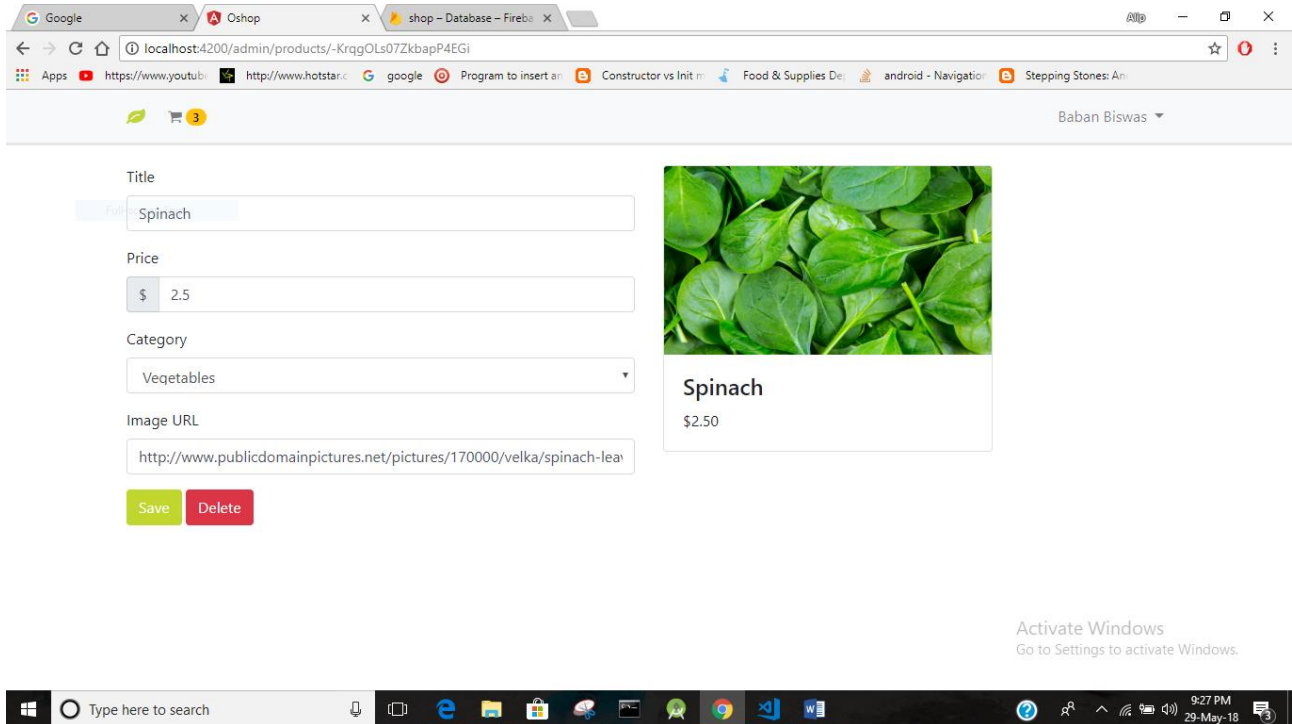


Figure11: Admin can delete an existing order

- **Search products**

Admin will have a list view of all the existing products. He can also search for a product by category.

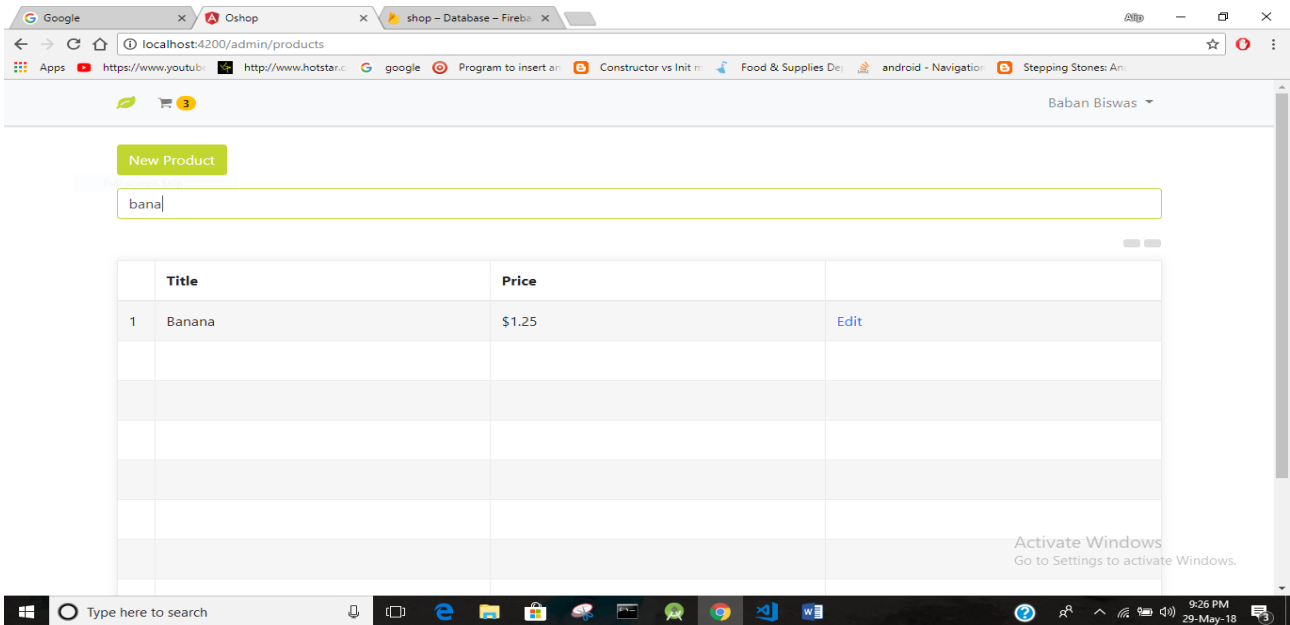


Figure12: Search a product by name

## **5.1.2 MANAGE ORDERS**

- **View Order**

Administrator can view the Orders which is generated by the users. He can verify the details of the purchase.

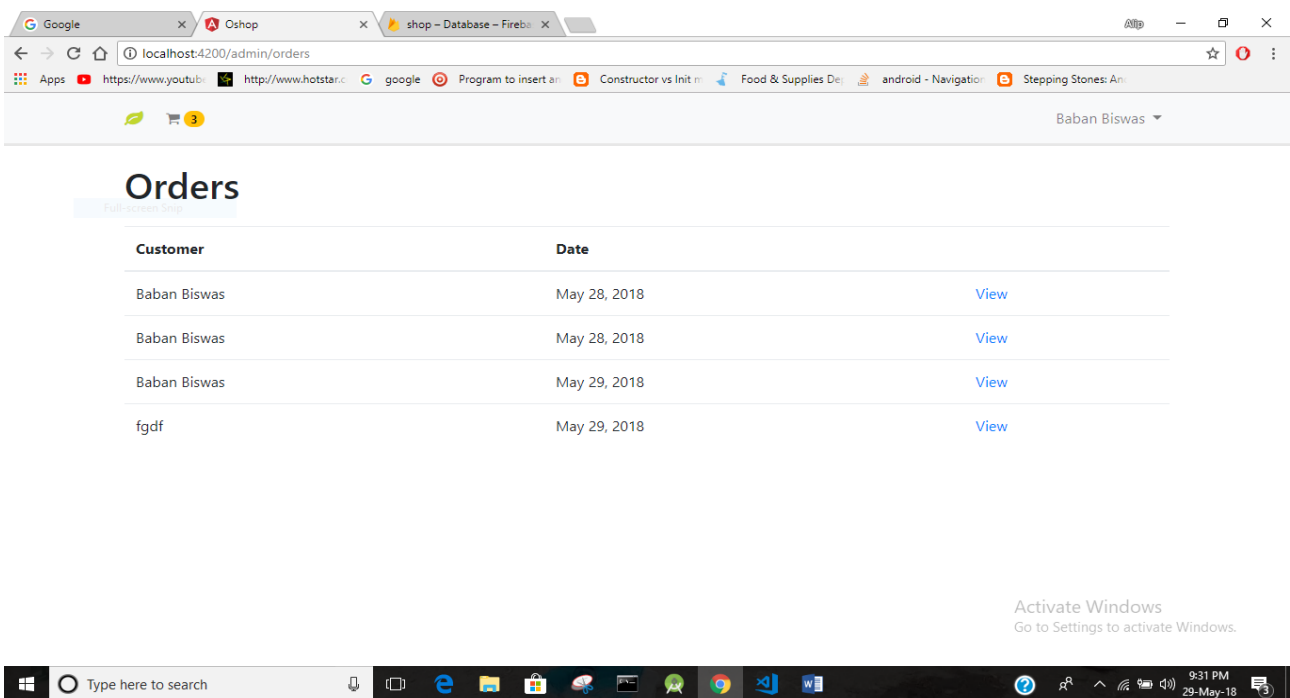


Figure13: View order

## **5.2 USERS**

A user can view the product details without registered in this system, but he can't be placed the order without Login.

### **5.2.1 Registration**

A new user will have to register in the system by providing essential details (In this case an E-Mail and password) in order to check-out the products.

### **5.2.2 Login**

A user may login with his E-Mail and password to the system after registration. But Login is essential for checkout of the product.

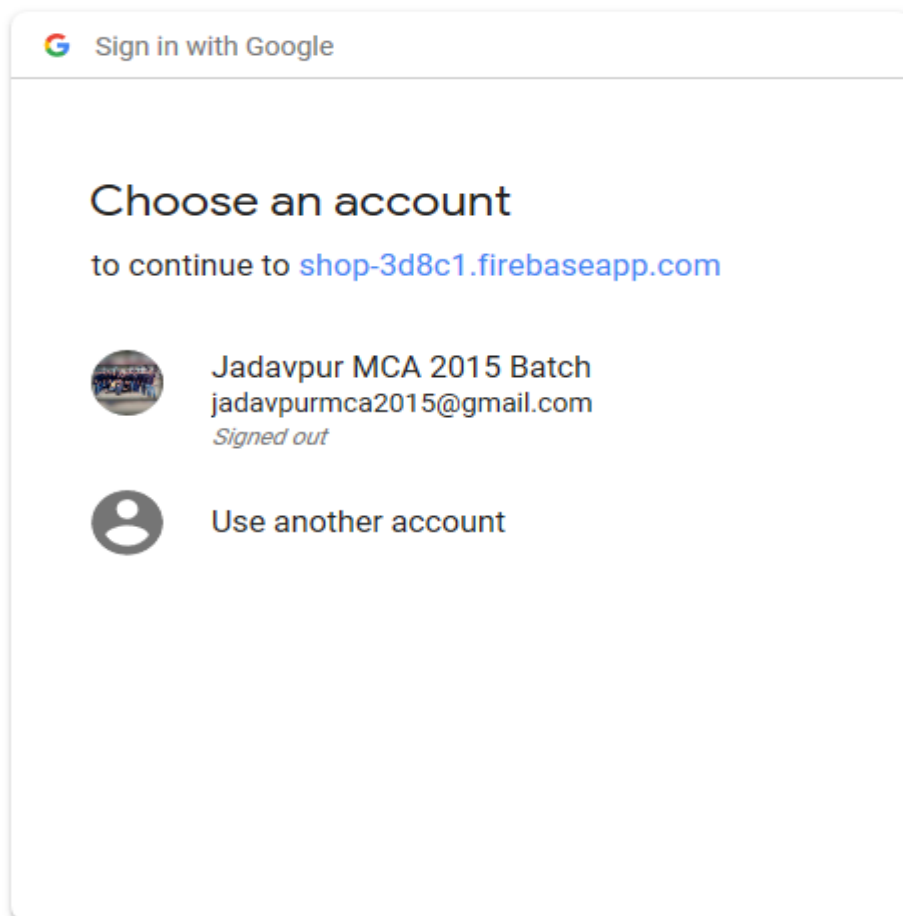


Figure14: Authentication through E-mail and password

### 5.2.3 View Products

User can view the list of products based on their names without login. A description of a particular product with product name, product image, price and category can be viewed by users.

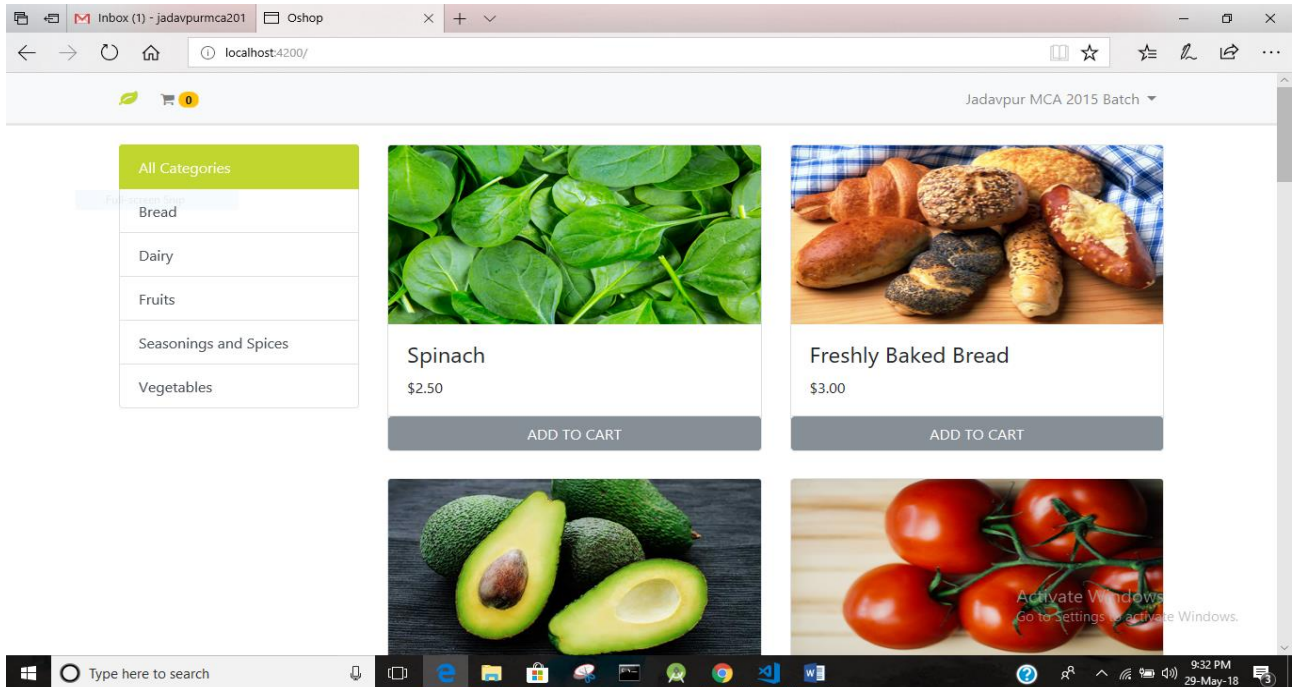


Figure15: Home page

### 5.2.4 Search Product

Users can search for a particular product in the list by existing category.

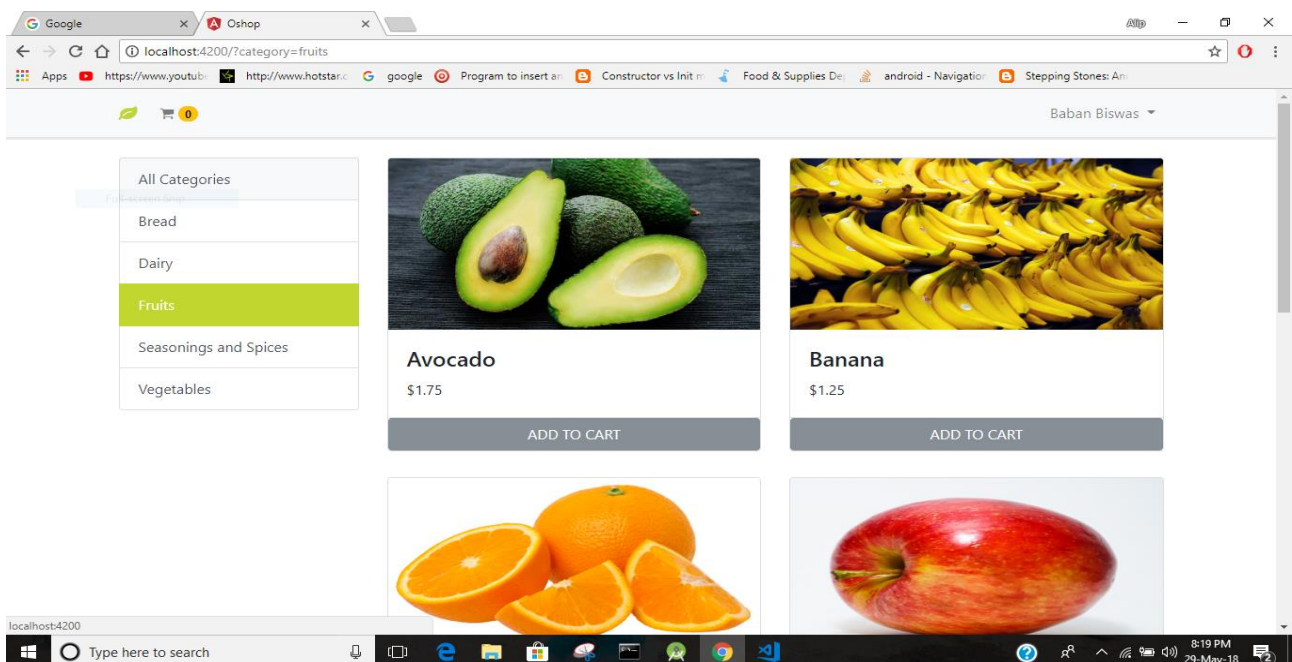


Figure16: Search product by category



### 5.2.5 Add to cart

The user can add the desired product into his cart by clicking add to cart option on the product. He can view his cart by clicking on the cart button. All products added by cart can be viewed in the cart. User can remove an item from the cart by clicking remove.

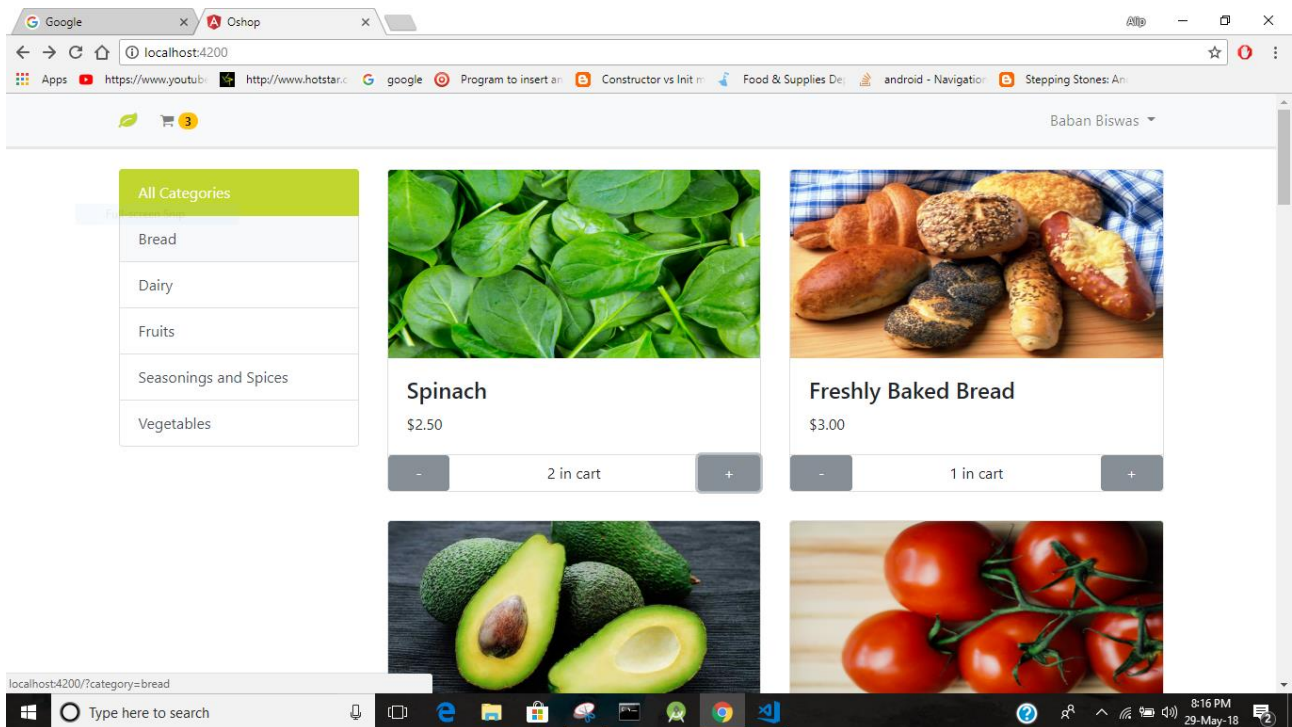


Figure17: Selecting product

- **Submit Cart**

After confirming the items in the cart the user can submit the cart by providing a delivery address.

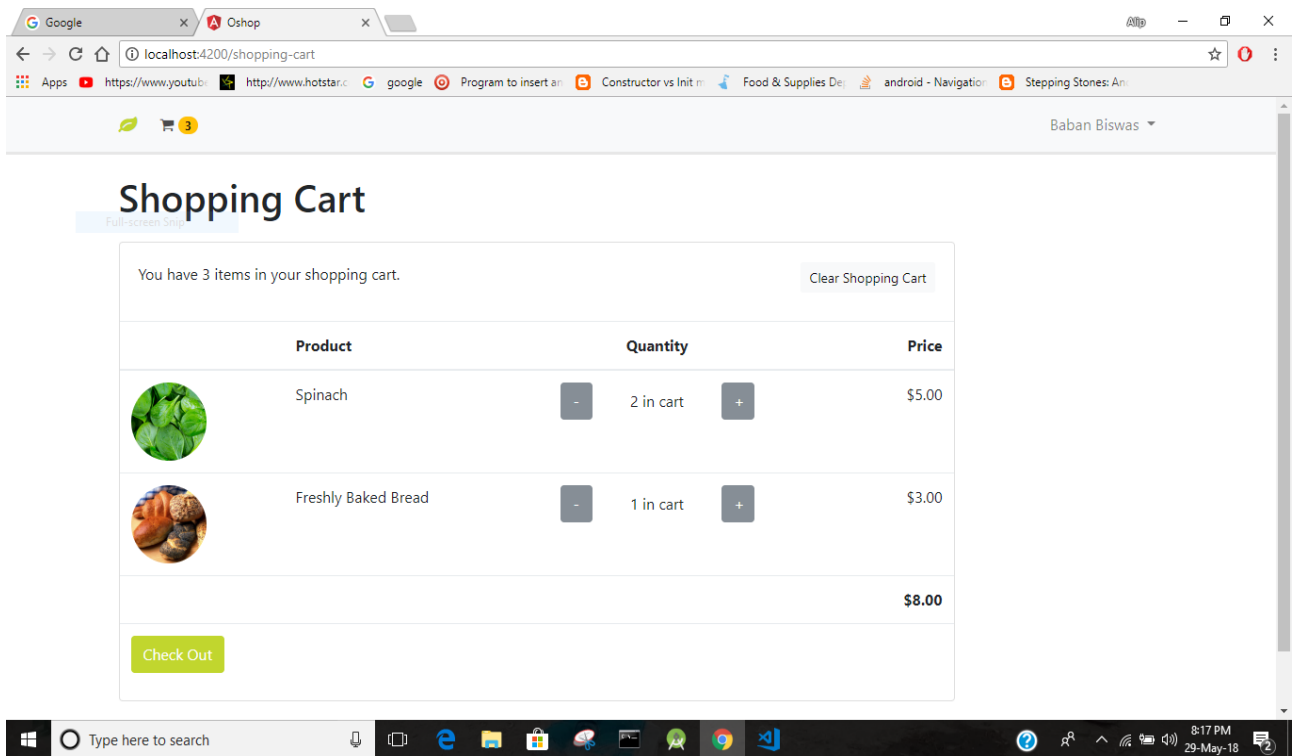


Figure17: Shopping cart

## ● Checkout Process

Every users go through the check-out process to finally purchase items. Whereas the checkout process through payment gateway is out of scope of this project and hence not implemented.

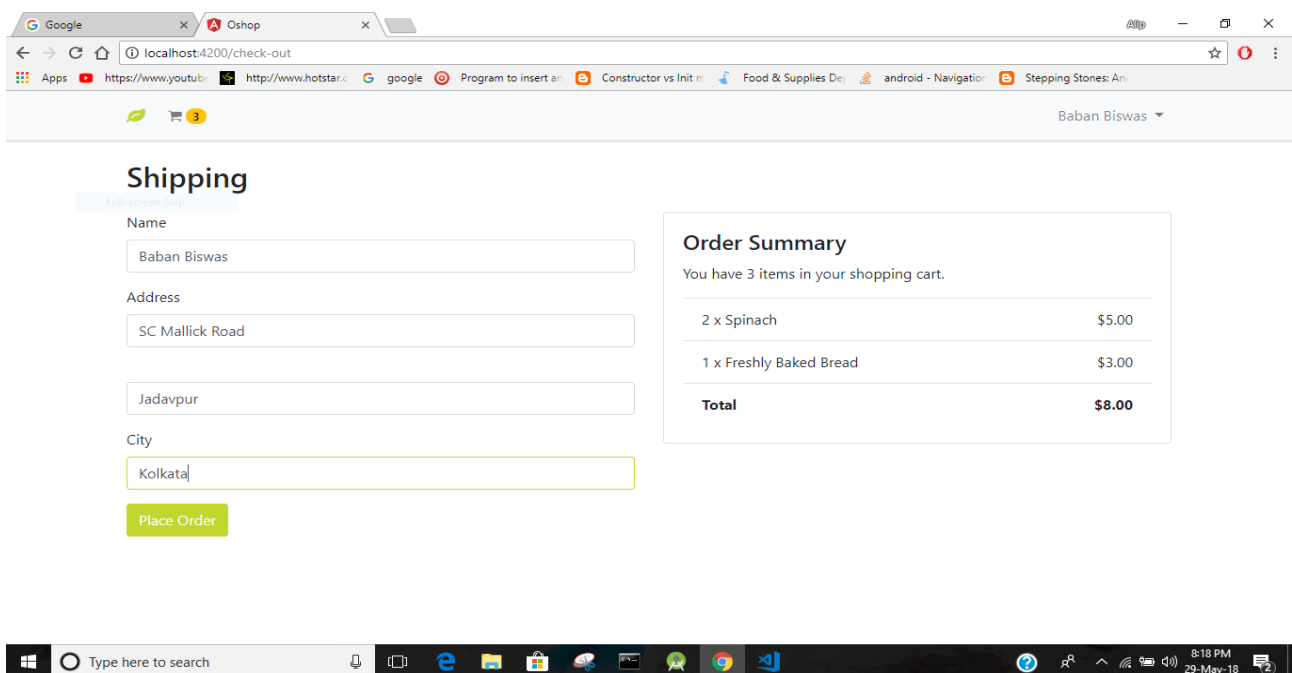


Figure18: Checkout Process

## **6 Limitations and Future Development**

There are some limitations for the current system to which solutions can be provided as a future development:

1. Check-out process is not implemented in this above project.
2. The Website is not accessible to everyone. It can be deployed on a web server so that everybody who is connected to the Internet can use it.

As for other future developments, the following can be done:

1. The Administrator of the web site can be given more functionalities, like looking at a specific customer's profile, delete user etc.

## **7 Conclusion:**

The Internet has become a major resource in modern business, thus electronic shopping has gained significance not only from the entrepreneur's but also from the customer's point of view. For the entrepreneur, electronic shopping generates new business opportunities and for the customer, it makes comparative shopping possible. As per a survey, most consumers of online stores are impulsive and usually make a decision to stay on a site within the first few seconds. "Application design is like a shop interior. If the shop looks poor or like hundreds of other shops the customer is most likely to skip to the other application". Hence I have designed the project to provide the user with easy navigation, retrieval of data and necessary feedback as much as possible.

In this project, the user is provided with an e-commerce application that can be used to buy vegetables and fruits online. To implement this as a mobile application I used Angular as the Technology. It has several advantages such as enhanced performance, scalability and simplicity. To build any web application need a programming language such as JavaScript.

Firebase was used as back-end database since it is one of the most popular open source real-time databases, and it provides fast data access, easy installation and simplicity. Also I used Firebase for user authentication, cloud storage.

A good shopping cart design must be accompanied with user-friendly shopping cart application logic. It should be convenient for the customer to view the contents of their cart and to be able to remove or add items to their cart. The shopping cart application described in this project provides a number of features that are designed to make the customer more comfortable.

This project helps in understanding the creation of an interactive app layout and the technologies used to implement it. The design of the project which includes

Data Model and Process Model illustrates how the database is built with different nodes, how the data is accessed and processed from the database.

The building of the project has given me a precise knowledge about how Angular4 is used to develop an Web application, how it connects to the Firebase database to access the data and how the data and app layouts are modified to provide the user with a shopping cart application.

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