"SHOPX"

A DBMS PROJECT REPORT SUBMITTED TO

THE NATIONAL INSTITUTE OF ENGINEERING, MYSURU

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Bachelor of Engineering

in

Computer Science and Engineering

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CERTIFICATE

This is to certify that the project work entitled "**Shopx**" is a work carried out by **Vinay KV** (**4NI21CS121**), **U Dilip Sagar** (**4NI21CS115**) and **Vivek KN** (**4NI21CS122**) partial fulfilment for the for-Database Management Systems Laboratory 5th semester of Computer Science & Engineering of The **National Institute of Engineering, Mysuru**, an autonomous institute under Visvesvaraya Technological University, Belagavi during the year 2023-24. It is certified that all suggestions/corrections suggested during the Internal Assessment have been incorporated in the Report deposited in the departmental library.

Signature of the Faculty Advisors **Signature of the HOD**

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Chapter 1

Introduction to Shopx: Revolutionizing the Online Shopping Experience

In the ever-evolving landscape of commerce, the digital realm has emerged as a cornerstone of convenience and accessibility. Introducing Shopx, an innovative online e-commerce platform poised to redefine the way consumers engage with retail in the digital age.

Shopx represents more than just a website; it embodies a vision to revolutionize the online shopping experience by seamlessly blending functionality, aesthetics, and reliability. Our platform serves as a gateway to a vast array of products, ranging from fashion and electronics to home essentials and beyond or whatever a business has to offer, it is best suited for small-scale businesses where an owner can handle all the transactions without much effort, offering a seamless experience for customers as well as eliminating middlemen.

At the heart of Shopx lies a commitment to excellence in both user experience and product quality. Our intuitive, facilitating informed purchasing decisions with ease. Moreover, stringent quality control measures ensure that every product featured on Shopx meets our rigorous standards, providing customers with the assurance of superior quality and reliability.

Driven by a dedication to customer satisfaction, Shopx prioritizes transparency, security, and efficiency in every transaction. Our secure payment gateways and data encryption protocols safeguard sensitive information, instilling confidence in our customers to shop with peace of mind.

As we embark on this journey of digital transformation, Shopx invites you to join us in shaping the future of online commerce. Together, let us unlock new horizons of possibility, convenience, and delight in the world of e-commerce.

Chapter 2

System Analysis

1. Functional Requirements:

Cart Tracking: The system allows customers to add the product of their desire and place multiple orders which he/she has added to the cart. It gets redirected to the admin upon confirmation of payment, where the admin takes the responsibility of shipping the product to customers.

Product Selection: Customers can select their desired product by entering the product section of the website, providing flexibility and customization in their buying experience.

Communication: Shopx enables communication between single administrators and customers through announcements and promotional offers. It fosters community engagement.

2. Non-functional Requirements:

Usability: The application offers a user-friendly interface with intuitive navigation and seamless interaction flows. It prioritizes ease of use and accessibility for both administrators and customers.

Reliability: Shopx ensures reliable performance and data integrity, minimizing downtime and data loss. It employs robust data storage and backup mechanisms to safeguard user data.

Scalability: The system is designed to accommodate varying levels of usage and scale, supporting multiple users, products, payments, and multiple cart product additions simultaneously. It can handle future growth and expansion without compromising performance.

Security: Shopx implements stringent security measures to protect user privacy and sensitive data. It employs encryption, authentication, and authorization mechanisms to prevent unauthorized access ensure data confidentiality and ensure the admin has overall control for adding and deleting products.

3. System Architecture:

Shopx follows a three-tier client-server architecture, where the web application serves as the client interface, and the server hosts the application logic and data storage components. The data is stored on a MYSQL database hosted on Amazon Web Service(AWS) Relational Database Service

Instance(RDS). The client application communicates with the server through HTTP protocols such as POST and GET, exchanging data and performing operations such as availability in stock, product selection, placing orders and communication.

The server-side components include:

- Database: Stores user data, product descriptions, data on carts and history of the user of shopx.
- Application Logic: Implements the business logic of the system, including tracking products added to the cart, desired product selection, and payment gateway.
- Protocols: Exposes endpoints for client-server communication, allowing the web application to interact with the server-side components securely.

4. Data Flow:

Cart Tracking: Customers buy products by adding products to the cart. The product added to the cart will be stored in a specified database table called Cart where each customer is associated with a unique id of Cart table. The product added to the cart will be stored in the database and at any time it can be removed from the database.

Product Selection: Users select their desired items using the application. The selected product is added to the cart and the products present in the cart are transmitted to the server and stored in the database for reference.

Communication: Shopx administrators promotional offers to customers through the application. The communication messages are delivered to the users' home page via the server, facilitating timely and relevant updates.

5. Future Enhancements:

Integration with Product Buying Tools: Integrate with product buying and inventory management systems to optimize product search and ensure the availability of products in stock.Advanced Analytics: Implement advanced analytics capabilities to derive insights from user feedback data, identify trends, and make data-driven decisions to improve customer services, customer satisfaction and service quality

Chapter 3

System Design

1. **User Interface (UI) Layer:**

- **Description**: The UI layer of Shopx encompasses the web interface accessible to users for browsing products, managing accounts, and completing transactions.
- **Components**:
  - **Responsive Web Interface:** Developed using HTML, CSS, and JavaScript to ensure compatibility across devices.
  - **Product Listings:** Organized and visually appealing display of products.
  - **Shopping Cart:** Interactive cart feature allowing users to add and remove items before checkout.
  - **User Account Management:** Secure authentication system for user login, registration, and profile management and history of previous purchases.
  - **Payment Gateway Integration:** Seamless integration with payment gateways for secure online transactions with Stripe payment gateway and there is also an option for cash on delivery.

2. **Application Layer:**

- **Description:** The application layer handles business logic and core functionalities of Shopx, including product management, and order processing.
- **Components:**
  - **Product Management System:** Back-end system for managing product inventory, including CRUD operations for products.
  - **Order Processing System:** Workflow management for order placement, fulfilment, and integration with inventory management.

3. **Data Layer:**

- **Description:** The data layer comprises databases and storage mechanisms for storing and managing data related to products, users, orders, and transactions.
- **Components:**
  - **Relational Database:** Structured database for storing product information, user profiles, and order details using MySQL Relational Database Systems(RDS) hosted on AWS.
  - **Data Replication and Backup:** Implementing data replication and backup strategies to ensure data integrity and availability.

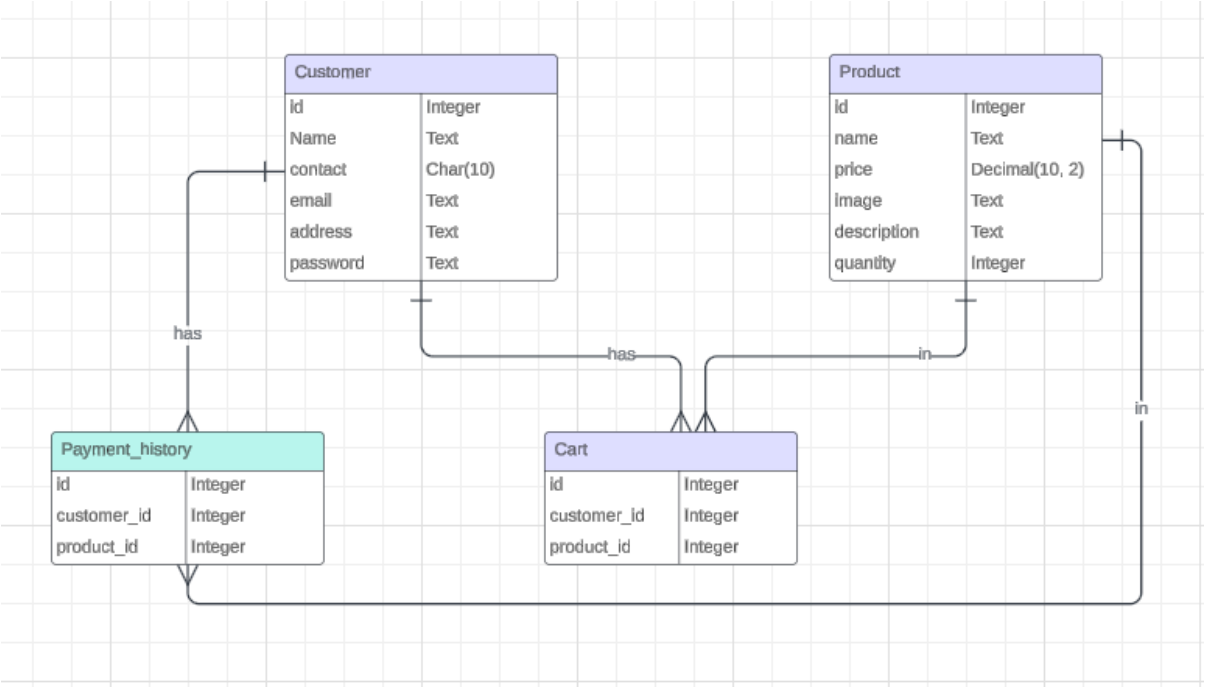

Fig 1: Entity Relationship diagram

4. **Integration Layer:**

- **Description:** The integration layer facilitates communication between internal components and external services, enabling seamless interoperability and functionality enhancement.
- **Components:**
  - **Third-Party Service Integration:** Integration with external services such as payment gateways, shipping carriers, and analytics platforms.

5. **Infrastructure Layer:**

- **Description:** The infrastructure layer encompasses the underlying architecture and deployment environment for Shopx, including cloud hosting, scalability, and monitoring.
- **Components:**
  - **Cloud Infrastructure:** Deployment on cloud platform AWS and implementation in local host for development, scalability, reliability, and cost-effectiveness.
  - **Load Balancing:** Load balances for distributing incoming traffic across multiple servers or instances, ensuring high availability and performance, all these works are handled by AWS.
  - **Auto-Scaling:** Dynamic scaling of resources based on demand using auto-scaling capabilities to handle traffic spikes efficiently, again these functionalities are done by AWS.
  - **Monitoring and Logging:** Implementation of monitoring tools and logging mechanisms for tracking system performance, detecting issues, and troubleshooting errors through admin interfaces and handling emergency triggers through MYSQL workbench.

6. **Security Layer:**

- **Description:** The security layer focuses on safeguarding the Shopx platform from security threats and vulnerabilities, ensuring data confidentiality, integrity, and availability.

- **Components:**
  - **Encryption:** Secure data transmission using encryption techniques for protecting sensitive information also the users' passwords are encrypted using werkzeug security modules' function calls.
  - **Authentication and Authorization:** Robust authentication mechanisms and access controls for verifying user identities and regulating access to resources using Flask login manager.

- **Security Auditing:** Regular security audits and penetration testing to identify and mitigate security risks proactively.

Chapter 4

System Implementation

1. Client-Side Implementation (web application):

- User Interface: Developed user-friendly UI screens using HTML and CSS styling sheets to enable customers to interact with the system seamlessly. This includes webpages for home, index, profile, products and about pages.
- Functionality Implementation: Implement the logic for various functionalities such as login, and registration of users, viewing product, adding product to cart, removing from cart, checking out the product, viewing history of purchases etc.
- Data Storage: Utilized MYSQL database for storing user profiles, history of purchases, product info, and payment history.

2. Server-Side Implementation:

- Application Logic: Developed the server-side application using Python-Flask to handle business logic, including product registration, user authentication and authorization, product addition to the cart and removing it from the cart, checkout and payment etc.
- Database Integration: Implement data storage using a relational database management system MYSQL to store user profiles, products, cart, and payment history.
- Security Measures: Implement security measures such as authentication using Flask-Login and authorization (role-based access control) to ensure secure communication between the client and server, protect user data, and prevent unauthorized access.
- Scalability Considerations: Designed the server-side application with scalability in mind, utilizing cloud-based infrastructure AWS for auto-scaling capabilities, load balancing, and database sharding to handle increasing user load and data volume.

3. Integration and Testing:

- Integration Testing: Tested the integration between the client-side and server-side components to ensure seamless communication and data exchange.

- User Acceptance Testing (UAT): Conducted UAT sessions with stakeholders and end-users to validate system functionality, usability, and performance. Gathered feedback and iterated on the implementation based on user input and requirements.
- Deployment: Deployed the application to a production environment, the version control of the application has been done through git. Data Migrations were also performed. Finally, the application has been launched to the Render cloud platform for hosting online so that users can access the service.

4. Maintenance and Support:

- Monitoring and Logging: Implement monitoring and logging mechanisms to track system performance, detect errors or anomalies, and troubleshoot issues in real time.
- Bug Fixes and Updates: Address reported bugs, issues, and feature requests promptly through regular maintenance cycles. Release updates and patches to improve system functionality, security, and user experience based on feedback and evolving requirements.
- User Training and Support: Provide user training and support resources, including documentation, tutorials, and helpdesk assistance, to empower users to effectively utilize the system and troubleshoot common issues independently.

Chapter 5

System Testing

1. Functional Testing:

- Product registration: The product can only be registered by the admin who would also be the owner of the business which sells that product. The admin has to log in with the admin credentials and add the proper details and quantity of the stock. The testing was done to ensure that the product registered on the application has been reflected in the database.
- User authentication: Tested the functionality of an existing user to log in and get the authorization to add the product to the cart and make the payment. The functionality of a new user to register themselves on the website to use the services is also tested and asserted true.
- Addition of product to Cart: Validated the process of adding of particular product to a cart and reflecting the process such as the decrease in the number of products in the stock by one after each product is added to some authenticated user's cart and reverted if removed were all tested, and all the mentioned transactions are safe and functioning properly as expected.
- Placement of order: Tested the process of placing an order through payment by card using the Stripe payment gateway handling the errors and exceptions raised during the process and reverting If payment fails.

2. Usability Testing:

- User Interface Evaluation: Evaluated the user interface for ease of use, clarity, and intuitiveness. Gather feedback from users through usability testing sessions to identify any areas for improvement in terms of navigation, layout, and visual design.
- UI Elements Testing: Verify that all UI elements are properly labelled and provide adequate feedback to users.

3. Performance Testing:

- Load Testing: Assessed the system's performance under expected and peak loads by simulating multiple concurrent users accessing the application simultaneously. Measure response times, throughput, and resource utilization to identify any bottlenecks or scalability issues.

- Stress Testing: Subjected the system to stress conditions by increasing the load beyond its capacity limits. Monitor system behaviour and performance degradation to determine the breaking point and assess how gracefully the system handles overload situations.

4. Security Testing:

- Authentication and Authorization: Test the authentication mechanism to ensure that only authorized users can access the system. Verify that user credentials are securely stored and transmitted, and that access control mechanisms are enforced properly.
- Data Protection: Validate data protection measures such as encryption of sensitive information (e.g., user's password) both in transit and at rest. Perform penetration testing to identify and remediate any vulnerabilities in the system.
- Session Management: Test session management features to prevent unauthorized access or session hijacking. Verify that sessions expire after a certain period of inactivity and that users are logged out securely.

5. Integration Testing:

- Client-Server Communication: Test the integration between the client-side and server-side components to ensure seamless communication and data exchange. Validate the HTTP protocols to handle requests and responses correctly and that data is transmitted accurately between the client and server.

6. Compatibility Testing:

- Device Compatibility: Tested the application on various web browsers with different screen sizes, resolutions, and hardware specifications. Ensure that the application functions correctly across a range of window sizes i.e. responsive. The results were assertive given that the Bootstrap grid system model was used to ensure a highly responsive design of the web page.
- Browser Compatibility: If applicable, test the web-based components of the system (e.g., administrative dashboard) on different web browsers to ensure cross-browser compatibility and consistent user experience.

7. Regression Testing:

- Regression Test Suites: Executed regression test suites to verify that recent changes or updates have not introduced any unintended side effects or regressions in existing functionality. Re-run critical test cases to confirm that the system behaves as expected after modifications.

Chapter 6 - Results

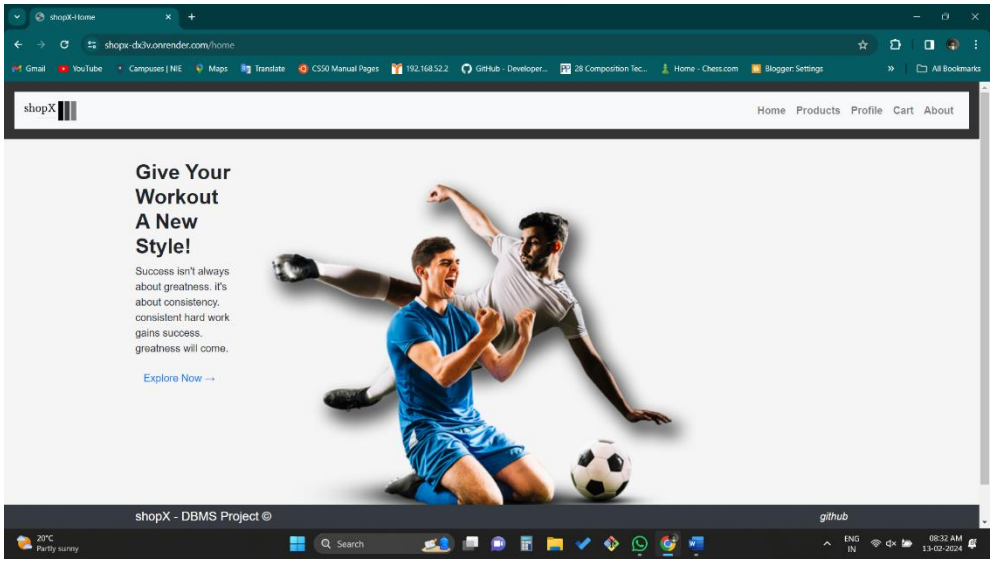

Fig 2: shopx home page

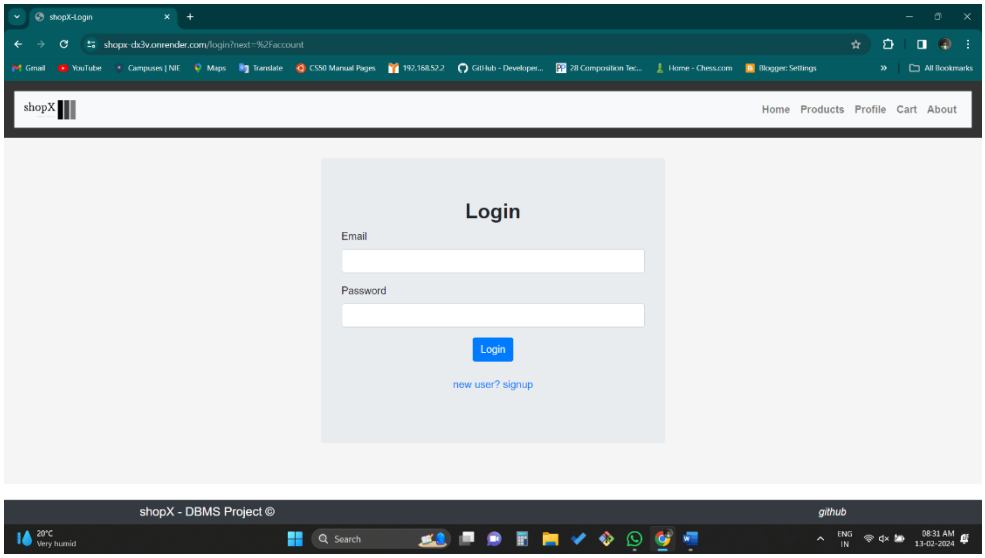

Fig 3: Login page

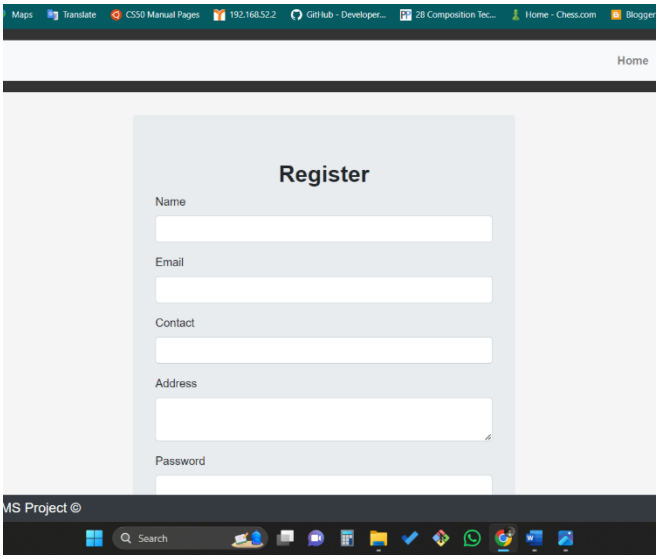

Fig 4: User registration

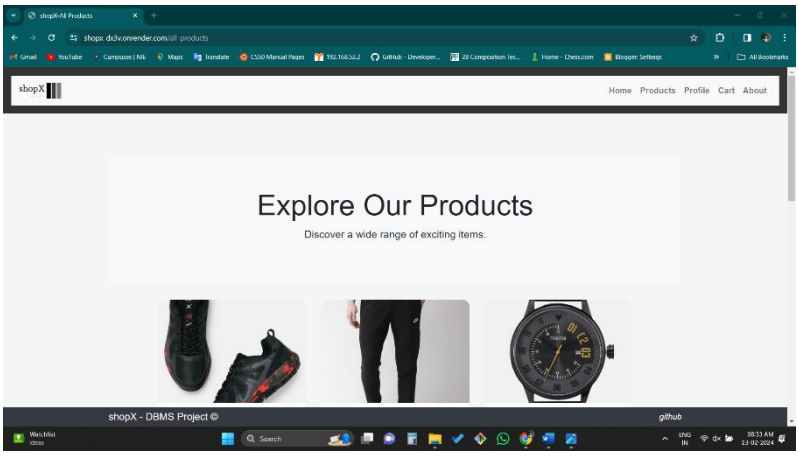

Fig 4: Product list

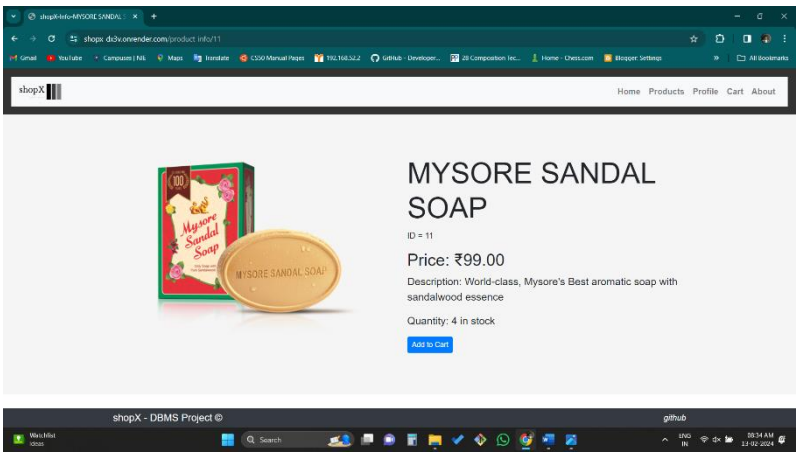

Fig 5: Product detail page

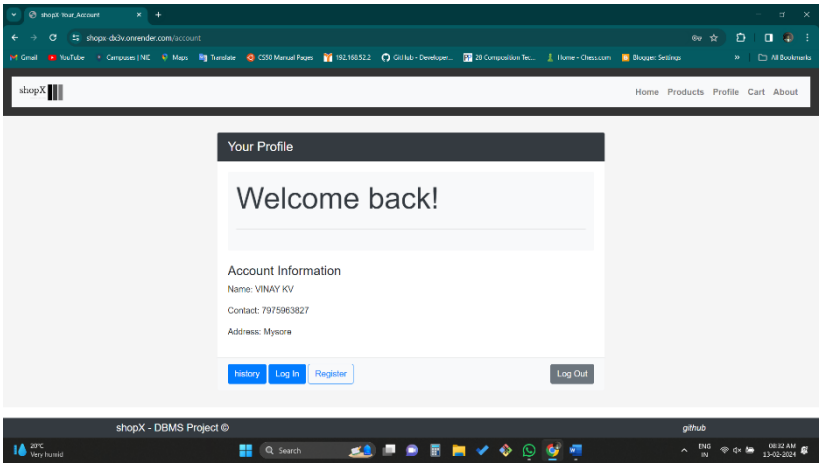

Fig 6: User profile

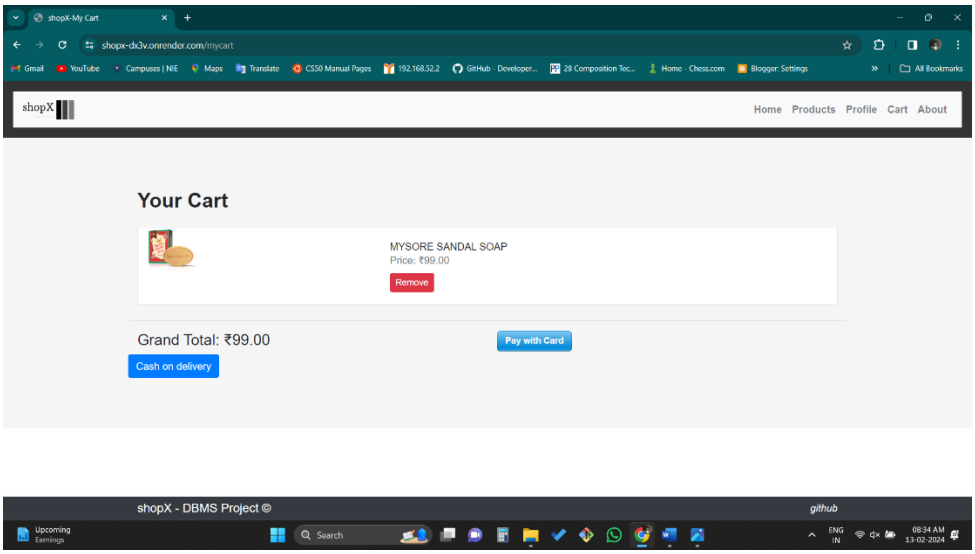

Fig 7: Cart

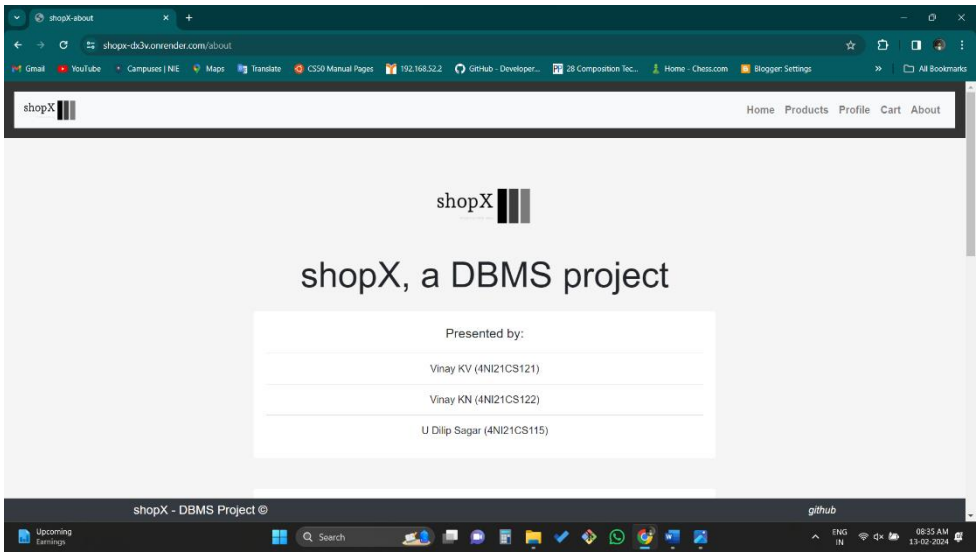

Fig 8: About page

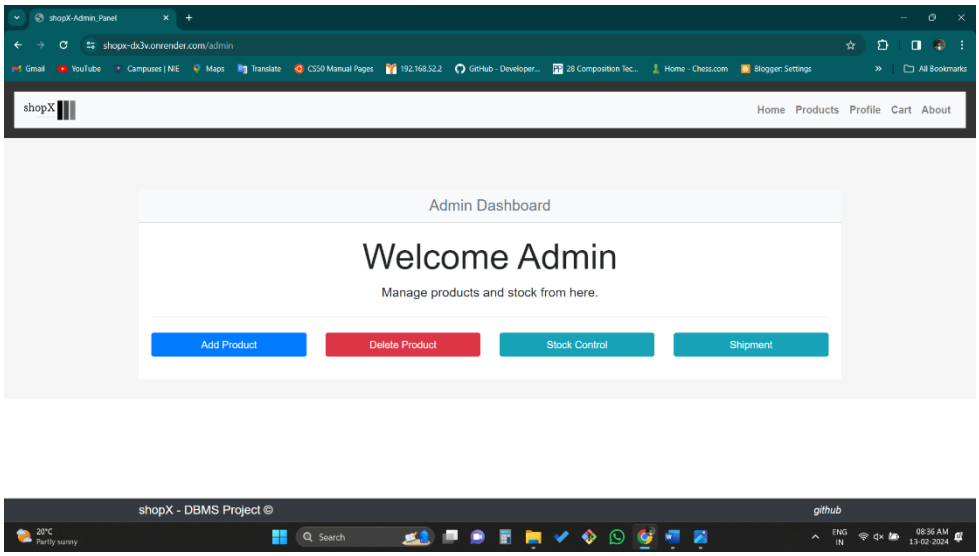

Fig 9:Admin page

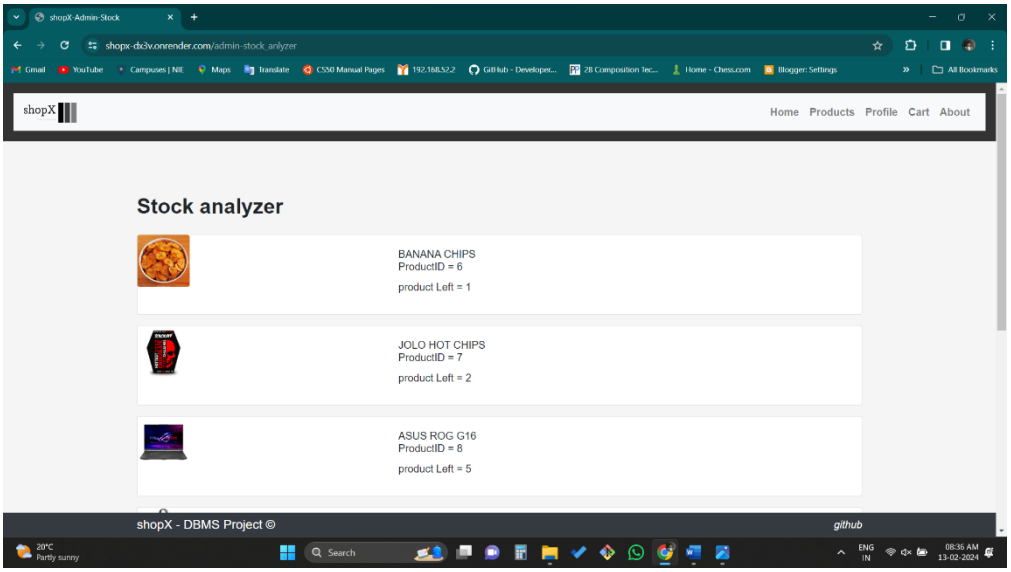

Fig 10: Admin stock analyser

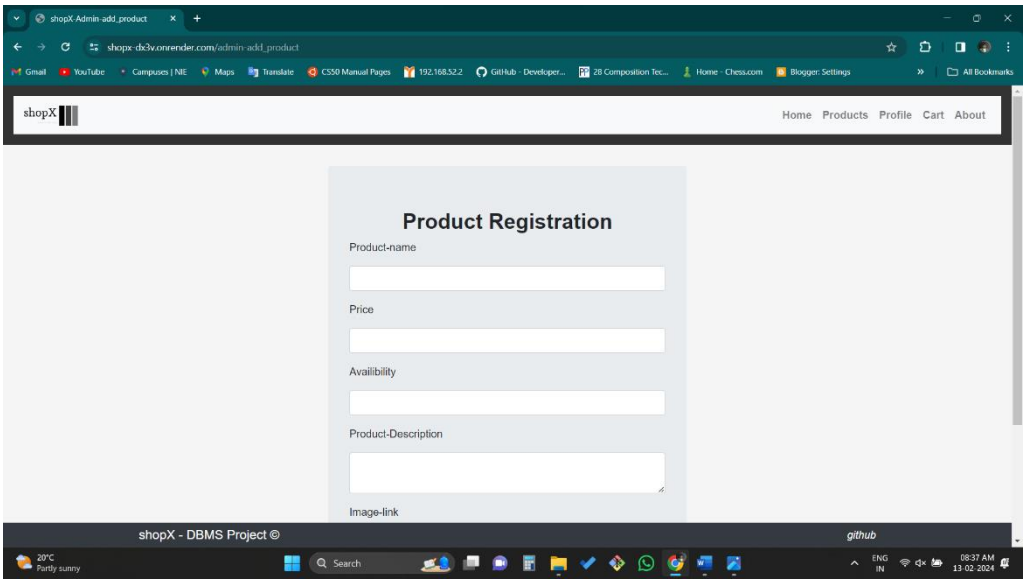

Fig 11: Product registration page

Conclusion

In conclusion, the development and implementation of Shopx will mark a significant milestone in the realm of online commerce. Through meticulous planning, robust architecture, and innovative features, Shopx is poised to emerge as a leading platform, offering users a seamless and enjoyable shopping experience.

Throughout the journey of conceptualization, design, and deployment, Shopx has remained committed to its core principles of convenience, quality, and customer satisfaction. The user-centric approach adopted in the development process ensures that every aspect of the platform is tailored to meet the evolving needs and expectations of modern shoppers.

The success of Shopx will be attributed to its comprehensive system design, encompassing a user-friendly interface, robust application layer, efficient data management, seamless integration with external services, scalable infrastructure, and robust security measures. Together, these components will form the backbone of Shopx, enabling it to deliver exceptional performance, reliability, and scalability.

Looking ahead, Shopx is poised for further growth and expansion, with plans to introduce new features, enhance existing functionalities, and explore opportunities for strategic partnerships and collaborations. By staying agile, adaptive, and responsive to market dynamics and customer feedback, Shopx aims to maintain its position as a trusted and preferred destination for online shopping.

In closing, the journey of Shopx will serve as a testament to the transformative power of technology in shaping the future of commerce. As we navigate the ever-changing landscape of digital retail, Shopx will stand as a beacon of innovation, excellence, and customer-centricity, inspiring us to embrace new possibilities and redefine the boundaries of online shopping.

Future Enhancements

1. **Subscription Services:** Offer subscription-based services for recurring purchases of consumable products, providing convenience and value to customers while fostering long-term loyalty and predictable revenue streams for the platform.

2. **Personalized Shopping Experiences:** Enhance the recommendation engine to deliver more personalized product recommendations based on user preferences, purchase history, and browsing behaviour, leveraging machine learning algorithms to drive engagement and sales.

3. **Omnichannel Integration:** Expand Shopx's presence across multiple channels, including mobile apps and social media platforms, to provide a seamless omnichannel shopping experience for customers, allowing them to interact with the brand wherever they prefer.

4. **Enhanced Customer Support:** Invest in AI-driven chatbots and virtual assistants to provide 24/7 customer support, address inquiries, resolve issues, and offer personalized assistance, improving customer satisfaction and reducing response times while scaling support capabilities effectively.