A Thesis/Project/Dissertation Report

on

Bakeful: An E-Commerce App

Submitted in partial fulfillment requirement for the award of

the degree of

Bachelor's of Technology in Computer Science Engineering

Under The Supervision of

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Candidate's Declaration

I/We hereby certify that the work which is being presented in the thesis/project/dissertation, entitled **"Bakeful : An E-Commerce App"** in partial fulfillment of the requirements for the award of the Bachelors of Technology submitted in the School of Computing Science and Engineering of Galgotias University, Greater Noida, is an original work carried out during the period of month, September/2021 to November/2021, under the supervision of Name **"Dr. S. Jerald Nirmal Kumar"** Associate Professor, Department of Computer Science and Engineering, Galgotias University, Greater Noida.

The matter presented in the thesis/project/dissertation has not been submitted by us for the award of any other degree of this or any other place.

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This is to certify that the above statement made by the candidates is correct to the best of my knowledge.

Supervisor Name   **Designation**

CERTIFICATE

The Final Thesis/Project/Dissertation Viva-Voce examination of **"JOY GUPTA(18SCSE1010749) & ABHISHEK RAJPOOT(18SCSE1010311)"** has been held on _____ and their work is recommended for the award of B.Tech(CSE).

Signature of Examiner(s)   **Signature of Supervisor(s)**

Signature of Project Coordinator   **Signature of Dean**

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Place: Greater Noida

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Abstract

The motivation behind this undertaking is to make a web application that will be simpler to discover intriguing crude food things and flavors. This E-commerce web application administrator can add items and can remove them. Clients likewise can without much of a stretch quest for their number one merchandise. They can likewise get them effectively simply by adding to the truck and they can increment or abatement by tapping on the "+" sign and "- " sign. In the wake of adding they can check the aggregate sum of what has been added to the truck. An effective installment doorway is empowered so installment should be possible by check card, Visa, and net banking.

Keywords: JavaScript, Software Stack, Framework, Library, Performance Analysis, React.js, MongoDB, Node.js, Express.js

List of Figures

Table of Contents

Chapter 7   References 35

Acronym

DOM	Document Object Model
W3C	World Wide Web Consortium
ISO	International Organization for Standardization
NPM	Node Package Manager
API	Application Program Interface
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
URL	Uniform Resource Locator
JSON	JavaScript Object Notation
JS	JavaScript
JSX	JavaScript XML
XML	Extensive Markup Language

CHAPTER-1

Introduction

1.1   Introduction:

The facts really confirm that innovation has turned into a fundamental device for web-based advertising these days. Notwithstanding, there are various little shops and supermarkets with generally disconnected plans of action in Vietnam as of late. This trade model will bring a lot of terrible encounters for the two purchasers and merchants. For example, the vendor has the item needed to bring to the table yet the purchaser may not know it, or the purchaser may directly have to buy something, yet the store is unavailable. Besides, internet shopping assists clients with picking a wide scope of items, costs and they can contrast them with one another without any problem. Experiencing the insufficiencies and the shortcomings of the disconnected plan of action, making a site application for looking and purchasing things for each shop is extremely essential at this moment.As of late, there have been numerous internet business destinations traded like Amazon, e-inlet, or stores that can sell items through online media channels like Facebook. Nonetheless, clients actually think that it is hard to pick the items they need in light of the huge assortment of items in these locales and not center around explicit things. Also, the vendors need to spend a high measure of cash on advertising or paying for

expenses. From that point drawbacks, executing a web-based internet business web application for little supermarkets assists retailers with canning to oversee items on their own frameworks and not rely upon the outsider site. The clients can rapidly look through the items in case it is accessible and come to the store to get them and they can contact the retailer to dive more deeply into the items that they are searching for. To make a site that can secure the necessities of the two clients and retailers, MERN (MongoDB, Express.js system, ReactJS library, NodeJS stage) is one of the incredible stacks that can assist us with fostering a web-based business web application. It is true that technology has become an essential tool for online marketing nowadays. However, there are numerous small shops and grocery stores with mostly offline business models in Vietnam recently. With this commerce model, it will bring a lot of bad experiences for both buyers and sellers. For instance, the seller has the product they want to offer but the buyer may not know it, or the buyer may urgently need to purchase something, but the store is out of stock. Moreover, online shopping helps customers to choose a wide range of products, prices and they can compare them to each other easily. Encountering the inadequacies and the weaknesses of the offline business model, making a website application for searching and buying things for each shop is very necessary right now. Recently, there have been many e-commerce sites exported such as Amazon, ebay or the stores that can sell products via social media channels like Facebook. However, customers still find it difficult to choose the products

they want because of the large variety of products on these sites and not focus on specific things. Moreover, the sellers have to spend a high amount of money on marketing or paying for fees. From there disadvantages, implementing an online e-commerce web application for small grocery stores helps retailers to manage products on their own systems and not depend on 3rd party websites. For the customers, they can quickly search the products if it is available and come to store to pick it up and they can contact directly to the shop owner to learn more about the products that they are looking for. In order to make a website that can acquire the needs of both customers and retailers, MERN (MongoDB, Express.js framework, ReactJS library, NodeJS platform) is one of the powerful stacks that can help us to develop an e-commerce web application.

1.2 **Problem Formation**

1. In December 2019, a bunch of India's shopkeepers started mobilizing against Amazon and Flipkart.

2. The reason behind this movement was that these big giants were regulating the market abruptly.

3. In order to protect their local businesses, they started this movement.

4. People finally started raising their voice against such giant companies after

being dominated for years.

1.3   Tool and Technology Used

1. React JS

2. Node JS

3. Express JS

4. MongoDB

1.4   Motivation

In the first place, we should accept a glance at inspiration as a mental idea. To lay it out plainly, inspiration is the "why" driving human conduct. Inspiration works in the background to impact outer activities. As Psychology Today notes, one hypothesis called "impetus hypothesis" guides numerous cutting edge showcasing endeavors: "A decent promoting procedure will make you need something you neither have nor think you really want. You expect that by having this "thing," you will be in an ideal situation than you are without it."

This demonstrates that persuading purchasers depends to some extent on exhibiting the worth of your items, so they believe they need to possess them—or if nothing else emphatically wants them. However, another feature is assisting customers with keeping

away from torment all through the purchasing system. Customers these days esteem rapid, consistent web based buying encounters. Hitting an obstacle is regularly enough to make individuals re-examine, maybe in any event, venturing to such an extreme as to leave their shopping basket prior to looking at. While inspiration might begin with a boost, it possibly keeps on impacting customers' conduct assuming they feel like each resulting step is worth the effort. For this reason, it's so essential for online retail locations to help advertising endeavors, which means your site should have the option to work with an instinctive and bothersome free purchasing experience so as not to waste the important inspiration your showcasing endeavors have found.

1.5   Objective

With the increasing trend of online shopping, businesses must shift their business operations to online platforms. E-Commerce is a platform that allows ventures to sell their products or services worldwide using online mode. The core aims of e-commerce are to focus on digitally enabled transactions and help to grow your customers' reach. It is a cost-effective, wide area coverage and connective platform for businesses.The primary aim of every business is to focus on cost reduction, and E-Commerce helps them do the same effectively. The automatic process of e-commerce helps to reduce the cost of management. The proper use of technology, Digital Marketing, can help you gain more

customers without investing much.Customers are the core element of any business whether it is b2b or b2c, and making a stable relationship with your existing customers is significant. E-commerce helps you sustain your customers for a longer period. When you continuously interact with your customers on a network on which they usually spend time, you will build a strong connection with customers. Social media networks are the most used platforms, and with these, you can grab your customers' attention. With E-commerce, you can establish a brand name using social media networks.

1.6   Project Features

1. Login

2. SignUp

3. Product Listing

4. Wishlist Management

5. Cart Management

6. Forgot Password

CHAPTER-2

Literature Survey

2.1   Research/Study

E-Commerce/e-business research articles done in Indian context compared India and China's approaches in adoption of e-business.Based on the literature survey and secondary data, the study analyzed various factors influencing the growth of e-businesses in the two counties. The factors examined include government policy and focus, existing technology infrastructure, regulatory environment, experience and understanding of business operations, and culture, among others. The study concludes that China appears to be ahead of India in infrastructure, but India is ahead in e-readiness. Further, it states that both countries are poised for rapidly increasing e-business, however,problems of poverty and inequality between urban and rural connectivity must be resolved to really take advantage of e-business in both the countries.

Folks studied the determinants of Internet banking adoption by banks in India. Panel data of 88 banks in India covering the financial years 1997—1998 to 2004-2005 was collected through the CMIE (Center for Monitoring Indian Economy) database. Logistic regression analysis was used, the dependent variable is categorical with a value of if a bank adopted

Internet banking during the study period and 0 otherwise. Independent variables included in the study are firm size, firm age, bank deposits ratio, average wages, expenses (fixed assets & premises), ROA (ratio of average net profits to average assets), market share,average number of branches, percentage of banks adopting Internet banking. The Results of the study prove that Bank type (Private), firm size, bank deposits ratio,firm age, market share, average number of branches, percentage of banks adopted Internet banking and expenses are found to be significant in adoption decisions.Wage and ROA are found to be insignificant. This study contributes to the empirical literature on diffusion of financial innovations, particularly Internet banking in Indian context. Most of the study on adoption of technology was related to developed markets like US and Europe, this study is an important contribution to evolving literature as it dealt with the problem of technology adoption in a developing country context. Study by Tarafdar and Vaidya examined the factors that determine the organizational inclination to adopt E-Commerce (EC). The study proposes a framework based on the qualitative data on four financial firms in India collected through multiple case study design. Face to face interviews were used to collect primary data and existing databases, company documents, press reports and websites are used to collect secondary data. The framework describes two broad factors—leadership characteristics and organizational characteristics—to explain the influence of organizational factors on the propensity to employ EC technologies. The study found that

both leadership and organizational characteristics influence EC adoption. It establishes that leadership characteristics influence adoption of EC technologies in centralized organization and organization. The study also found that characteristics of Information Systems professional and organization structure influence EC adoption.Another study by Tarafdar and Vaidya, analyzes organizational and strategic imperatives that influence Information System (IS) assimilation in Indianorganizations. IS assimilation here refers to the extent to which a system or technology becomes diffused in organizational processes. The study is based on multiple case study methods. Data on nine firms which have deployed IS was collected through face to face structured interviews involving middle managers,senior managers of IS and other departments. The study examines the nature of the system present data processing transaction oriented, operational,strategic and how these systems affected key operational processes. Strategic imperatives are examined by analyzing the environmental factors—presence or absence of government regulation, pressure from customers, suppliers and competitors, and strategic stance—whether product and process changes, and the consequent IS deployment were proactive or reactive Organizational imperatives were investigated by qualitatively assessing six factors— top management support; IS department knowledge of business, technology and involvement in IS deployment, IT literacy of managers, management style; presence of IT champions and availability of IT resources. Data was analyzed across-case and

within-case. The study identifies three categories of organizations—innovative IS users, enlightened IS users and reluctant IS users—with respect to IS assimilation, and describes strategic and organizational factors characteristics of each group. The study also traces the evolution of the IS application portfolio in each of the studied firms and analyses accompanying changes in strategic and organization factors. In short, the paper presents an integrated and first level analysis of strategic and organizational imperatives that have influenced the assimilation and evolution of IS in Indian organizations. We examined the issue of e-commerce in India from the framework of developing countries as suggested by Tallon and Kraemer.The framework included critical factors that might impact the diffusion of e-commerce. The factors are government policy, legal framework, technology infrastructure, relationship with developed economies and extent of e-commerce usage by individual, corporate and government. The study's primary focus is onIndia. Mexico is analyzed more briefly, and compared with India based on common intemational datasets. The analysis and the data presented in this paper represent a synthesis of data from secondary research and data from interviews conducted with senior executives in the IT industry in India and Mexico. The study suggests that substantial efforts have to be made to invest in telecommunications infrastructure, and to create a culture of electronic payments and e-commerce usage that will support economic growth.

2.2 Comparative study

2.2.1 What is E-commerce?

E-comm, EC for short (E-commerce) is a concept referring to transactions, purchase, and sale of goods and services by the internet. E-commerce was first known in the 1960s. After years of development, as mobile devices became popular, social media increasingly affirmed the power and the boom of the webpage. Launchers promote the rapid development of commerce (E-commerce).

2.2.2 Types of E-commerce

E-comm, EC for short (E-commerce) is a concept referring to transactions, purchase and sale of goods and services by the internet. E-commerce was first known in the 1960s. After years of development, as mobile devices became popular, social media increasingly affirmed the power and the boom of the webpage. Launchers promote the rapid development of commerce (E-commerce).Currently, there are many forms of e-commerce, including the

following basic forms:

- ➢ **B2B (Business to Business):** is a trade between companies, businesses and organizations. About 80% of e-commerce today falls into this category.

- ➢ **B2C (Business to Consumer):** is an Internet-based business to directly exchange the goods and services it creates or distributes to consumers.

- ➢ **C2B (Consumer to Business):** is a consumer who sells their products or services to a business or organization.

- ➢ **C2C (Consumer to Consumer):** is when a consumer sells his goods or services to another consumer.

There are also G2C, G2B, etc., but used less often than these four basic forms.

2.2.3 <u>What are the Advantages of E-commerce?</u>

- ➢ **Global market:** Clearly, when you open a physical store, you will only be able to deliver your goods and services in a small geographic

area. E-commerce will help you solve that problem. E-commerce helps you reach the market quickly, expanding the market to the maximum level compared to direct sales so that products and services are easily introduced, purchased, and sold through retailers. and online market.

➢ **Always open:** In e-commerce, running an online business is much easier, it's always open 24h / 7/365. For businesses, it's a great opportunity to increase sales opportunities all the time.

➢ **Budget savings**: Compared with traditional forms of commercial business, all costs when e-commerce business are reduced: the cost of renting booths, salespeople, and management is much more economical. Naturally, when sellers save operating costs, they can offer more incentives and better discounts for their customers. At this time, the customer is the next beneficiary. Mutual benefit, isn't it great?

➢ **Inventory management:** By using electronic tools to speed up the ordering, delivery, and payment processes, e-commerce businesses can save billions of operating costs and reduce the amount of inventory.

➢ **Most accurate customer marketing:** With access to customer data and the opportunity to track customers' buying habits, e-commerce businesses can quickly identify and market products and services. service. Service most suitable for consumers.

➢ **Work anywhere, buy anywhere:** Running an ecommerce business allows you to not need to sit in the office, and buying does not force you to go to the supermarket. Everything the seller and the buyer needs is an internet-connected device and that's all.

2.3   Challenges:

➢ **Internet access required:** When participating in the EC, to be able to buy and sell, you need a device connected to the internet. Currently, most people have internet access but, in many areas, it is still very limited.

➢ **Not enough to trust:** Products and services that cannot be seen, touched, held or felt directly, are not allowed to try as a prudent buyer. Doubt in both buyers and

sellers leads to many incomplete transactions, especially when they have dealt with untrusted partners before.

➢ **Limited payment methods:** Currently, the most popular payment method in Vietnam when buying goods online is to receive and pay. Payment gateway in Vietnam is growing quite strong, but not reliable enough for users to use as the main payment method. Therefore, it also contributes to teething.

In addition, e-commerce business also faces many other challenges: technical, competitors, payment, etc.

2.4   <u>Proposed System</u>

The E-commerce Management System has many advantages, compared to traditional stores as one can compare the cost of a product with other e-commerce websites, and if a user dislikes any product he/she can return it. While we can make use of the current technology to overcome the problem with the existing system. The E-commerce Management System companies can use a flying robot, so when a user places an order, the company will send the product through the robot. The robot will find the user by using the GPS, and in this way, we can reduce the time to

deliver a product. Before sending a product the e-commerce company will check if the product is the same or not with the requested order.

2.5 <u>Architecture</u>

E-commerce is based on the client-server architecture in which the client can be an application, which uses a Graphical User Interface (GUI) that sends requests to a server for certain services and the server is the provider of the services requested by the client. The E — Commerce Web server is the computer program that provides services to "other computer programs and serves requested Hyper Text Mark-up Language (HTML) pages or files.

A client refers to a customer who requests for certain services and the server refers to the business application through which the services are provided. A machine can be both a client as well as a server. There are two types of client server architecture that E-commerce follows including two-tier and three-tier architectures. In two-tier client-server architecture the user interface runs on the client. The database is stored on the server. The business application logic can either run on the client or the server and likewise the user application logic can either run on the client or the server. It allows the client processes to run separately from the server processes

such as on different computers. The three-tier architecture emerged to overcome the limitations of the two-tier architecture.In three-tier architecture, the user interface and the business application logic are known as business rules. The data storage and access are developed and maintained as independent modules. The three-tier architecture includes three tiers named as top tier, middle tier and third tier. The top tier includes a user interface where user services such as session, text input, and dialog and display management reside and the middle tier provides process management services such as process development, process monitoring and process resourcing that are shared by the multiple applications.

The third tier provides database management functionality in which the data management component ensures that the data is consistent throughout the distributed environment. Also the centralized process logic in this architecture, which makes administration easier by localizing the system functionality, is placed on the middle tier. The client-server architecture provides standardized and abstract interfaces to establish communication between multiple modules. When these modules are combined, they become an integrated business application and here each module is a shareable and reusable object that can be included in another business application.

The functions of a business application are isolated within the smaller business

application objects and so application logic can be modified easily here. In the client-server architecture, each business application object works with its own encapsulated data structures that correspond to a specific database and so on. When business application objects communicate, they send the data parameters as specified in the abstract interface rather than the entire database records, this is the process to take place. This also reduces the network traffic. In the client-server architecture, a programmer can develop presentation components. They do these without knowing the business application logic

CHAPTER-3

Project Design

3.1 Bakeful: Web Application

Bakeful is an E-commerce Web Application using a MERN stack that can help a toys retailer bring their products to the customers.

Main function:

➢ Sign up and log in: Requires Users to register using their phone number or email

➢ Shopping cart: this feature helps users buy and check goods directly on the application

➢ Search: Users can search directly by typing in the search box for the product they want to see.

➢ Buy and pay: Customers who buy through the app can pay through many different payment gateways.

3.2   Login System

The login system of the app will ask the user to provide the username and password whether they are customers or admin.
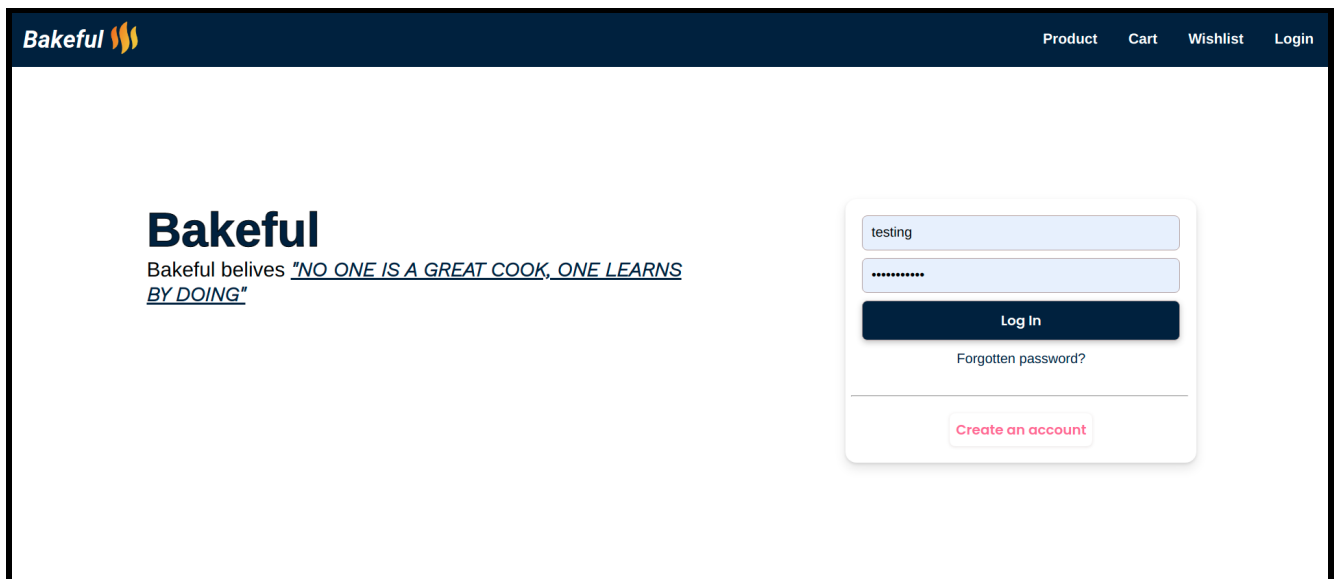

Figure 1: Login.jsx

3.3   <u>Sign in</u>

Users login into the website need to sign in otherwise they have to register a new account.

The empty strings are set up for each field. After a user finishes, they form and click the submit button, the handleChange will setValues to each string and store all the data to the backend system. If an error occurred, none of the data is stored. It can be explained in figure 2.
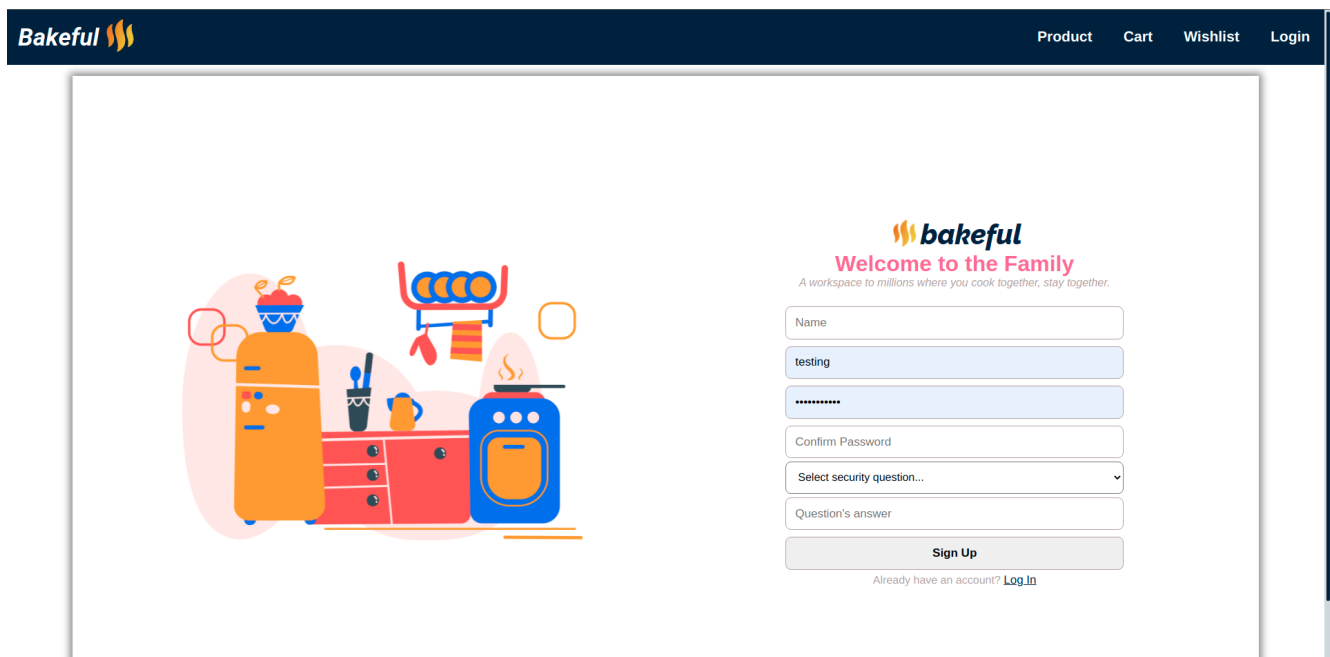

Figure 2: Signin.jsx

3.4   __Product Listing__

The main shop page says that customers can select the products that they want to add to cart. Users can scroll down the mouse to browse all the products, or filter by categories or filter by price range. In each product, users can see its short description and their available status. Therefore, customers can consider buying it or not. When one or more categories need to be checked, the handleToggle method.. This indexOf method will return the first index at which a given element can be found in the array. If it is not found in the state, then that will return -1. newCheckedCategoryId gives all the categories that are in the state and currentCategoryId will tell us if it is already there.
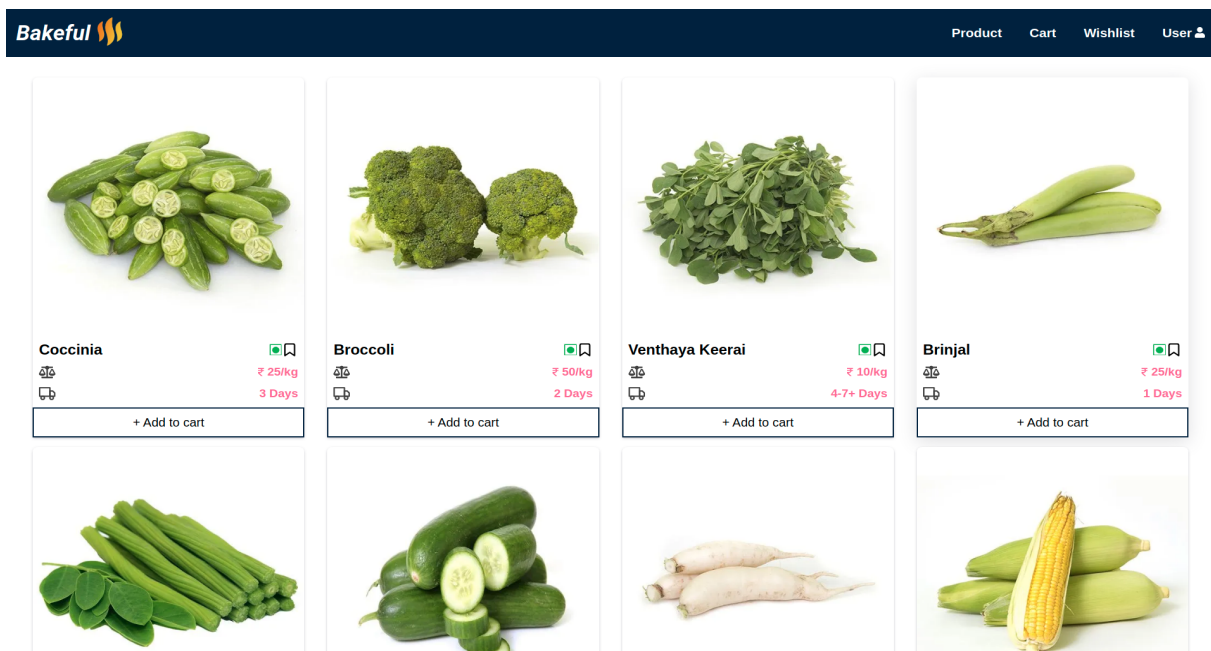

Figure 3: Product.jsx

3.5   Cart Page

Customers select all of the products they want to buy and add to the cart. All of these products will move to Cart. There is a number 2 on the Cart Button on the navigation bar which means there are 2 items in Cart that have not been paid yet. On the left side there is a list of products that customers added to cart. When the user clicks the Add to Cart button, the product must be saved to the local storage. Based on that, total products in cart can be calculated. When a user clicks on the product twice or more than that, this function only updates the quantity of the product instead of actually duplicating the product.
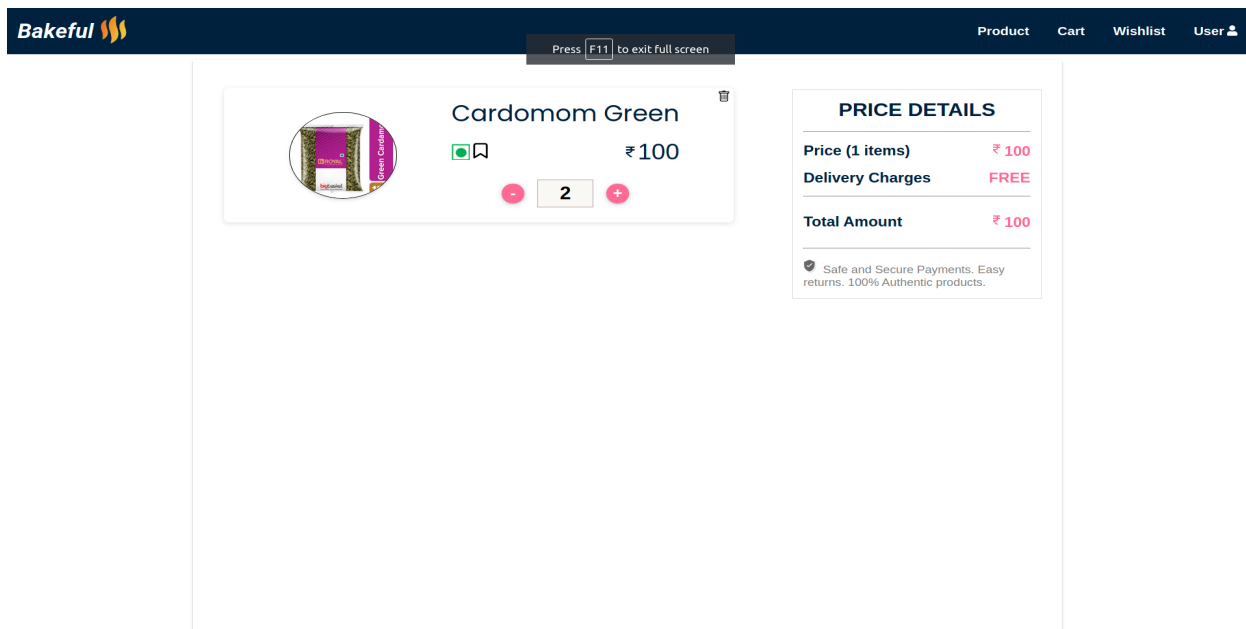

Figure 4: Cart.jsx

3.6   Wishlist Page

One last thing to mention before we dive into the meat of this post is best practices when creating a wishlist. Here the most important ones:

- Place it in a conspicuous location toward the top of your site (the top right-hand corner is used by nearly all brands)

- Make it easy and intuitive to use

- Confirm that an item has been added to a wishlist

- Don't get it and require signup

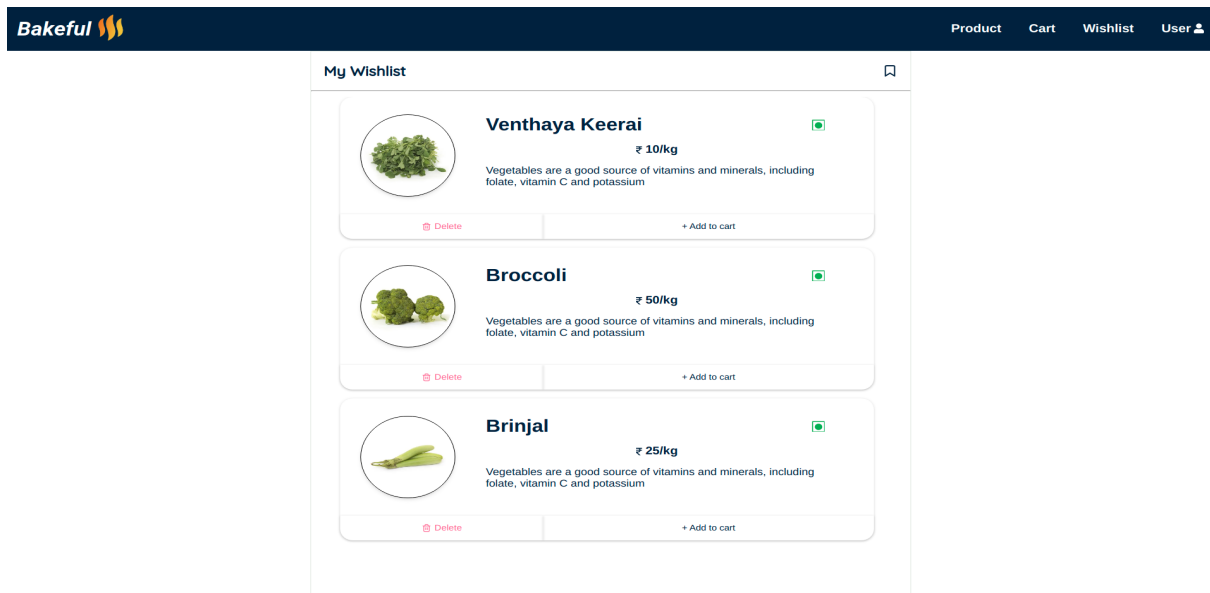- Make it easy to remove items shoppers no longer want.

Figure: 5: Wishlist.jsx

CHAPTER-4

Modules Description

4.1 JavaScript

JavaScript is a scripting, object-oriented, cross-platform programming language. Objects of the host environment can be connected to JavaScript and arrange ways to operate them. Standard libraries for objects are contained by JavaScript, for example Array, Date, Math, and the essence component of programming languages for instance managers, control framework and statements.

By adding objects, JavaScript could be protracted for many principles, such as:

In 1996, JavaScript was officially named ECMAScript. ECMAScript 2 was released in 1998 and ECMAScript 3 was released in 1999. It is continuously evolving into today's JavaScript, now works on all browsers and devices from mobile to desktop. Open standard language can be used by association to establish their own JavaScript applications. The ECMAScript Standard is one of the parts of the ECMA-262 specification.

ISO has approved the ECMA-262 standard at ISO-16262. The ECMAScript standard does not include descriptions for the DOM, it is standardized by the W3C.

The DOM specifies how your scripts display HTML objects. To get a advance anticipate

of the distinctive innovations used when programming with JavaScript, check out the JavaScript technology analysis article

4.1.1 <u>Usage of JavaScript</u>

➢ **Client-side JavaScript:** JavaScript is developed by implementing objects for controlling the browser and DOM. For instance, an application is granted by client-side extensions to influence components on an HTML page and answer to user behavior like mouse hovers, form input and page changeover.

➢ **Server-side JavaScript:** JavaScript is developed by implementing the supplementary objects required to run JavaScript on the server. For instance, an application is granted by this server-side extension to connect to a database, transfer data frequently from one request to another section of the application or execute an application with another function file on the server.

4.2 NodeJS

Node.js is an open source, a system application and furthermore is an environment for servers. Nodejs is an independent development platform built on Chrome's JavaScript Runtime that can build network applications quickly and easily. Google V8 JavaScript engine is used by Node.js to execute code. Moreover, a huge proportion of essential modules are written in JavaScript

Node.js accommodates a built-in library which allows applications to serve as a Web Server left out of demanding software like Apache HTTP Server, Nginx or IIS. An event-driven, non-blocking I/O mechanism (Input / Output) is implemented by Node.js. It optimizes application throughout and is extremely extensible. Node.js use asynchronous functions. Therefore, Node.js processes and executes all tasks in the background (background processing).

4.2.1 Applications using NodeJS

➢ WebSocket server

➢ Notification system

➢ Applications that need to upload files on the client.

➢ Other real-time data applications.

4.2.2 <u>NodeJS Pros</u>

➢ Node.js is the exclusive application that with only a single thread, it can obtain and handle numerous connections. Building new threads for each query is not needed, therefore the structure expends the least amount of RAM and runs rapidly. Secondly, Node.js produces the most of the server property without generating latency with the JavaScript's non-blocking I/O.

➢ **JSON APIs.** JSON Web services can take advantage of that because of the event-driven, non-blocking I/O structures and JavaScript-enabled model.

➢ **Single page application.** NodeJS is very suitable with an application on a single page. Node.js has the capability to handle different requests concurrently and quickly. Node JS should be used in an application that does not have to reload the page, including users who make a vast number of requests and need a quick procedure to show professionalism.

➢ **Shelling tools Unix.** Node.js usually uses Unix to work. They can handle multiple processes and return them for best performance. Programmers often use Node.js to build real Web applications like chat, feeds, etc.

➢ **Streaming Data.** Typical websites send HTTP requests and also receive responses. Node.js can handle many questions and feedback, so they are suitable if the developer wants to create an application on the page. In addition, Node.js also builds proxies to stream the data, this is to ensure maximum operation for other data streams.

➢ **Real-time Web Application**. Node.js is sufficient to develop real-time innovations like chat apps, social networking services like Facebook, Twitter because of the opening of mobile application

4.2.3 <u>NodeJS Cons</u>

➢ Resource-intensive applications. Node.js is written in C ++ & JavaScript, so when programmers need to handle applications that use a lot of file

conversion, video encoding, decoding, etc.They should not be using Node.js. Programmers need to use it more carefully in this case.

➢ The final purpose of NodeJS is like other programming languages such as Ruby, PHP, .NET, Python, that is developing web applications. Therefore, do not expect NodeJS to outperform other languages for now. But with NodeJS the application can be developed successfully as expected.

4.2.4 **When not to use Node JS**

➢ Build resource-intensive applications: Do not use Node.js when creating a video converter application. Node.js often comes down to bottlenecks when working with large files

➢ An all-CRUD-only application: Node.js is not faster than PHP when doing heavy I/O tasks. In addition, with the long-term stability of other web server scripts, its CRUD tasks have been optimized. Node.js will come up with odd APIs and never be used.

➢ Stability in the application: Within 11 years of development (2009-2020), the current version of Node.js is already v14.2.0. Every API can be changed – in a way that is not backwards compatible.

➢ Lack of knowledge about Node.js: Node.js is extremely dangerous in this case, you will fall into a world full of difficulties. With most non-blocking/async APIs, not understanding the problem will cause an error that you do not even know where it came from. Moreover, when the Node.js community is not strong enough, there will be less support from the community.

4.2.5 <u>When to use Node JS</u>

➢ Building RESTful API (JSON). You can use Node.js in building RESTful API (JSON). They handle JSON very easily, even more than JavaScript. API servers when using Node.js usually do not have to perform heavy processing, but the number of concurrent requests is high.

➢ Applications that demand alternative connection protocols, not just http. With

TCP protocol backing, any custom protocol can be built easily.

➢ Real-time applications.

➢ Stateful websites. Every request on the invariable procedure is handled by Node.js, therefore building caching is simpler: store it to a comprehensive variable then all requests can approach the cache. The status of one client can be saved and shared with other clients and do not have to go through external memory.

4.3 Express JS

Express.js is a framework built on top of Nodejs. It provides powerful features for web or mobile development. Express.js supports HTTP and middleware methods, making the API extremely powerful and easy to use.

Express implements extra features to developers which help them get a better programming environment, not scaling down the speed of NodeJS.

Importantly, the well-known frameworks of NodeJS apply Express.js as a substance

function, for instance: Sails.js, MEAN.

4.4 **MongoDB**

MongoDB is an open source database; it is also the leading NoSQL (*) database currently used by millions of people. It is written in one of the most popular programming languages today. In addition, MongoDB is cross-platform data that operates on the concepts of Collections and Documents, providing high performance with high availability and ease of expansion.[8]

(*) NoSQL is a source database format that does not use Transact-SQL to access information, this database was developed on JavaScript Framework on JSON data type. With its introduction, it has overcome the disadvantages of RDBMS relational data model to improve operating speed, functionality, model scalability, cache.

Furthermore, MongoDB is a cross-platform database, performing on Collection and Document approach, it produces sharp production, huge availability, and effortless scalability.
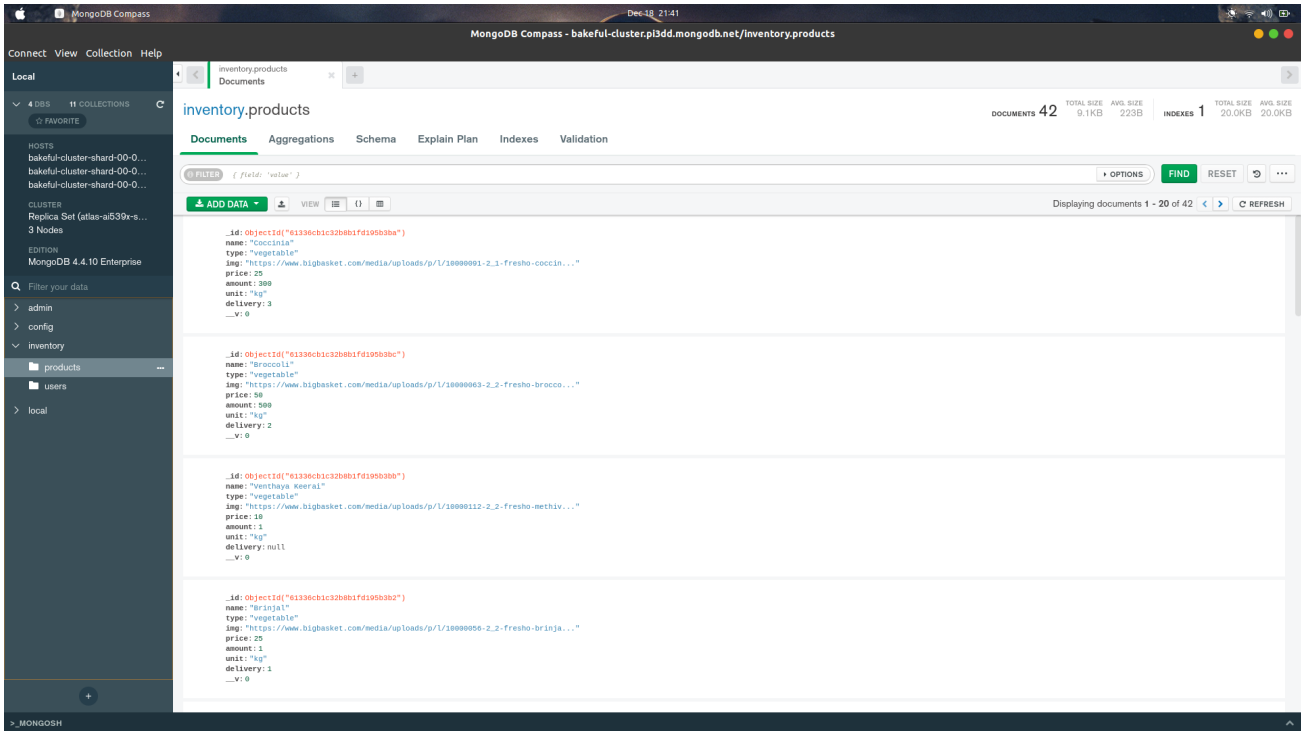
Figure 6: Compass

4.4.1 Commonly used terms in MongoDB

➢ **_id:** Almost every document required this field. The _id field illustrates an exceptional value in the MongoDB document. The _id field can also be interpreted as the primary key in the document. If you add a new document, MongoDB will automatically generate a _id representing that document and be unique in the MongoDB database.

➢ **Collection:** A group of many documents in MongoDB. Collection can be interpreted as a corresponding table in the RDBMS (Relational Database Management System) database. Collection resides in a single database. Collections do not have to define columns, rows or data types first.

➢ **Cursor:** This is a pointer to the outcome set of a query. The client can emphasize over a cursor to get the result.

➢ **Database:** The location of the collections, similar to the RDMS database that contains the tables. Each Database has a separate file stored on physical memory. Some MongoDB owners may contain various databases.

➢ **Document:** A transcript belonging to a Collection. Documents, in turn, include name and value fields.

➢ **Field:** A name-value pair in a document. A document may not need all the fields. The fields are like columns in a relational database.

➢ **JSON:** Short for JavaScript Object Notation. Human readability is in the

plain text format representing structured data. JSON currently supports a lot of programming languages.

➢ **Index:** Exclusive data structures used to save a small allocation of data sets for simple scanning. The index puts the value of an individual field or sets of fields, sorted by the value of these fields. Index effectively supports the analysis of queries. Without an index, MongoDB will have to scan all the documents of the set to choose the documents that pair the query. This scan is ineffective and requires MongoDB to progress a vast amount of data

4.5 React JS

4.5.1 Virtual-DOM

Virtual-DOM is a JavaScript object, each object contains all the information needed to create a DOM, when the data changes it will calculate the change between the object and the real tree, which will help optimize the re-render DOM tree. It can be assumed that a virtual model can handle client data.

4.5.2 **Component**

React is built around components, not templates like other frameworks. A component can be created by the create Class function of the React object, the starting point when accessing this library. ReactJS creates HTML tags unlike we normally write but uses Component to wrap HTML tags into stratified objects to render. Among React Components, render function is the most important. It is a function that handles the generation of HTML tags as well as a demonstration of the ability to process via Virtual-DOM. Any changes of data at any time will be processed and updated immediately by Virtual-DOM.

4.5.3 **Props and State**

Props: are not controlled by Component, actually stands for Properties.

The title = "Title" line creates a name attribute with the value "Title". It looks like a function call. It is true that props are passed to the component in the same way that an argument is passed to a function.

A component may also have default props, so if the component does not pass any props, it will still be set.

State: private data is controlled by the Component. Like props, the state also holds information about the component. However, the type of information and how to handle it varies. State works differently than Props. The state is a component of the component, while props are passed in from the outside into the component. It should be noted that we should not update the state directly using this. state but always use setState to update. Update the state of the objects. Use setState to re-renders one component and all its children. This is great because you don't have to worry about writing event handlers like any other language.

4.5.4 Pros and Cons of ReactJS

4.5.4.1 Pros of ReactJS:

➢ Update data changes quickly.

➢ React is not a framework so it offloads the constraints of libraries together.

➢ Easy access to who understands JS.

4.5.4.2 Cons of ReactJS:

➢ ReactJS only serves the View tier, but the library size is on par with Angular while Angular is a complete framework.

➢ Incorporating ReactJS within common MVC frameworks demands reconfiguration.

➢ Hard to reach for beginners on website development.

Chapter 5

Results

We have successfully created a web application based on the MERN stack. We will be starting an e-commerce app based on groceries and then expanding it into several other fields as well. Currently the functionalities that we have successfully implemented are:

1. Authentication using JSON Web Tokens (JWT).

2. Option to add, edit, view and delete all the items in our store.

3. Option to add items or remove items from the cart.

4. Display the total bill of the cart and update it as soon as the cart is updated by the user.

5. Using Local Storage to store the JWT so that we only allow logged-in users to buy items.

6. Option to pay and checkout thus creating order and emptying the cart.

Chapter 6

Conclusion

The achievement of the thesis is researching the basic components of MERN stack technology: MongoDB, ExpressJS framework, ReactJS library, and NodeJS platform. Using MEAN stack technology in conjunction with Braintree to build an e-commerce web application with a payment gateway.

The advantages are performing the basic functions of a product search website for customers, making it easy for customers to find categories that have the products they are looking for. Gives small stores a platform to store information and promote their products. Password data of accounts when logging in to the system is stored in a secure database. The management interface, statistics of the user, and admin are easy to use for everyone. The disadvantages are online chat functions between shop owners and customers are not yet supported as well as between shop owners and administrators.

Since the purpose of the thesis is the e-commerce application, understanding MERN technologies and applying it to this app is the most important. Overcome current shortcomings, listen to customers' comments and make improvements, helping users have a great experience in the future.

Chapter 7

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