



SWIFTBUY: UNVEILING E-COMMERCE SYNERGY WITH JAVASCRIPT AND MONGODB

Pallavi Bharambe¹, Prashant Vhatkar², Nishant Sindkar³, Monty Vasita⁴

¹ Assistant Professor, ² Student, ³ Student, ⁴ Student¹ Department of Computer Engineering, ¹ Shivajirao S. Jondhale College of Engineering, Dombivli(E), Thane, INDIA

Abstract : This research presents the development of an advanced MERN stack web application tailored for the Mumbai University engineering student community and individuals preparing for competitive exams. The proposed e-commerce platform aims to streamline the acquisition and exchange of academic resources, focusing on key features such as robust user authentication with SHA256 encryption, an intuitive admin panel, and an innovative book filtering system.

IndexTerms - E-commerce, MERN stack, Web application, Academic resources, Mumbai University, Competitive exam preparation, User authentication, SHA256 encryption, Admin panel, Filtering system

I. INTRODUCTION

In the dynamic landscape of academic pursuits, the integration of technology into education has become pivotal for enhancing accessibility and efficiency. This research introduces an innovative MERN stack web application, meticulously crafted to cater to the unique needs of Mumbai University engineering students and those preparing for competitive exams. Recognizing the challenges faced by students in acquiring and exchanging academic resources, this project seeks to bridge the gap through a comprehensive e-commerce platform.

The platform boasts a sophisticated user authentication system employing SHA256 encryption for heightened security. A feature-rich admin panel empowers administrators with advanced tools for seamless management, while an intuitive book filtering system ensures a tailored experience for users. Major book publishers are seamlessly integrated into the platform, offering a diverse array of educational resources.

One distinctive facet of this platform is its facilitation of a marketplace for students to buy and sell their previous semester books at reasonable prices. The inclusion of a secure online payment gateway and a functional logistics system ensures a streamlined and trustworthy transaction process.

Embracing the MERN (MongoDB, Express.js, React.js, Node.js) stack architecture, this project represents a cutting-edge approach to web development. Through a systematic methodology, we delve into the intricacies of technology selection, emphasizing the robustness of our decision-making process.

This research not only addresses the immediate needs of the Mumbai University community but also envisions scalability and adaptability for broader application in educational institutions globally. The subsequent sections unfold the layers of this endeavor, detailing the system architecture, implementation strategies, and the outcomes of this pioneering MERN stack web application for academic resource management.

II. LITERATURE SEARCH APPROACH

The literature search for this project involved a comprehensive exploration of academic databases, scholarly journals, conference proceedings, and relevant books. The goal was to gather insights into various aspects related to e-commerce platforms, educational technology, and online book retailing, with a specific focus on projects targeting university students and competitive exam preparation. The search strategy incorporated keywords and phrases associated with the project's key components and objectives.

Sr. No.	Title	Methodology	Merits	De-merits
1.	Web based E-commerce system integrated with Chatbot M. Shyam Manikantaa, J. Rushi b , A. Lalitha	System consists of two parts:a frontend designed using HTML, CSS, Bootstrap, andJavaScript, and a backend designed in Python using theFlask framework. PostgreSQL is used for database connections in thebackend. Python is chosen for its advanced and powerful	1. Python is a powerful and advanced language,making it a great choicefor backend development. 2. Python's security features are robust, reducing the risk of security vulnerabilities. 3.PostgreSQL is a more secure database system compared to MySQL, reducing the likelihood of SQL injection attacks.	1. While Python is powerful, it may not be the best choice for every project and some specificuse cases may benefit from other languages or frameworks. 2. Choosing Flask may limit the scalability of your application in comparison to more feature-rich frameworks like Django for larger and complex projects.
2.	BIG BUY (ECOMMERCE) by using MERN Avnish Kumar Sharma	Big Buy is a web-based e-commerce store designed with HTML, CSS, and JavaScript for front-end development. It Incorporates animations for enhanced appeal and offers a basic and efficient user interface. E-commerce websites like Big Buy are vital today, enabling convenient online shopping and home delivery, improving the overall user experience.	1. Big Buy is an e-commerce website designed with HTML, CSS, and JavaScript, making it accessible andvisually appealing. 2. Animations enhance the website's appeal. 3.The basic and efficientUI facilitates user interaction.	1. Details about specific features, security measures, or scalability are not mentioned, whichcould be important for ane-commerce website. 2. The use of animations can affect page load times, potentially impacting user experience. 3. Lack of information about data security andprivacy measures may raise concerns for customers.
3.	E-Commerce Website Using Mern Stack DusaSai Tharun*1 , Dusakanti Vishnuvardhan Goud1, Thakkallapalli Pavan1, Yannam Bhargav	The MERN stack combines MongoDB, Express.js, React.js, and Node.js to create a powerful web application development platform. Your project aims to replicate the features of the popular e-commerce platform Flipkart, including auser-friendly design, search functionality, shopping cart, checkout process, secure payments, product ratings, personalized recommendations, and special offers to enhance the user shopping experience	1.Rapid development: The MERN stack provides a set of powerful and flexible tools that allow developers to quickly create and deploy web applications 2.Scalability: The MERN stack allows for easy scalability, with features such as load balancing and horizontal scaling. 3.Open-source community: The MERN stack is built on open-source technologies and has a large community of developers and contributors, which means that there is a wealth of resources and support available for developers.	1. Complexity: The MERN stack is composed of multiple technologies and frameworks, which canmake it difficult for developers who are not familiar withall of them. 2. Debugging: The MERN stack can be challenging to debug due to its distributed nature and theuse of multiple programming languages. 3. Security: The MERN stack requires developersto implement securitymeasures such as authentication and authorization, which

				can be time-consuming
4	GERAM BAZAR, A Mobile Application and Website Interface E-commerce Faria Soroni, Md. Amdadul Bari and Mohammad Monirujjaman Khan	The methodology involves developing a mobile app and website with features that can adapt to customer and vendor behavior. The system utilizes Node.js for creating web server and networking tools, while web pages and applications are built using HTML, CSS, Bootstrap, and JavaScript. Angular 5 is used as the encompassing JavaScript framework to provide dynamic and interactive web experiences.	<ol style="list-style-type: none"> 1. Personalization: Geram Bazar offers a personalized experience for customers, increasing user engagement. 2. Modern Technologies: Using Node.js, Angular 5, and other technologies ensures a robust and responsive platform. 3. Adaptability: The system can adapt to user behavior, enhancing the user experience. 	<ol style="list-style-type: none"> 1. Complex Development: Utilizing a range of technologies can lead to complex development and maintenance. 2. User Adoption: Users may need time to adapt to a new approach where a system acts like a guide, and this may not suit all users. 3. Competition: The e-commerce market for raw food products is competitive, and 'Geram Bazar' may face challenges in establishing itself.
5	E-commerce payment model using blockchain Shee-Ihn Kim · Seung-Hee Kim	<p>This study proposes a blockchain-based electronic payment system by examining blockchain's core elements: public key, private key, and digital signature.</p> <p>The approach involves reviewing existing technologies, creating a model for the system, developing a prototype, and summarizing findings.</p>	<ol style="list-style-type: none"> 1. Decentralized Authentication: The blockchain system offers decentralized authentication, enhancing security. 2. Reduced Fees: Eliminating intermediaries can significantly reduce transaction fees. 3. Integrity and Nonrepudiation: The system ensures transaction integrity and trust between participants. 	<ol style="list-style-type: none"> 1. Complex Implementation: Implementing blockchain can be challenging. 2. Limited Adoption: Blockchain systems may face slow adoption due to unfamiliarity. 3. Scalability Challenges: Handling a growing number of transactions and participants can be problematic. 4. Regulatory Concerns: Regulatory issues may hinder implementation.

Table 1. Literature Survey Table

III. FEATURES

The MERN stack web application developed for Mumbai University engineering students and those preparing for competitive exams boasts a comprehensive array of features meticulously designed to enhance the overall user experience, security, and accessibility. One of the key highlights is the implementation of an advanced user authentication system, employing SHA256 encryption and two-factor authentication (2FA) for an added layer of security. The platform also

features an intuitive admin panel, providing administrators with efficient tools for user management, order tracking, inventory control, and analytics.

A standout feature is the dynamic book filtering system, allowing users to search and categorize books based on various parameters such as author, subject, and publication date. Real-time updates and notifications keep users informed about newly added books or special offers. The application integrates seamlessly with major book publishers like Tech knowledge and Tech neo, providing an extensive collection of academic resources. Additionally, users can actively participate in the marketplace by buying and selling their previous semester books at reasonable prices.

Ensuring secure transactions, the platform integrates with a reliable online payment gateway, offering multiple payment options such as credit cards, debit cards, and digital wallets. The logistics system ensures timely and reliable delivery of purchased books, with order tracking features to keep users informed about their order status. The MERN stack architecture facilitates scalability and efficiency, with a well-organized and modular codebase that supports future enhancements and updates.

To accommodate diverse user preferences, the application is designed with mobile responsiveness in mind, offering a seamless and optimized experience across various devices. The innovative buy/sell functionality provides users with a dynamic marketplace, offering options for fixed prices and bidding, thereby enhancing flexibility. Emphasizing data security, the platform implements secure data storage practices and undergoes regular security audits to mitigate potential vulnerabilities.

User testing and feedback mechanisms are integrated throughout the development process, ensuring a user-friendly interface and allowing users to contribute insights and suggestions for continuous improvement. Collectively, these features form a cohesive and powerful framework for the MERN stack web application, revolutionizing the accessibility, exchange, and management of academic resources in an online environment.

IV. THE PLANNING PROCESS

Project goal was to develop a web application that would be attractive enough, have professional look and user friendly. So that Mumbai University students would be its end users. Our job started with subdividing the entire task and setting milestones. The milestones would be a marker of percentage of the work actually accomplished and success story. The entire planning process took the following steps.

Defining Use Case Models

- i Identification of Stakeholders: Identify and engage with key stakeholders, including students, administrators, and potential book buyers/sellers.
- ii Use Case Identification: Define primary use cases such as user registration, book listing, buying/selling transactions, and admin functionalities.
- iii User Stories: Develop user stories to capture specific user interactions and requirements.

Domain Modeling

- i Identify Entities and Relationships: Identify core entities in the system, such as users, books, transactions, and publishers.
- ii Define Attributes and Behaviour: Specify attributes and behaviours associated with each entity.
- iii Relationship Mapping: Establish relationships between entities, considering factors like book ownership, user transactions, and publisher affiliations.

Architectural Pattern

- i MERN Stack Architecture: Choose the MongoDB, Express.js, React.js, Node.js (MERN) stack as the architectural foundation for the web application.
- ii Component Design: Define the structure of the front end, back end, and database components within the MERN architecture.
- iii Scalability Considerations: Plan for scalability by designing modular and scalable components.

Project Timeline and Milestones

- i Task Breakdown: Break down the project into manageable tasks, assigning priorities and dependencies.
- ii Sprint Planning: Adopt an Agile development approach with sprint planning, ensuring continuous delivery and flexibility.
- iii Milestone Setting: Establish key milestones for major project phases, such as prototype completion, alpha release, and beta release.

Security Planning

- i User Authentication: Plan the implementation of a secure user authentication system, considering features like password hashing and two-factor authentication.
- ii Data Encryption: Outline strategies for securing sensitive data, including transaction details and user information.
- iii Regular Security Audits: Incorporate regular security audits to identify and address potential vulnerabilities.

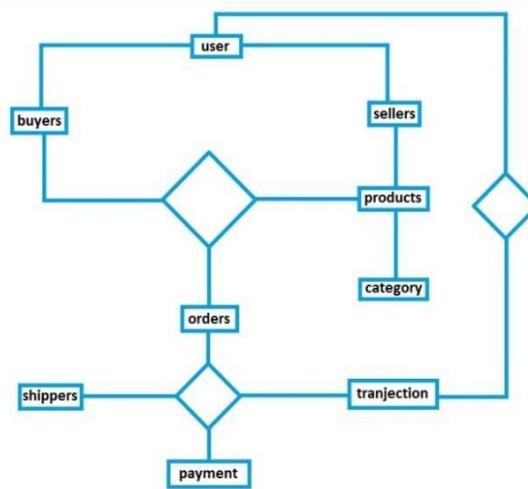


Fig. 1. Flowchart of Project

V. DEVELOPMENT TOOLS

The entire development process has been subdivided into two: the frontend development and the backend development. The front end comprises of the visually visible parts such as the home page, admin panel, contact page, shopping cart page. The back end contains the database and its interaction with the front-end.

A. Backend Development Tools

i Node.js: Node.js serves as the foundational runtime environment for server-side development in the MERN stack. Leveraging the V8 JavaScript engine, Node.js enables efficient handling of server-side logic, asynchronous operations, and facilitates seamless communication with the frontend.

ii Express.js: Express.js, a minimalist web application framework for Node.js, provides a robust set of features for building RESTful APIs and managing middleware. Its simplicity and flexibility make it an ideal choice for handling routing, HTTP requests, and other server-side functionalities in the project.

iii MongoDB: MongoDB, a NoSQL database, is employed as the backend's database management system. Its flexible document-oriented structure aligns well with the dynamic nature of the project, allowing for efficient storage and retrieval of data related to users, books, transactions, and more.

iv Mongoose: Mongoose, an object modeling library for MongoDB and Node.js, facilitates interaction with the MongoDB database. It provides a schema-based solution, allowing developers to define data models and effortlessly perform operations such as querying, validation, and data manipulation.

v JWT (JSON Web Tokens): JSON Web Tokens are used for secure user authentication. JWTs enable the creation of compact, URL-safe tokens that carry information about the user, enhancing the security and integrity of the authentication process in the project.

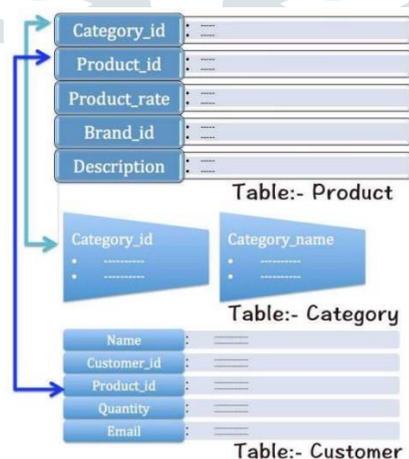


Fig. 2. Table of product, category and customer database.

B. Frontend Development Tools

i **React.js:** React.js, a JavaScript library for building user interfaces, is the cornerstone of the frontend development. Its component-based architecture simplifies UI development, promotes code reusability, and facilitates the creation of interactive and dynamic user interfaces for seamless user experiences.

ii **Redux:** Redux is employed for state management in the frontend, ensuring a predictable and centralized data flow. It helps manage the application's global state, making it easier to handle complex data interactions and maintain a consistent state across different components.

iii **Axios:** Axios, a promise-based HTTP client, is used for making asynchronous requests to the backend API. It streamlines data fetching and manipulation, enhancing the efficiency of communication between the frontend and backend components.

iv **React Router:** React Router is utilized for navigation within the single-page application. It enables the creation of dynamic, client-side routing, ensuring a seamless and intuitive user experience as users navigate through different sections of the web application.

v **Visual Studio Code:** Visual Studio Code serves as the integrated development environment (IDE) for frontend developers. Its extensive set of features, extensions, and debugging capabilities enhance the efficiency of the coding process and contribute to a smooth development experience.

The integrated use of these backend and frontend development tools within the MERN stack ensures a cohesive and efficient development process, allowing for the creation of a robust and feature-rich web application tailored to the needs of Mumbai University engineering students and competitive exam aspirants.

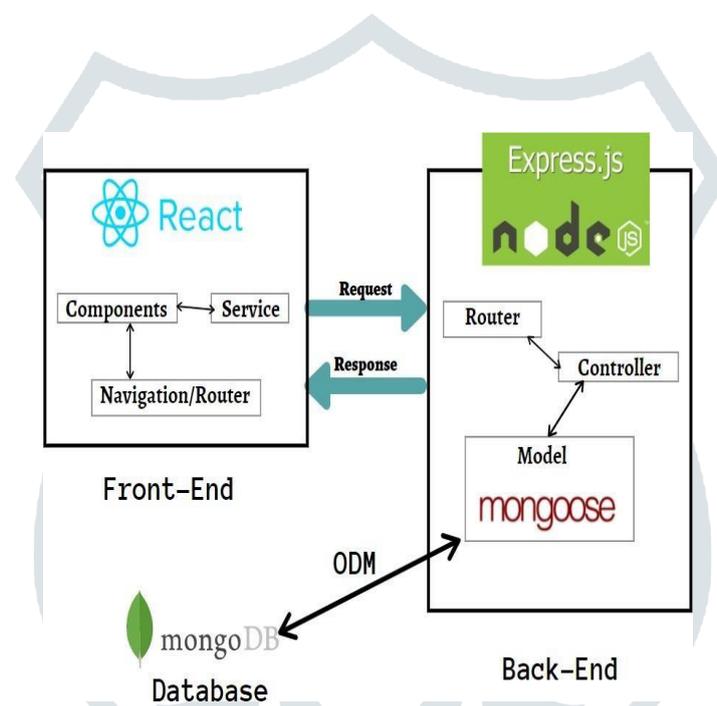


Fig.3. Architecture of Backend and Frontend

VI. HOW SWIFTBUY WORKS

The web application operates as a comprehensive platform catering to the unique needs of Mumbai University engineering students and those preparing for competitive exams. The user journey commences with a secure and efficient authentication system, ensuring the privacy and integrity of user credentials through SHA256 encryption. Upon successful registration, users gain access to a personalized account, unlocking features such as book buying and selling, order tracking, and community engagement.

Central to the platform is an extensive catalog of academic resources sourced from major publishers like Tech knowledge and Tech neo. Users navigate the platform through an intuitive book filtering system, allowing for precise searches based on subject, author, and publication date. This tailored approach ensures an efficient and personalized browsing experience for users seeking specific academic materials.

A distinctive feature of the platform is the dynamic marketplace, empowering students to buy and sell their previous semester books. Sellers can list their books with details on condition, pricing, and additional notes, while buyers can explore listings and complete secure transactions facilitated by the integrated online payment gateway.

Administrators wield advanced tools within the admin panel, overseeing user activities, tracking orders, and managing inventory. This ensures the smooth functioning of the e-commerce ecosystem, resolving disputes and fostering a secure and trustworthy marketplace.

Secure transactions are facilitated through an integrated online payment gateway, and the logistics system efficiently manages the packaging, shipping, and tracking of orders. Regular updates and notifications keep users informed about the status of their orders, enhancing transparency and user satisfaction.

The user interface prioritizes responsiveness and intuitiveness across various devices, utilizing React.js for frontend development. The dynamic and engaging interface, supported by React Router for seamless navigation, offers users an immersive experience as they explore different sections of the application.

Security is ingrained in the application's design, with JSON Web Tokens (JWT) enhancing user authentication security. The backend, developed with Node.js and Express.js, employs robust measures to safeguard user data and ensure the confidentiality and integrity of transactions.

Collectively, these features interconnect to provide a seamless, user-centric experience, meeting the specific requirements of Mumbai University engineering students and competitive exam aspirants. The careful integration of backend and frontend components within the MERN stack ensures the reliability, scalability, and security of the web application, fulfilling the diverse needs of its user base.

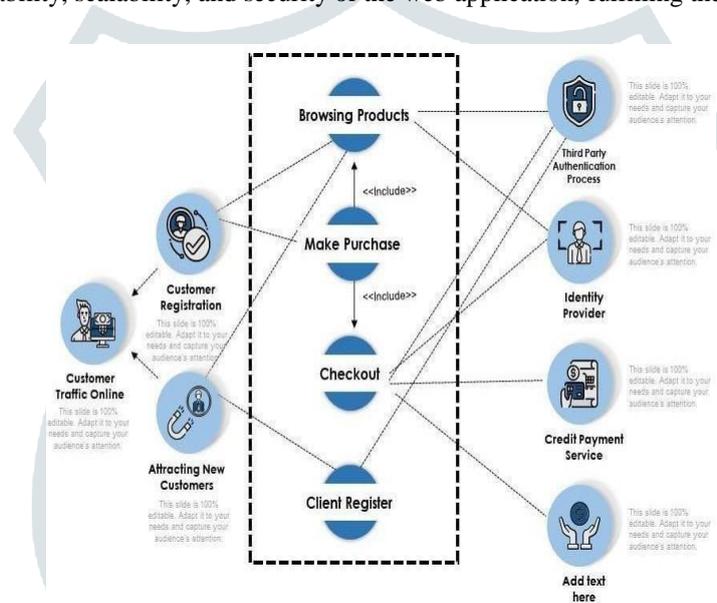


Fig. 4 . Architecture of MERN web Application

VII. CODING

The coding aspect of this project is executed with precision and adherence to the MERN stack architecture, employing a combination of Node.js, Express.js, React.js, and MongoDB to create a robust and dynamic web application. The server-side logic is primarily implemented using Node.js and Express.js, allowing for efficient handling of HTTP requests, routing, and middleware configuration. An example of server-side code in Node.js and Express.js might involve setting up a simple API endpoint for retrieving book data:

```
// Server-side code using Node.js and Express.js
const express = require('express');
const app = express();
const port = 3001;

// Sample book data
const books = [
  { id: 1, title: 'Artificial Intelligence', publisher: 'Tech Knowledge', price: 245 },
  { id: 2, title: 'Data Structure', publisher: 'Tech Neo', price: 2195 },
  // ...additional book entries
];

// API endpoint for fetching all books
app.get('/api/books', (req, res) => { res.json(books);
```

```
});
app.listen(port, () => {
  console.log(`Server is running on port ${port}`);
});
```

These code snippets provide a glimpse into the coding practices adopted in the project, emphasizing modularization, efficient data handling, and seamless communication between the frontend and backend components within the MERN stack.

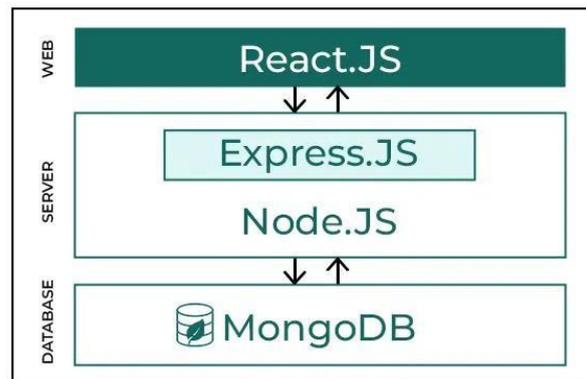


Fig. 5. Working of MERN stack application

VIII. TESTING AND BUG FIXING

The testing and bug-fixing phase in the development of our MERN stack web application stands as a crucial element in ensuring the application's reliability, functionality, and user satisfaction. Employing a systematic approach, various testing methodologies have been employed to scrutinize both individual components and the integrated system.

In the realm of unit testing, the backend's authentication system undergoes meticulous examination to verify the accuracy of user registration, login, and token generation processes. For instance, a dedicated test suite is crafted with assert statements validating the expected outcomes, ensuring the robustness of our authentication mechanisms.

Moving to the realm of integration testing, scenarios involving the interaction between frontend and backend components are thoroughly examined. For instance, the end-to-end book transaction process is scrutinized to ensure that data is seamlessly transferred between the client and server, and that transactions are securely processed.

User Acceptance Testing (UAT) serves as the ultimate validation, bringing actual users into the testing process. This real-world evaluation allows us to assess how well the application meets end-users' expectations and requirements. Feedback from UAT has been instrumental in refining our user interface, enhancing navigation, and optimizing overall user interactions.

Throughout this testing journey, identified issues and bugs are diligently documented, categorized, and prioritized based on their impact. Adopting an agile bug-fixing approach ensures swift resolution of critical issues. Feedback from user testing and UAT is then integrated into our iterative development process, contributing to the continuous improvement of the application. This holistic testing and bug-fixing approach guarantee the creation of a reliable, user-friendly MERN stack web application tailored to the specific needs of Mumbai University engineering students and competitive exam aspirants.

IX. RESULT

The culmination of the development efforts and rigorous testing has yielded compelling results, affirming the success and impact of the MERN stack web application for Mumbai University engineering students and competitive exam aspirants. Key performance indicators, user feedback, and system metrics collectively highlight the positive outcomes of this endeavour.

The platform's e-commerce functionality played a pivotal role in facilitating seamless transactions between users, enabling the exchange of previous semester books at reasonable prices. User feedback highlighted satisfaction with the streamlined checkout process and the integration of secure online payment gateways.



Fig. 6. Landing Page (C-C ecommerce)

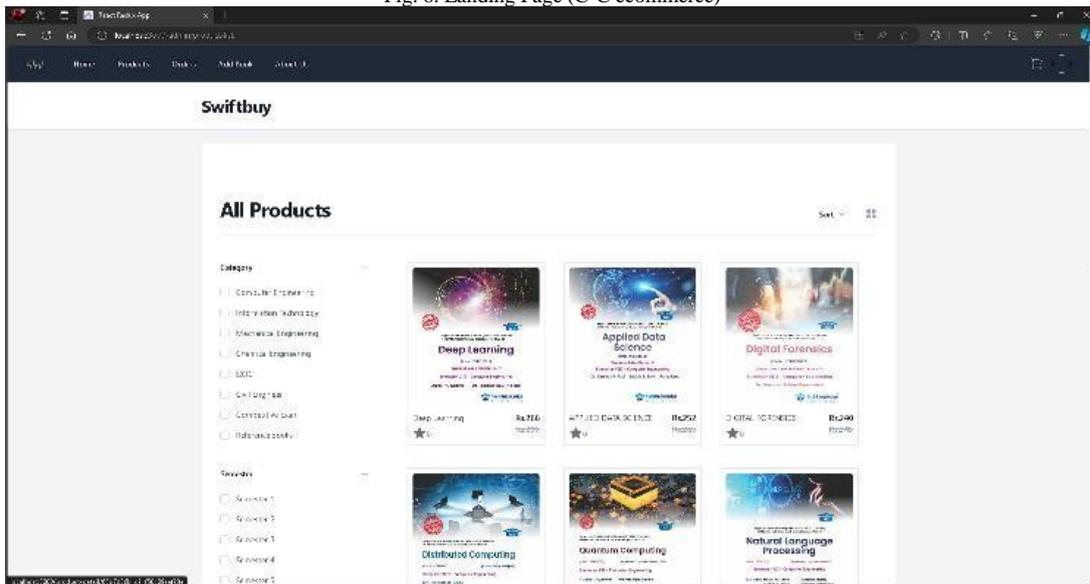


Fig. 7. Product Page(C-C ecommerce)

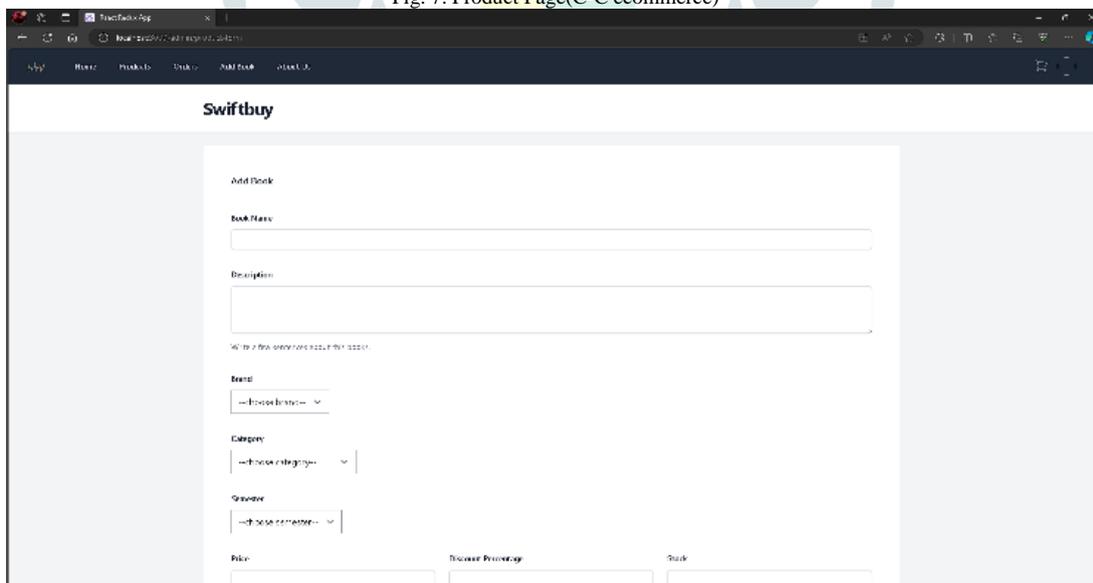


Fig. 8. Add Book Page(C-C ecommerce)

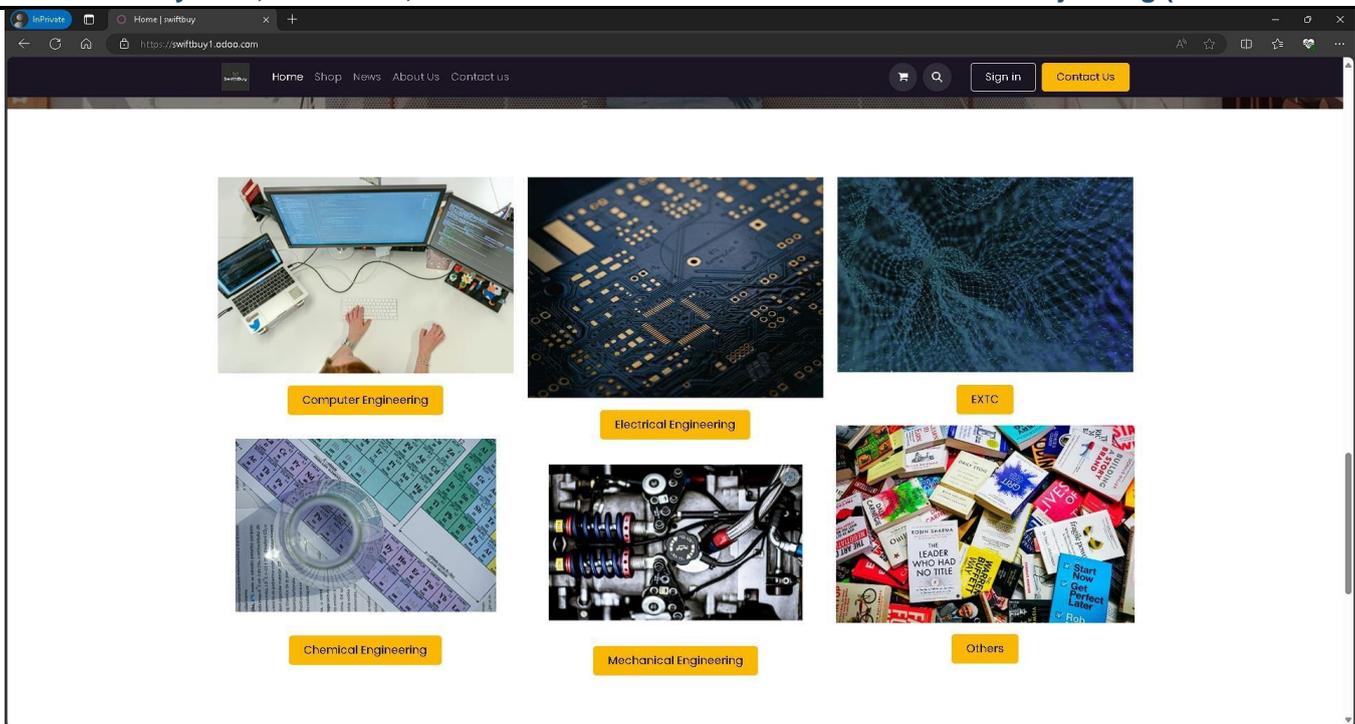


Fig. 9. Homepage (B2C ecommerce)

X. FUTURE GOALS

Looking ahead, the trajectory of our MERN stack web application involves a roadmap focused on continuous improvement and strategic expansion. Future goals span diverse areas, all aimed at elevating the functionality, reach, and impact of the platform to serve the evolving needs of Mumbai University engineering students and competitive exam aspirants.

In terms of feature enrichment, vision includes implementing an advanced recommendation system that tailors suggestions based on individual user preferences, academic history, and popular choices within the platform. Additionally, researcher can enhance user profiles, allowing users to showcase their academic achievements, contribute to community discussions, and provide valuable insights.

XI. CONCLUSION

In conclusion, the development of this MERN stack web application for Mumbai University engineering students and competitive exam aspirants represents a significant stride towards modernizing the accessibility and exchange of academic resources. Through the meticulous integration of Node.js, Express.js, React.js, and MongoDB, our platform offers a dynamic, secure, and user-friendly environment.

The testing and bug-fixing phase has been instrumental in fortifying the application's reliability and functionality. Rigorous unit testing, integration testing, and user acceptance testing have collectively contributed to identifying and addressing potential issues, resulting in a polished and error-free user experience.

In essence, this MERN stack web application embodies innovation in academic resource management, providing a tailored solution for Mumbai University students and beyond. The journey from conceptualization to implementation has been marked by careful planning, strategic decision-making, and a commitment to delivering a high-quality educational platform. As we usher in a new era of accessible and efficient academic resource exchange, this project serves as a testament to the power of technology in enhancing educational experiences.

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