Grocery Store using Mern Stack and Redux Toolkit

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ABSTRACT

In today's world where the internet is at boon, there is hike in demand for electronic services. Just sit at one place order things and get home delivery within an hour. With the rise of e- commerce and mobile applications, there is a growing demand for grocery shopping. The proposed application will provide users with a seamless shopping experience, allowing them to browse through a wide range of products, add items to their cart, and securely checkout. Leveraging the power of React.js for the frontend, the application will be highly responsive, providing a smooth and intuitive user interface. The backend will be powered by Node.js and Express.js, utilizing MongoDB as the database for storing product information, user data, and transaction records. Additionally, Redux Toolkit will be employed for state management, enabling the application to maintain a centralized state and efficiently manage complex data flows.

Keywords: **MongoDB, Express.js, React.js, Node. js.**

INTRODUCTION

We all know that the peoples are used to and friendly with this new online and modern marketing this days. As the people all over the world are showing interest to buys things online rather than actually going and wasting time queue of the stores. Morever online stores gives a hell lot offers on the specific amount of purchase. Compared to the product prices that are applicable on products kept in the stores.

To meet these demands, developers are turning to modern technologies like the MERN (MongoDB, Express.js, React.js, Node.js) stack and Redux toolkit for building feature-rich and scalable applications. The MERN stack, comprised of the MongoDB as the database, Express.js for the backend framework, React.js for the frontend, and Node.js for server-side scripting, has gained widespread adoption due to its flexibility, performance, and ease of development. With its component-based architecture and virtual DOM rendering, React.js enables developers to build interactive and responsive user interfaces, making it an ideal choice for modern web applications. In addition to the MERN stack, Redux Toolkit has emerged as a popular tool for state management in React applications. Redux Toolkit simplifies the process of managing application state by providing utilities for creating actions, reducers, and middleware, thereby reducing boilerplate code and improving developer productivity. By centralizing application state and facilitating predictable state updates, Redux Toolkit enhances the maintainability and scalability of React applications. Combining the power of the MERN stack with Redux Toolkit, developers can create sophisticated grocery store applications that offer a wide range of features, including product browsing, cart management, user authentication, order tracking, and secure payment processing.

Problem Statement

The traditional method for grocery shopping involves physically visiting stores, selecting products, and waiting in queues for checkout. However, this process can be time-consuming and inconvenient, especially for busy individuals or those with mobility constraints.

Additionally, with the advent of the digital age, consumers increasingly expect seamless and personalized shopping experiences that cater to their preferences and lifestyle. To address these challenges, there is a growing demand for efficient and user- friendly online grocery store applications. These applications should provide a wide selection of products, intuitive navigation, secure payment options, and convenient delivery or pickup services.

E-Commerce

It is also known as electronic commerce; it is nothing but the process of buying and selling products through the internet, and also online transfer of money through phone to complete the process of buying or selling product. In early days, e-commerce was not that famous but after increasing uses of electronic gadgets in everyday life everyone started chossing the internet over shops. There are mainly 4 types of e-commerce models:

Such as-

1. B2C(Business to consumer).
2. B2B(Business to business).
3. C2B(Consumer to business).
4. C2C(Consumer to consumer).

Objectives:

1. Develop a comprehensive understanding of MERN stack and Redux toolkit for web application development.
2. Study and explore various challenges and requirement for developing a grocery store application, including user authentication, product catalog, shopping cart and checkout processes and order tracking.
3. Design architecture for grocery store, design algorithm and block Diagrams.
4. Implement key features of grocery store application, such as user authentication, product browsing, search functionality, adding items to shopping cart, managing inventory and processing orders.
5. Discuss potential future enhancements and extensions to the grocery store application, such as integration with third-party services, optimization for mobile devices, and implementing additional features based on user feedback and market trends.
6. Provide insights and recommendations for developers, entrepreneurs, and stakeholders interested in leveraging the MERN stack and Redux Toolkit to develop innovative and user- centric grocery shopping solutions

LITERATURE SURVEY

"Performance Optimization using MERN stack on Web Application" by Sourabh Mahadev Malewade delves into the techniques employed to enhance the performance of web applications utilizing the MERN stack, which comprises MongoDB, Express.js, React, and Node.js. The author explores innovative strategies and methodologies within this framework to optimize the speed, responsiveness, and overall user experience of web applications. By leveraging the MERN stack's flexibility and scalability, the paper discusses how developers can efficiently manage data, streamline server-side processes, and create highly interactive user interfaces. Through a combination of backend and frontend optimization techniques, the paper offers valuable insights into improving the overall performance of web applications, ensuring they meet modern user expectations for speed and responsiveness. Sourabh Mahadev Malewade's research provides practical solutions for developers and businesses aiming to create high-performing web applications using the MERN stack [1].

"MERN Stack Web Development for E-Commerce Applications," authored by Sumangla A. Bafna, Pratiksha D. Dutonde, Shivani S. Mamidwar, Monali S. Korvate, and Prof. Dhiraj Shirbhare, delves into the comprehensive development of e commerce platforms using the MERN stack, comprising MongoDB, Express.js, React, and Node.js. The research outlines a systematic approach to building robust and scalable online marketplaces. It explores how MongoDB facilitates flexible data storage, Express.js ensures seamless backend operations, React enhances user interfaces, and Node.js enables efficient server-side scripting. The authors discuss the stack's synergistic potential, allowing businesses to create dynamic, responsive, and feature- rich e-commerce websites. This paper serves as a valuable guide, offering practical insights and best practices for developers and businesses aiming to capitalize on the MERN stack's capabilities for crafting high performance e-commerce applications. It bridges the gap between theoretical knowledge and practical implementation, making it an essential resource for professional in the we development domain [2].

"A Review on Study and Usage of MERN Stack for Web Development," authored by Lawal Olarotimi Badru, Vani Vasudevan, Govinda Ishwar Lingam, and M. G. M. Khan, provides a comprehensive overview of the MERN stack's study and application in web development. The authors critically analyze existing literature and real-world implementations, shedding light on the stack's strengths and challenges. Computer Science & Engineering in Artificial Intelligence and Machine Learning 2023-24.

The paper delves into MongoDB's NoSQL database capabilities, Express.js for robust server-side development, React's efficient frontend framework, and Node.js for scalable server scripting. By synthesizing various research findings and practical experiences, the paper outlines the advantages and limitations of using MERN stack in diverse web development scenarios. It serves as a valuable resource for developers, researchers, and businesses, offering insights into the stack's suitability, potential optimizations, and best practices.

This review acts as a roadmap for individuals and organizations aiming to make informed decisions regarding the adoption and implementation of the MERN stack in their web development projects [3].

The paper titled "Development of a Social Media Platform Using MERN Stack," authored by Deepika B. K. and Kumar S., explores the construction of a social media platform leveraging the MERN stack technology, encompassing

MongoDB, Express.js, React, and Node.js. This research delves into the intricacies of building a robust, dynamic, and interactive social network. It provides a detailed account of MongoDB's document-oriented database, Express.js for efficient backend development, React's powerful frontend framework, and Node.js for scalable server-side scripting. The paper likely delves into the challenges and advantages encountered during the development process, shedding light on how the MERN stack's synergistic combination facilitates the creation of modern, responsive, and feature- rich social media platforms. Readers can anticipate insights into the architecture, user experience, and the technology's role in fostering seamless interactions within the social networking domain. This paper is valuable for developers and researchers interested in understanding the application of MERN stack in crafting engaging and user-friendly social media platforms [4].

METHODOLOGY

The user searches for items on an online shopping website. They add items to their shopping cart and review the items before proceeding to checkout. At checkout, they enter their shipping and billing information and select a shipping method. After paying for items, purchase is complete successfully. Fig (1).
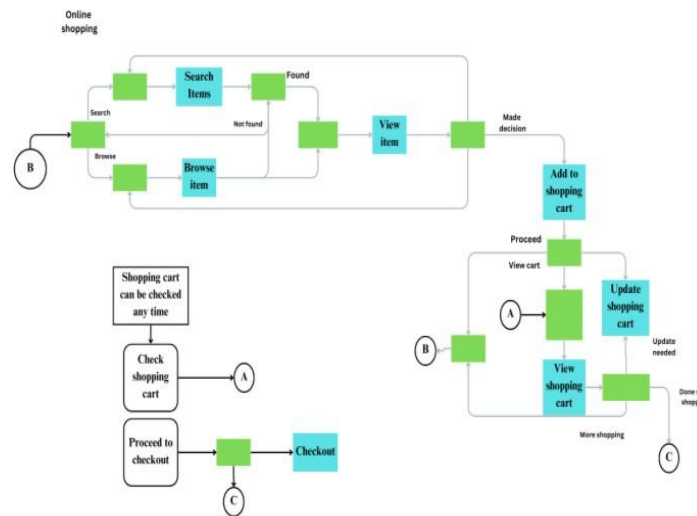

Fig 1. Flow chart of web application

Architecture of Stack
In MERN 4 main technologies are used Mongo DB, Express.js, Node.js, React.js merges are designed to built a robust framework for helping developers to practice with Java script components for solving real life problems.

1. **Mongo DB**
   MongoDB is a NoSQL database that stores data in a flexible, JSON-like format. It is schema-less, which means you can store heterogeneous data types within the same collection. MongoDB is known for its scalability, flexibility, and ease of use. It's particularly suitable for applications with large amounts of unstructured or semi-structured data.

2. **React.js**
   React is a JavaScript library developed by Facebook for building user interfaces. It allows developers to create reusable UI components and manage their state efficiently. React follows a component-based architecture, where the UI is composed of independent and reusable components that can be easily combined to build complex user interfaces. React also provides features like virtual DOM for optimizing performance and JSX syntax for writing HTML-like code within JavaScript.

3. **Express.js**
   Express.js is a minimalist web application framework for Node.js. It provides a set of features for building web and mobile applications, such as routing, middleware support, and templating engines. Express.js simplifies the process of handling HTTP requests and responses, making it easier to build robust and scalable server-side applications.

4. **Node.js**
   Node.js is a runtime environment that allows developers to run JavaScript code outside of a web browser. It is built on the V8 JavaScript engine from Google Chrome and provides a non- blocking, event-driven architecture that is well-suited for building scalable and high-performance server-side applications. Node.js enables developers to use JavaScript for both client-side and server-side development, allowing for a more seamless development experience.
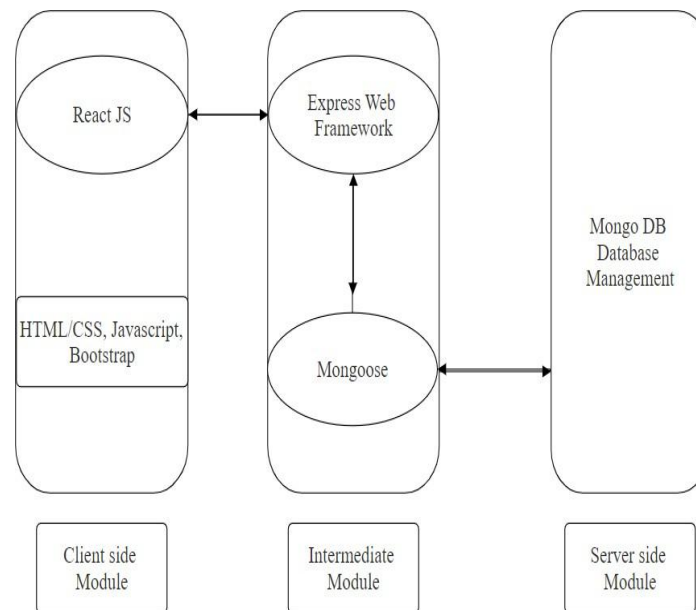
Fig 2. Architecture of MERN Stack

IMPLEMENTATION

Front End:

Home page
After the successful login the user will be redirected to home page where user can a browse the groceries and after clicking on particular item the user can choose the quantity whatever they want and then they can add item to cart. In this the user can also sort the product by price, users-rating and users can also filter the products by checking brands, categories. This helps the user to find the best product easily.

Sign in and sign up
These two options redirect to page where user can find a form to fill either to create an account or to sign in to an account.

Cart
This is the cart page of our web app where product which are added to cart by user are listed here. The product which are selected by user at home page are displayed here. It is the last chance for user, where user can change quantity or remove products from the cart which they doesn't want to buy. If user is final with their products list displayed in the cart then user can checkout according to their convenience. In this user get to which are the product present in the cart as well as amount and quantity of each product. With addition to that total amount is displayed which user has to pay.
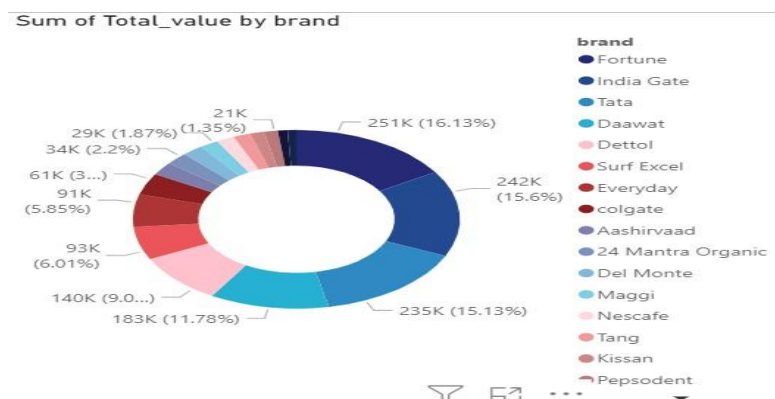
Dashboard

Fig 3. Total value by brand

This is donut chart which represent brands by value. It shows that which brand has how much value. The total value by brand is 1554020 among which fortune has 251K where as the least brand value is of lizol which is 21K only.
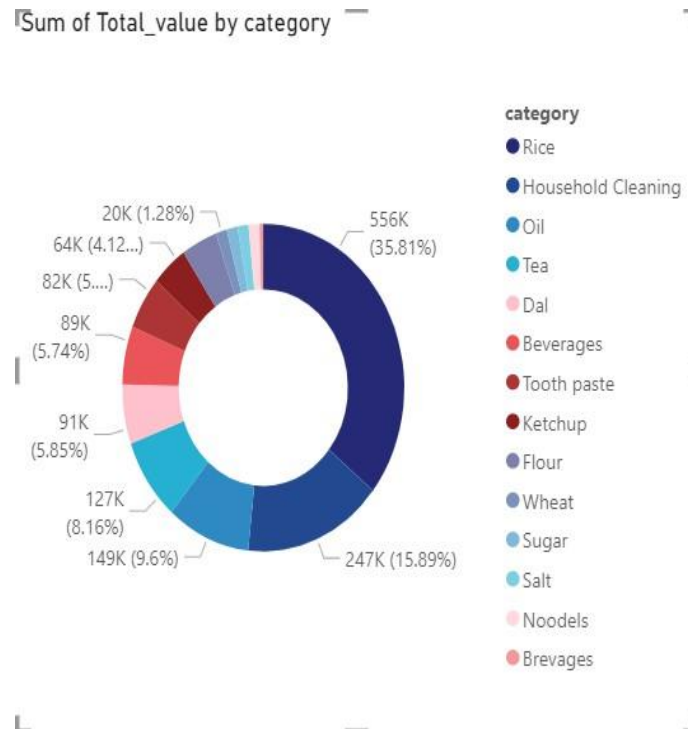

Fig 4. Total value by category

This is donut chart which represent category by value. It shows that which brand has how much value. The total value by category is 1554020 among which rice has total value of 556k with 35.81% of total value, where as the least value from category is 6.5k with having 0.42 % of total value.
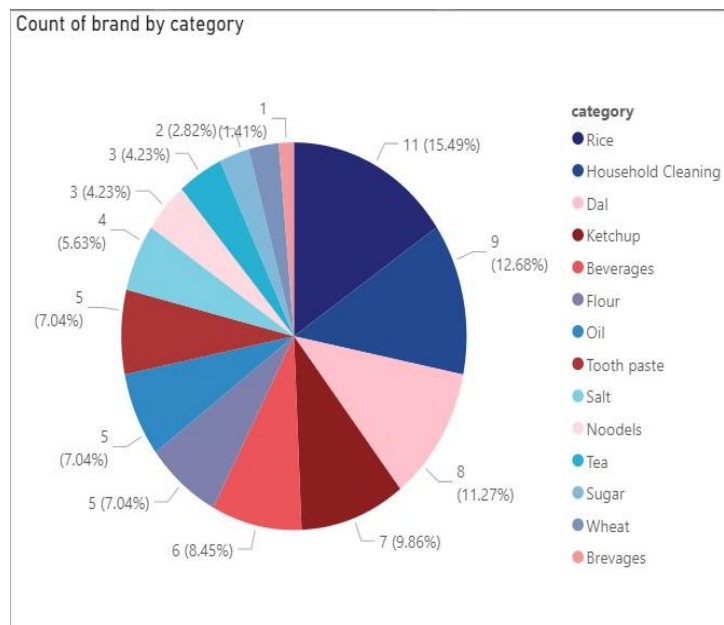

Fig 5. Count of brand by categories

This is pie chart which represent total no of brands by categories. There are total 14 Categories present in which rice has the biggest slice of pie chart with total 11 count of brand which contributes 15 % of total brand. Beverages has lowest slice of pie chart with 1 count of brand which contributes 1.41% of total brand.
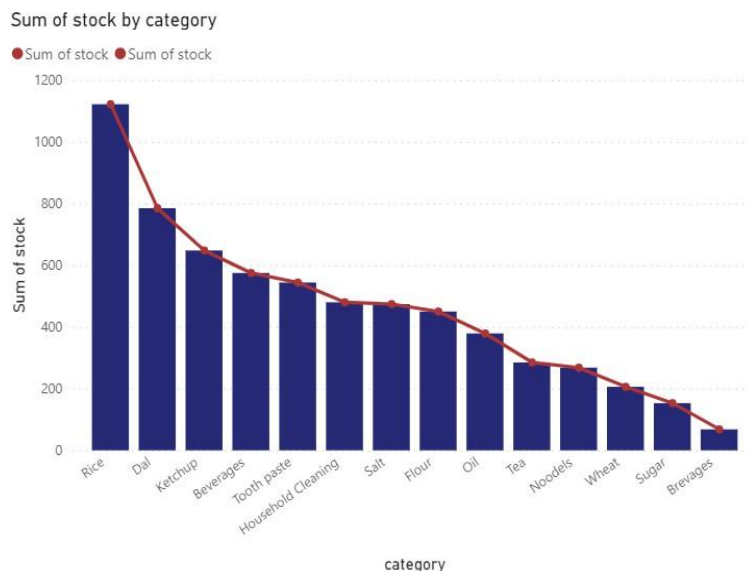
Fig 6. Most valued Categories

This is line and clustered column chart. In this x axis represent categories and y represent no stock present in each categories. The secondary y axis gives us the proper visualization. We can see that rice has the most no of stock which is approximately 1100, while beverages have least no of stocks present which is approximately less than 100. expansions.

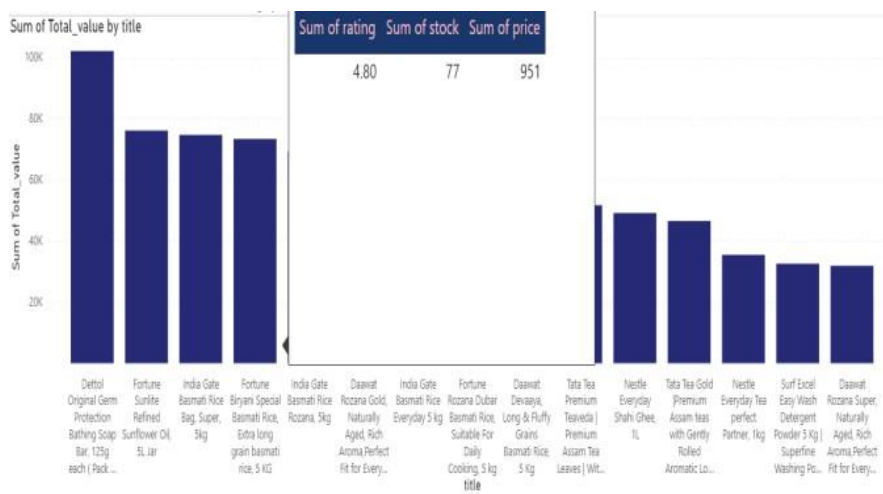Here are some future scope considerations for this topic:

Fig 7. Most Valued Item

This is the bar chart which represent the total amount of each product. This chart represent top 15 product which are having most of the value. Along with that it will show how much rating is given to that product, how much stock are there of that product and what is the price of individual product. We can see the most valued item in our list is dettol original germ protection having 100k value.

Database
Data that is entered by users will be stored in database. In this project, we have used MongoDB as a database. Using mongoose library, we can connect to Mongo DB.

CONCLUSION

The development of a grocery store application using the MERN stack and Redux Toolkit presents a promising solution to address the evolving needs of consumers in the digital age. Through the integration of MongoDB, Express.js, React.js, Node.js, and Redux Toolkit, developers can create a feature-rich and scalable application that offers a seamless shopping experience for users. By leveraging MongoDB's flexibility for data storage, Express.js' robustness for building

APIs, React.js' responsiveness for delivering an intuitive user interface, Node.js' efficiency for server-side scripting, and Redux Toolkit's simplicity for state management, developers can overcome the challenges associated with building complex web applications. The proposed grocery store application enables users to browse through a diverse range of products, add items to their cart, securely checkout, and track their orders, thereby enhancing convenience and efficiency in the shopping process. Additionally, features such as user authentication and secure payment processing ensure the safety and reliability of transactions, instilling trust and confidence among users.

Future Scope

The development of a grocery store application using the MERN stack and Redux Toolkit offers immense potential for further continuously improving the user experience is essential for retaining customers and attracting new ones. Future iterations of the application could focus on refining the user interface, optimizing performance, and implementing personalized recommendations based on user preferences and purchase history.

While the web application provides accessibility across devices, developing native mobile applications for iOS and Android platforms can further expand the reach of the grocery store. Leveraging frameworks like React Native can facilitate the development of cross-platform mobile apps with native-like performance.

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