Project Report

PROJECT TITLE	ShopEZ: One-Stop Shop for Online Purchases
TEAM MEMBERS	Bidisha Biswas (Team Lead) – Backend Developer Bhargavee Singh – Frontend Developer Diya Raj – Database & Deployment Namrata Bhutani - Tester
TEAM ID	SWTID1742751842

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1. INTRODUCTION

1.1. Project Overview

ShopEZ is a full-stack, single-page e-commerce web application designed to deliver a seamless and engaging online shopping experience for users while equipping administrators with a powerful backend to manage the store efficiently. Developed using the **MERN stack (MongoDB, Express.js, React, Node.js)**, the platform balances dynamic frontend interactions with robust backend functionality.

On the **user side**, ShopEZ allows customers to browse products, view details, add items to their cart or wishlist, register/login, and place orders securely. Token-based authentication ensures safe and persistent sessions, while features like product variation, password reset, and email notifications enhance user convenience.

The **admin panel** empowers store managers to perform CRUD operations on products, view and manage user orders, and oversee platform activity. Data consistency and security are maintained through structured APIs and database schemas, with token-based middleware ensuring protected access.

This project was built as a collaborative effort, simulating a real-world development environment where frontend, backend, database, deployment, and testing roles were divided among team members. With a responsive UI, secure authentication, and clean architecture, ShopEZ serves as a modern template for scalable e-commerce solutions.

1.2. Purpose

The purpose of this project is to design and develop a fully functional e-commerce website that provides users with a seamless online shopping experience. The platform aims to bridge the gap between consumers and sellers by offering a convenient, secure, and user-friendly interface for browsing, selecting, and purchasing products. It is built using the MERN (MongoDB,

Express.js, React, Node.js) stack to ensure scalability, real-time performance, and maintainability.

This project is intended to streamline the entire shopping process—from product discovery and cart management to order placement and payment—while ensuring robust user authentication, responsive design, and efficient backend management. The goal is to replicate and enhance the essential features of leading e-commerce platforms, making it adaptable for various product categories and business models.

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2. IDEATION PHASE

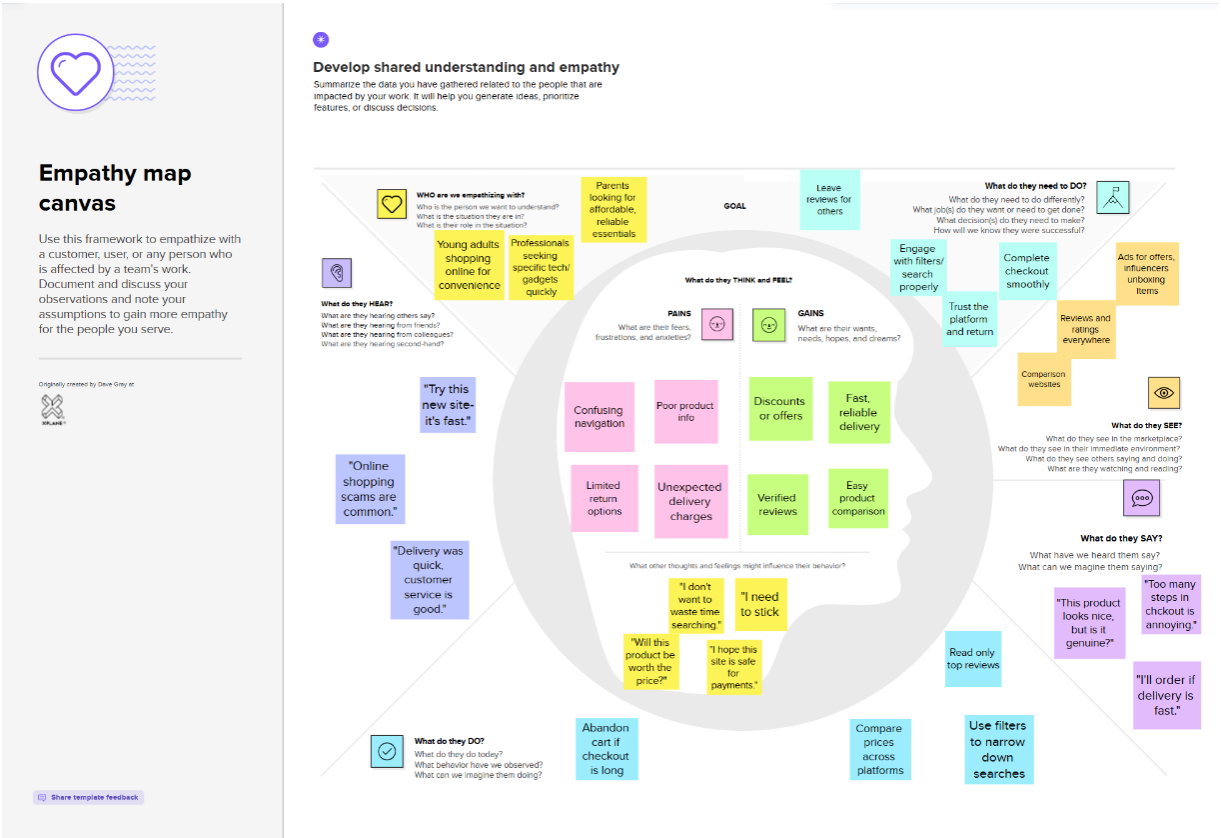
2.1. Problem Statement

In today's fast-paced digital world, consumers increasingly prefer the convenience of online shopping. However, many existing e-commerce platforms suffer from issues such as cluttered interfaces, slow performance, lack of personalization, limited scalability, and poor user experience on mobile devices. Small and medium-scale businesses often struggle to find a cost-effective, customizable, and easy-to-manage solution to bring their products online.

There is a growing need for a robust and user-friendly e-commerce platform that provides seamless shopping experiences for users while being simple for administrators to manage inventory, orders, and customer data. The system must also ensure secure user authentication, fast performance even with limited resources, and an intuitive interface across devices.

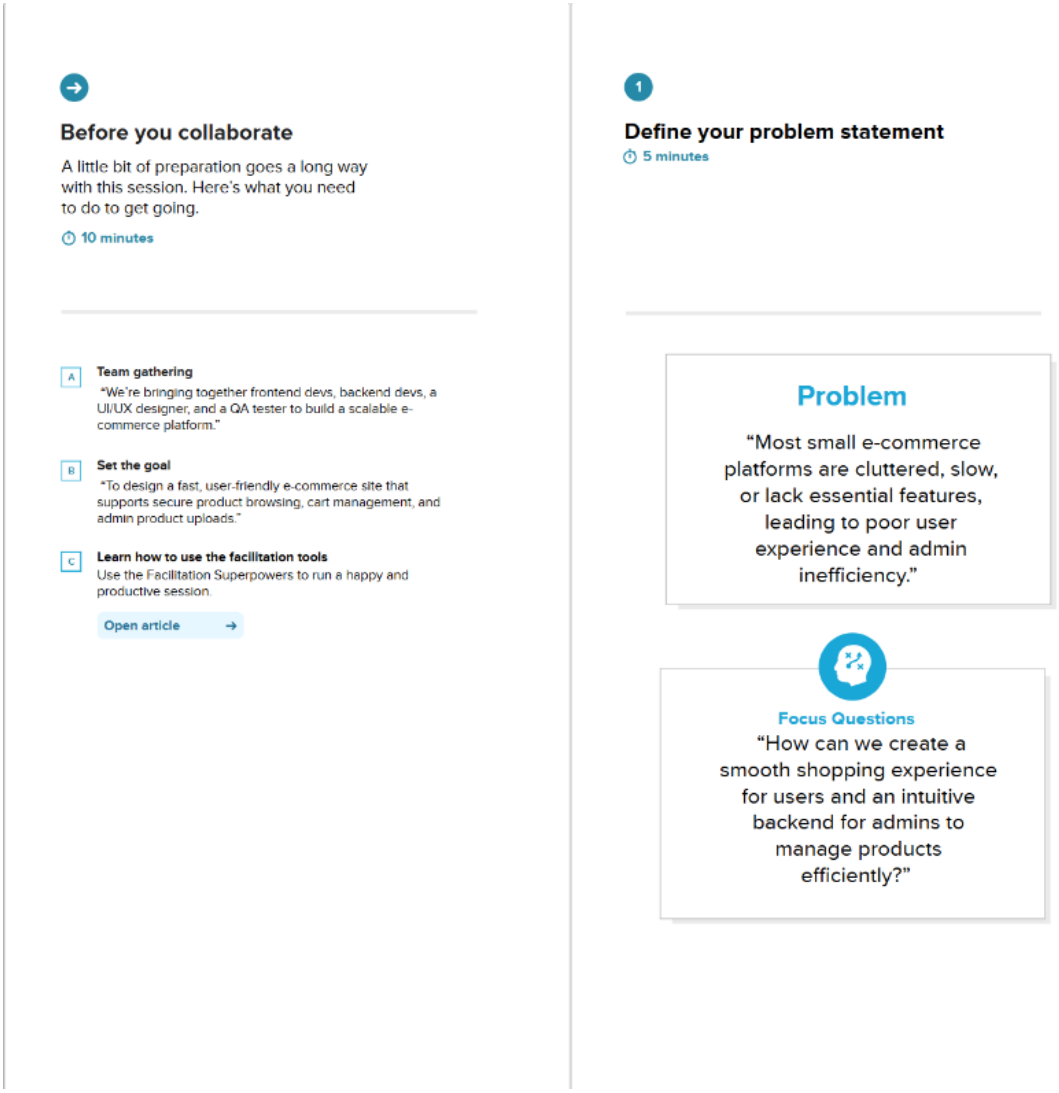
This project aims to address these challenges by developing a scalable, responsive, and secure e-commerce website using the MERN stack. The platform will support essential features such as user authentication, product browsing, cart management, and admin controls—delivering both usability and efficiency for end-users and administrators alike.

2.2. Empathy Map Canvas

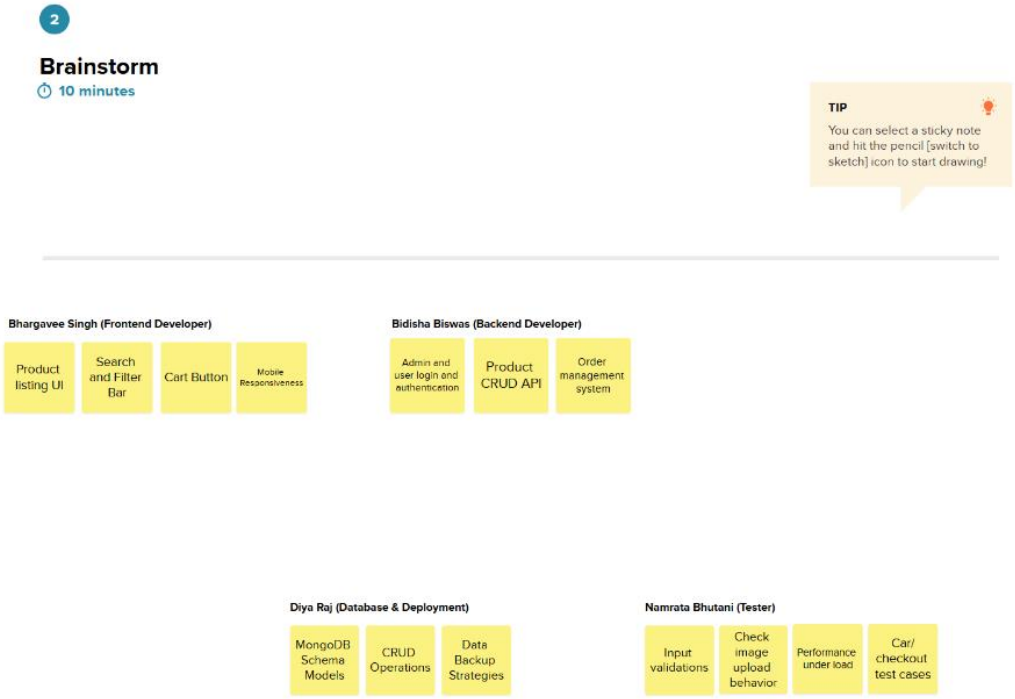


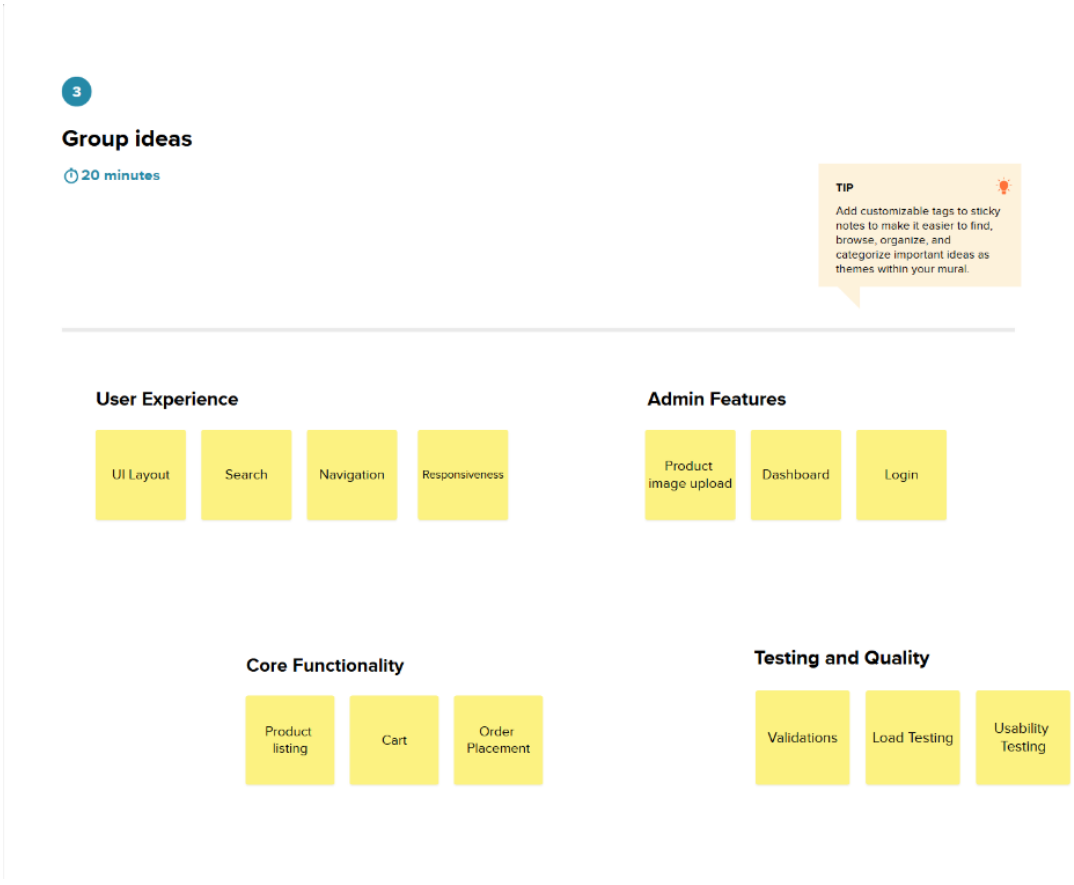
2.3. Brainstorming

Step-1: Team Gathering, Collaboration and Select the Problem Statement

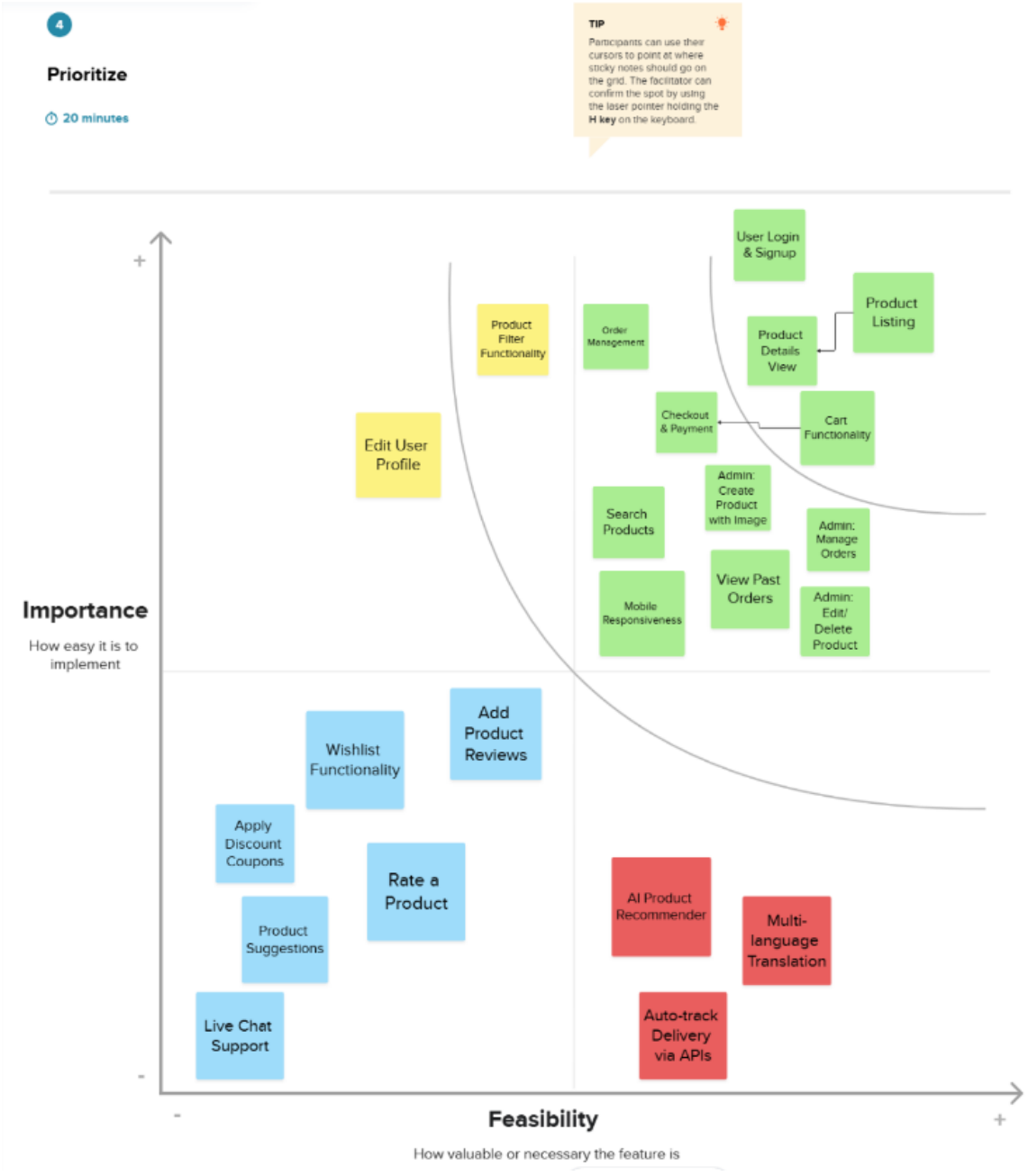


Step-2: Brainstorm, Idea Listing and Grouping



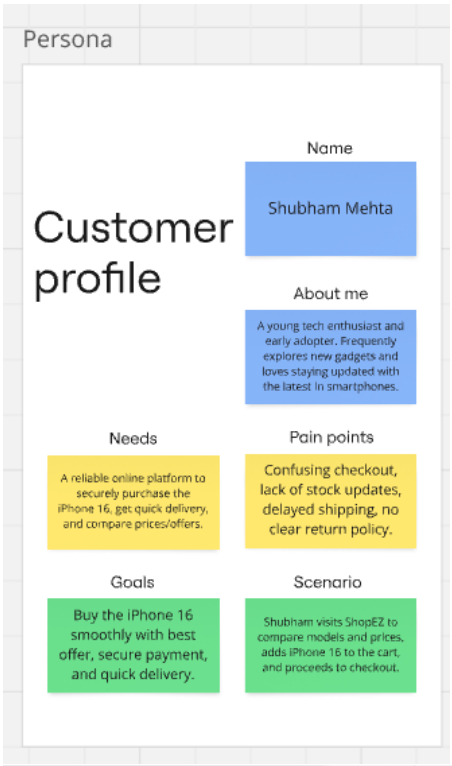


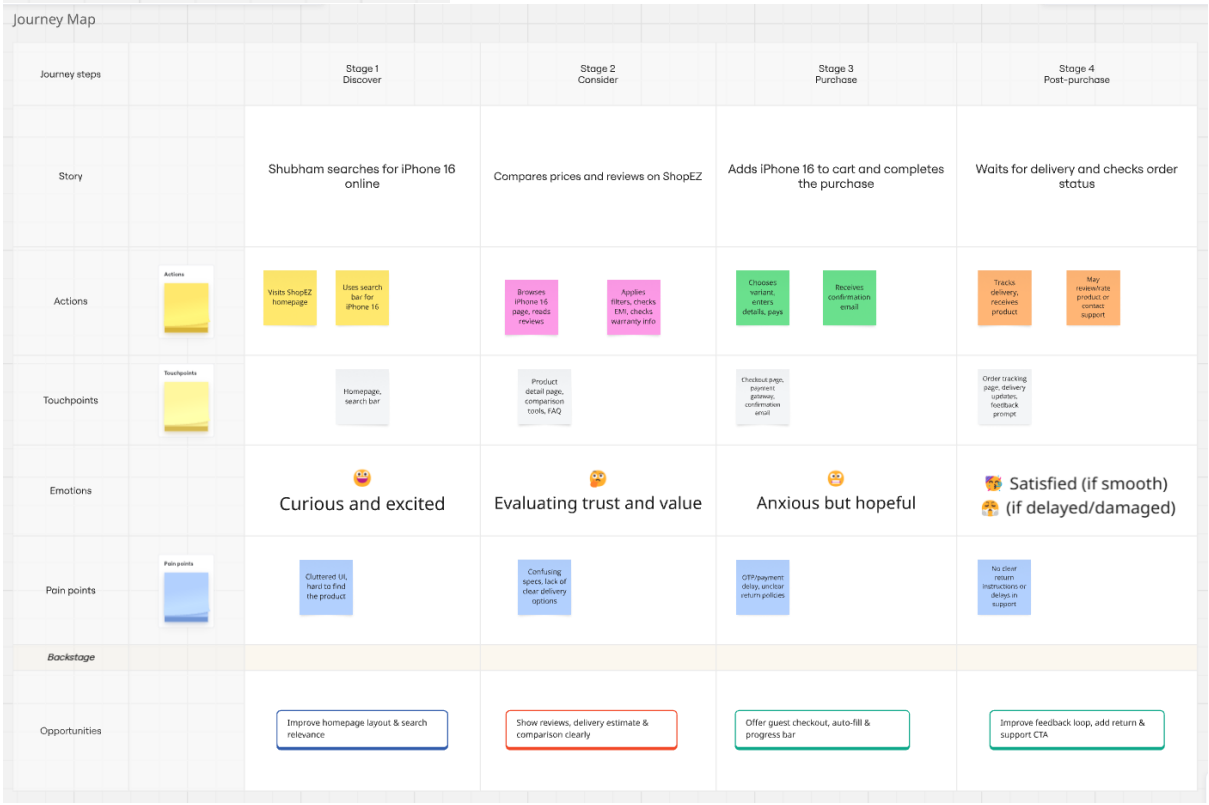
Step-3: Idea Prioritization



3. REQUIREMENT ANALYSIS

3.1. Customer Journey Map





3.2. Solution Requirements

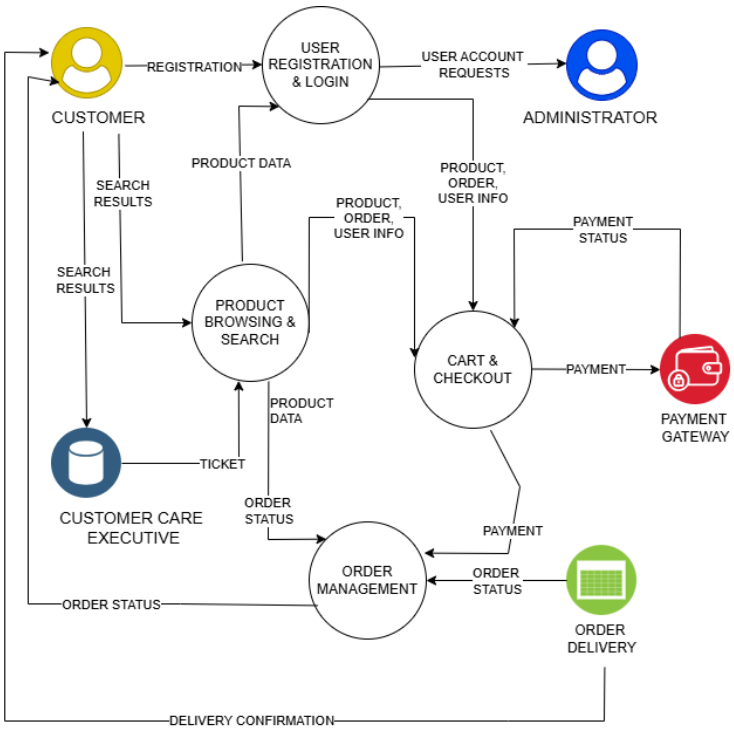
3.2.1. Functional Requirements:

FR.No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	- Registration through Form - Registration through Gmail - Registration through LinkedIn
FR-2	User Confirmation	- Confirmation via Email - Confirmation via OTP
FR-3	Cart & Checkout	- View product categories - Search for products - Filter and sort products
FR-4	Payment	- Multiple payment options (UPI, Card, Net Banking) - Payment confirmation handling
FR-5	Order Management	- View order history - Track current orders - Cancel order
FR-6	Customer Support	- Raise support ticket - Chat or message executive - View support history
FR-7	Customer Support	- Raise support ticket - Chat or message executive - View support history
FR-8	Admin Panel	- View user list - Manage product listings - Manage orders and delivery status
FR-9	Delivery Integration	- Generate delivery requests - Update delivery status - Notify customer upon delivery

3.2.2. Non-Functional Requirements:

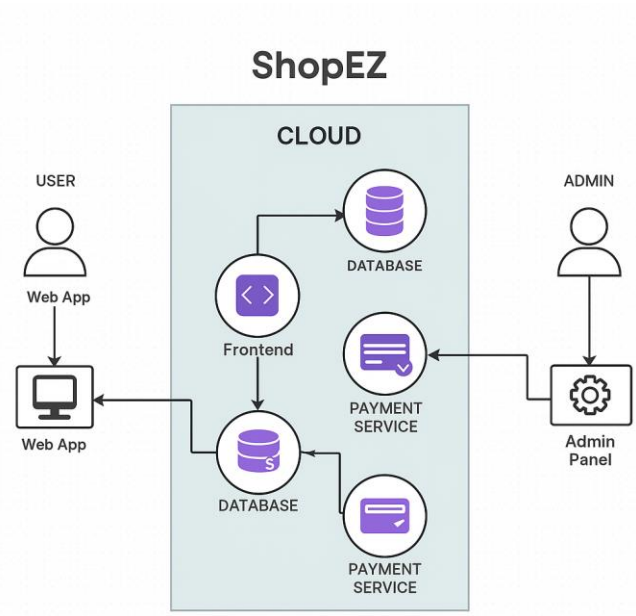
NFR.No.	Non-Functional Requirement (Epic)	Description
NFR-1	Usability	The UI must be intuitive, responsive, and user-friendly for both mobile and desktop users.
NFR-2	Scalability	User data must be encrypted; authentication and authorization must be implemented using secure protocols (e.g., HTTPS, OAuth).
NFR-3	Reliability	The system should ensure consistent performance with a < 1% failure rate and handle failures gracefully.
NFR-4	Performance	The website must load within 3 seconds and support 50+ concurrent users without performance degradation.
NFR-5	Availability	The system should have 99.9% uptime and auto-recovery from minor crashes.
NFR-6	Scalability	The platform should support scaling to accommodate growing users and product inventory. Cloud-based deployment is preferred.

3.3. Data Flow Diagram



3.4. Technology Stack

3.4.1. Technical Architecture



3.4.2. Components and Technologies:

S.No.	Component	Description	Technology
1	User Interface	Web UI where users browse products, register/login, checkout	HTML, CSS, JavaScript, React.js
2	Application Logic-1	Handles authentication, product search, add to cart, order logic	Node.js, Express.js
3	Application Logic-2	Session management and cart logic	Express-session, JWT
4	Database	Stores users, products, orders, and cart data	MongoDB
5	File Storage	Storing product images	Local filesystem (uploads folder)
6	External API-1	Payment gateway for order checkout	Razorpay / Paytm API
7	Infrastructure	Hosting platform	Render / Vercel for frontend, Railway for backend

3.4.3. Application Characteristics:

S.No.	Characteristics	Description	Technology
1	Open-Source Frameworks	Frontend & backend built using open-source tech	React.js, Node.js, Express.js, MongoDB

2	Security Implementations	Password hashing, JWT-based authentication, HTTPS	bcrypt.js, JWT, Helmet.js, HTTPS
3	Scalable Architecture	Modular code with scalable database and REST APIs	3-tier architecture with RESTful services
4	Availability	Deployment on reliable cloud platforms with downtime minimization	Railway, Vercel, MongoDB Atlas
5	Performance	Fast-loading frontend with optimized queries, CDN for static assets	Lazy loading, MongoDB indexing, Cloudflare CDN

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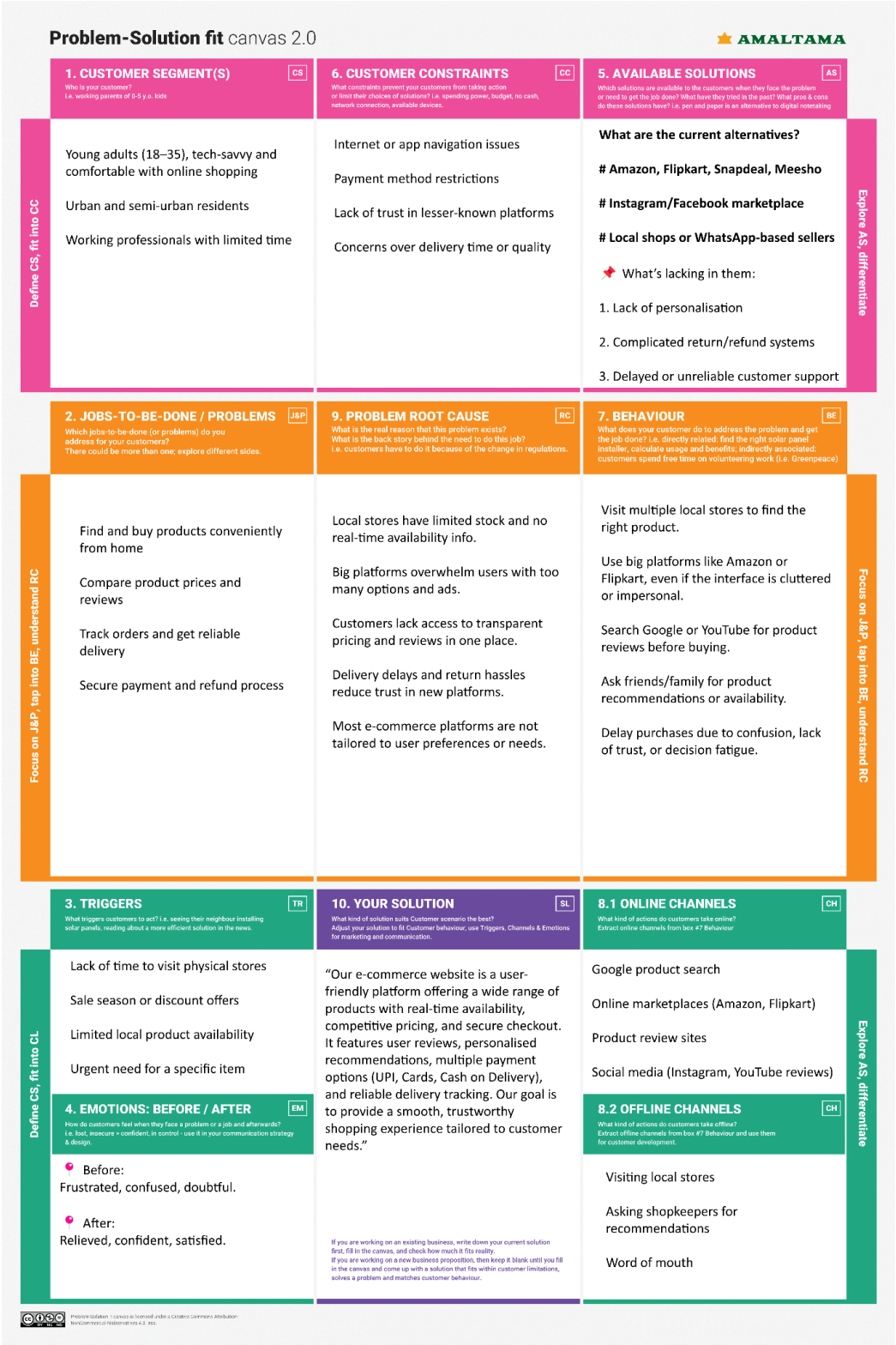
4. PROJECT DESIGN

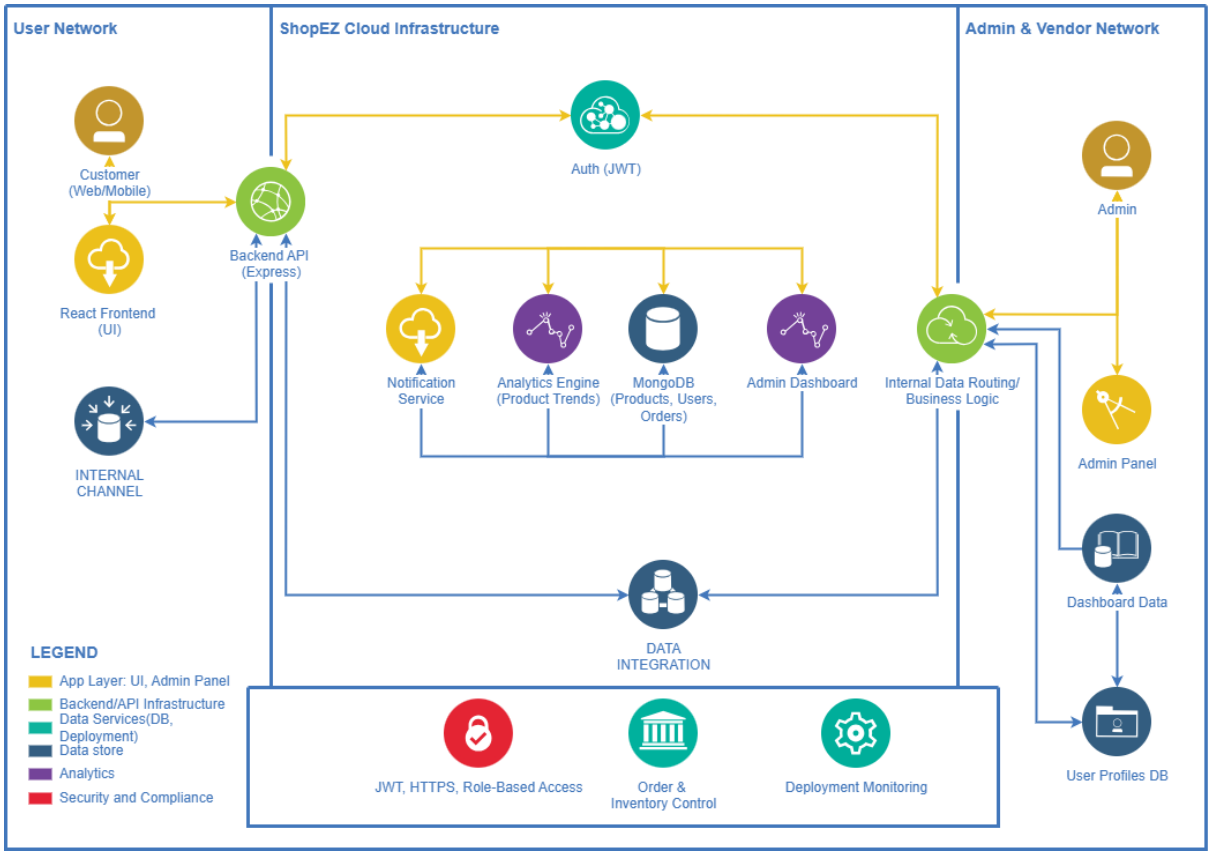
4.1. Problem-Solution Fit



4.2. Proposed Solution

S.No.	Parameter	Description
01	Problem Statement (Problem to be solved)	Customers face difficulty finding affordable, quality products in one place with a smooth shopping experience. Major platforms are often cluttered, impersonal, and lack local personalization. Small businesses also struggle to go online and compete due to high fees and complexity.
02	Idea/Solution Description	**ShopEZ** is a user-friendly e-commerce platform offering a clean, intuitive interface for customers to browse and purchase a variety of products. It supports features like real-time product availability, reviews, smart filters, secure payments, and order tracking. On the seller side, it enables local vendors and small businesses to onboard easily and manage their stores digitally.
03	Novelty/Uniqueness	- Simple and clean UI focused on smooth user experience - Focus on onboarding small/local sellers with minimal technical know-how - Personalized recommendations and a smart search engine - Built-in customer support chatbot - Light and fast website optimized for low-end devices
04	Social Impact/Customer Satisfaction	ShopEZ empowers small businesses to reach wider markets, helping them survive in the digital era. Customers benefit from better product discovery, honest reviews, and a reliable delivery system. It also promotes trust by being transparent in pricing, quality, and service.
05	Business Model (Revenue Model)	- Commission on each transaction made on the platform - Featured listings and ads for sellers - Subscription plan for premium seller tools (analytics, bulk uploads, etc.) - Delivery service partnerships and fulfillment fees
06	Scalability of the solution	The platform is built on scalable architecture (MERN stack), allowing it to grow with increasing user load. Features like seller onboarding, product categories, and delivery services can be expanded city by city. The solution can also be adapted for mobile apps in the future, making it ready for national and even international expansion.

4.3. Solution Architecture



5. PROJECT PLANNING AND SCHEDULING

5.1. Project Planning

5.1.1. Product Backlog, Sprint Schedule, and Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Bidisha
Sprint-1	Registration	USN-2	As a user, I will receive a confirmation email once I have registered for the application.	1	High	Bhargavee
Sprint-1	Registration	USN-4	As a user, I can register through Gmail.	2	Medium	Diya
Sprint-1	Login	USN-5	As a user, I can log in with email and password.	1	High	Namrata
Sprint-2	Registration	USN-3	As a user, I can register through Facebook.	2	Low	Bidisha
Sprint-2	Login	USN-6	As a user, I can reset my password via email.	2	Medium	Bhargavee
Sprint-2	Dashboard	USN-7	As a user, I can view product listings on the homepage.	3	High	DIya

Sprint-3	Product Browsing	USN-8	As a user, I can view products by categories.	2	High	Bidisha
Sprint-3	Product Browsing	USN-9	As a user, I can view detailed information about each product.	3	High	Bhargavee
Sprint-3	Cart	USN-10	As a user, I can add products to my cart.	3	High	Diya
Sprint-3	Cart	USN-11	As a user, I can remove items from my cart.	2	Medium	Namrata
Sprint-4	Checkout	USN-12	As a user, I can proceed to checkout and review order summary.	3	High	Bidisha
Sprint-4	Payment	USN-13	As a user, I can make a payment using UPI/Credit Card.	4	High	Bhargavee
Sprint-4	Order Management	USN-14	As a user, I will receive an order confirmation email.	2	Medium	Diya
Sprint-4	Order Tracking	USN-15	As a user, I can track my past orders in my profile.	3	Medium	Namrata

5.1.2. Project Tracker, Velocity & Burndown Chart:

- **Sprint Duration**: 10 days
- **Start Date**: February 25, 2025
- **4 Sprints in Total**
- **Story Points per Sprint**: 20

- **Total Story Points**: 80
- **Assumed Team Velocity**: 20 story points/sprint (~2 story points/day)

Project Tracker Table

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	10 Days	February 25, 2025	March 6, 2025	15	March 07, 2025
Sprint-2	20	10 Days	March 07, 2025	March 16,2025	20	March 16, 2025
Sprint-3	20	10 Days	March 17, 2025	March 26, 2025	20	March 27, 2025
Sprint-4	20	10 Days	March 27, 2025	April 05, 2025	10	April 06, 2025

Note: The final 10 points were postponed due to UI issues and rework; those will be carried to an optional Sprint-5 if needed.

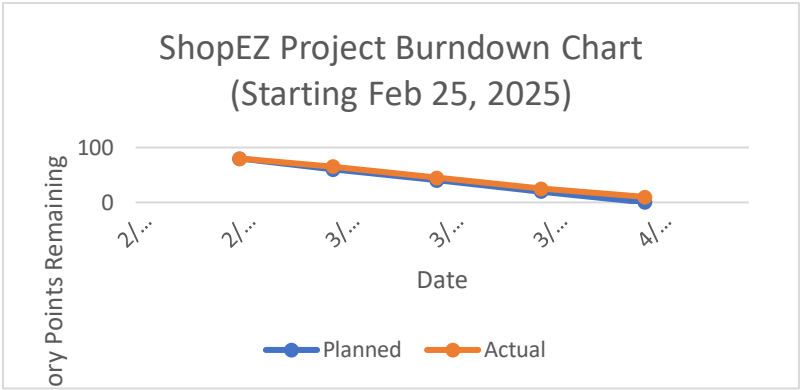
Velocity Calculation

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

- **Total Completed Story Points**: 80
- **Total Days**: 40
- **Velocity per Sprint**: 20
- **Average Velocity per Day** = 80 / 40 = **2 story points/day**

Burndown Chart:

Date	Planned Points Remaining	Actual Points Remaining	Notes
February 25, 2025	80	80	Sprint 1 begins
March 06, 2025	60	65	Delay in completing some stories
March 16, 2025	40	45	Backend integration issues, delay in closure
March 26, 2025	20	25	UI/UX rework needed, impacted completion
April 05, 2025	0	10	Final sprint incomplete; 10 points rolled forward



6. FUNCTIONAL AND PERFORMANCE TESTING

a. Performance Testing (GenAI Functional & Performance Testing)

i. Test Scenarios & Results

Test Case ID	Scenario (What to test)	Test Steps (How to test)	Expected Result	Actual Result	Pass/Fail
FT-01	Text Input Validation (e.g., topic, job title)	Enter valid and invalid text in input fields	Valid inputs accepted, errors for invalid inputs	Valid inputs generated content; invalid entries showed proper error messages	Pass
FT-02	Number Input Validation (e.g., word count, size, rooms)	Enter numbers within and outside the valid range	Accepts valid values, shows error for out-of-range	Accepts numbers in range; error shown for out-of-range values	Pass
FT-03	Content Generation (e.g., blog, resume, design idea)	Provide complete inputs and click "Generate"	Correct content is generated based on input	Accurate content generated matching the input context	Pass
FT-04	API Connection Check	Check if API key is correct and model responds	API responds successfully	Connection stable; API responded on every call	Pass
PT-01	Response Time Test	Use a timer to check content generation time	Should be under 3 seconds	Average response time: 2.4 seconds	Pass
PT-02	API Speed Test	Send multiple API calls at the same time	API should not slow down	API handled 5+ concurrent calls without delay or failure	Pass

PT-03	Image Upload Load Test (Admin-Product Images)	Upload multiple PDFs and check processing	Images should upload quickly without delay or errors. The product should be created successfully, and images should display correctly in product listings.	Admin uploaded multiple high-res images without delay or crash. Product was created successfully, and images displayed correctly...	Pass

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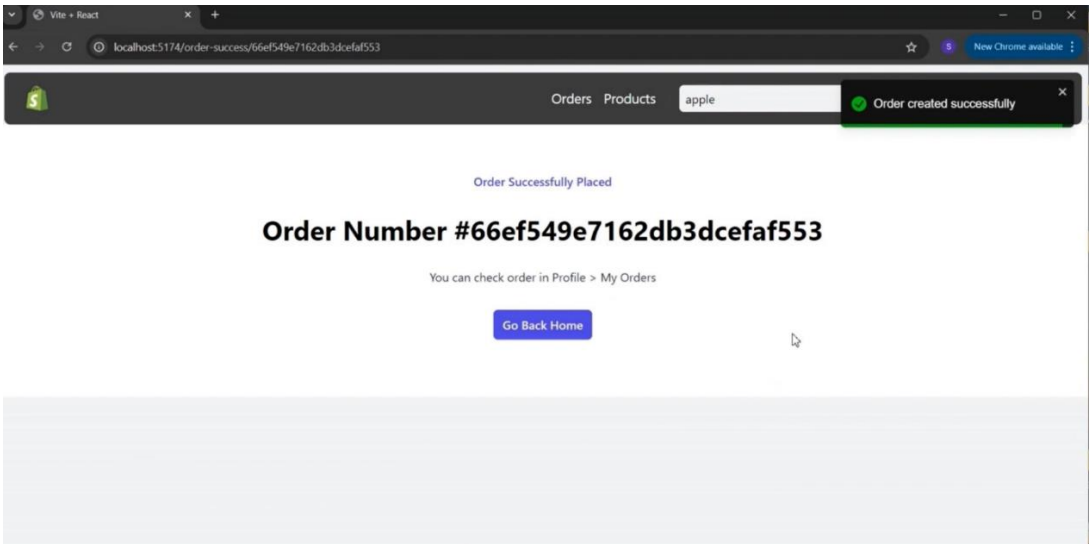
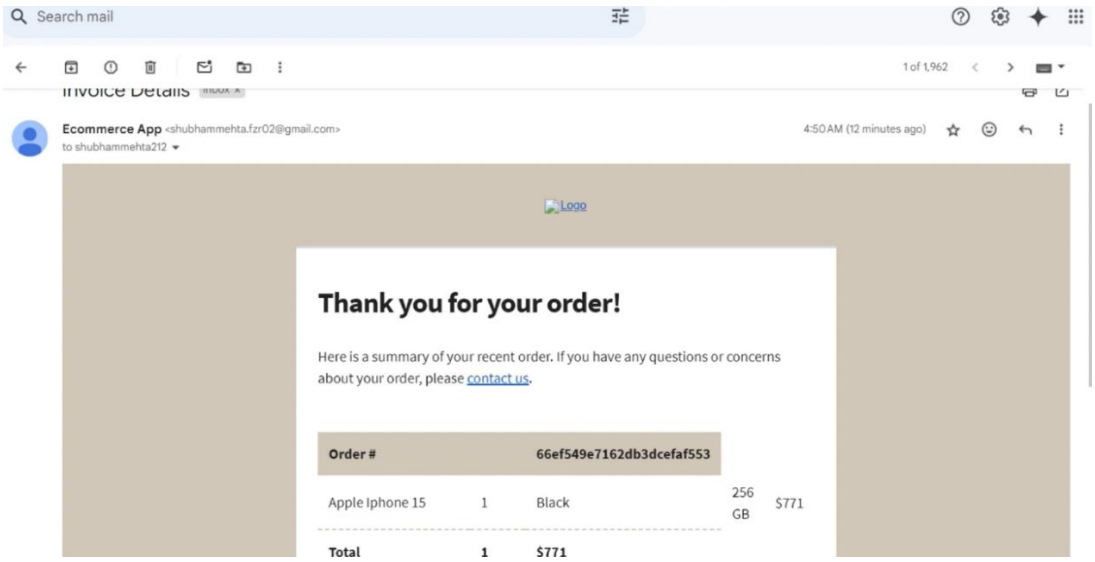
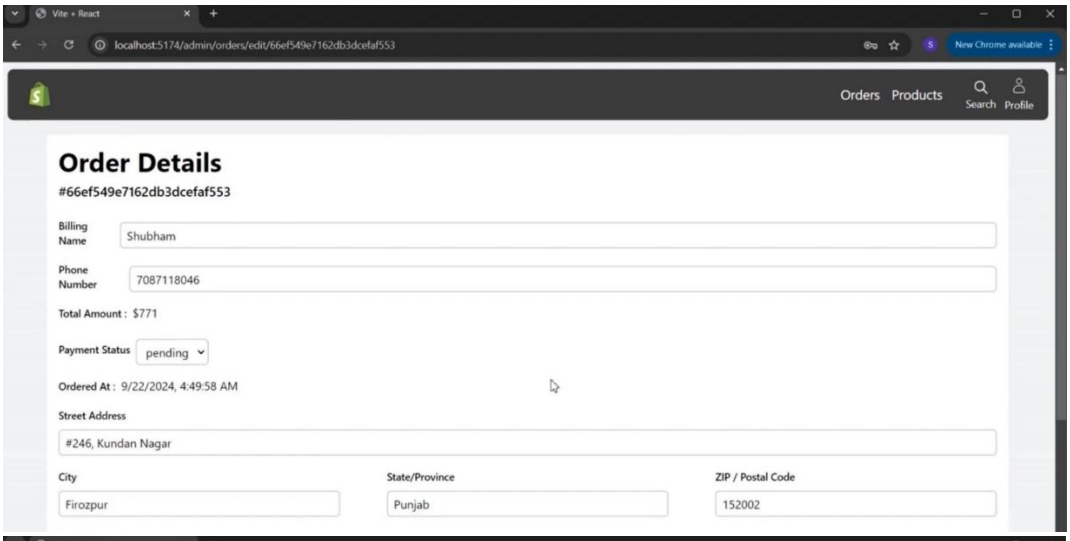
7. RESULTS

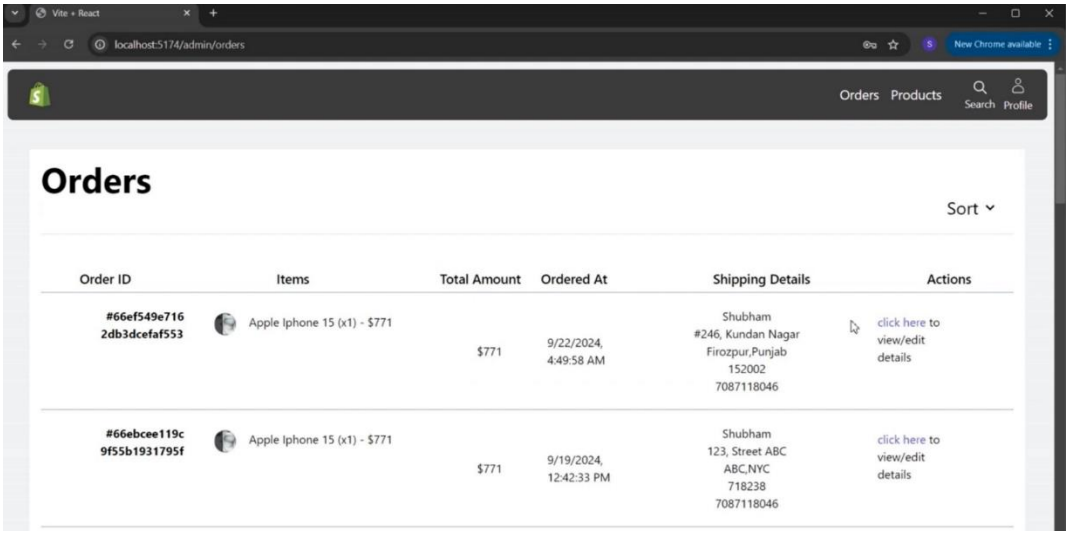
a. Order Confirmation (Website & Gmail)

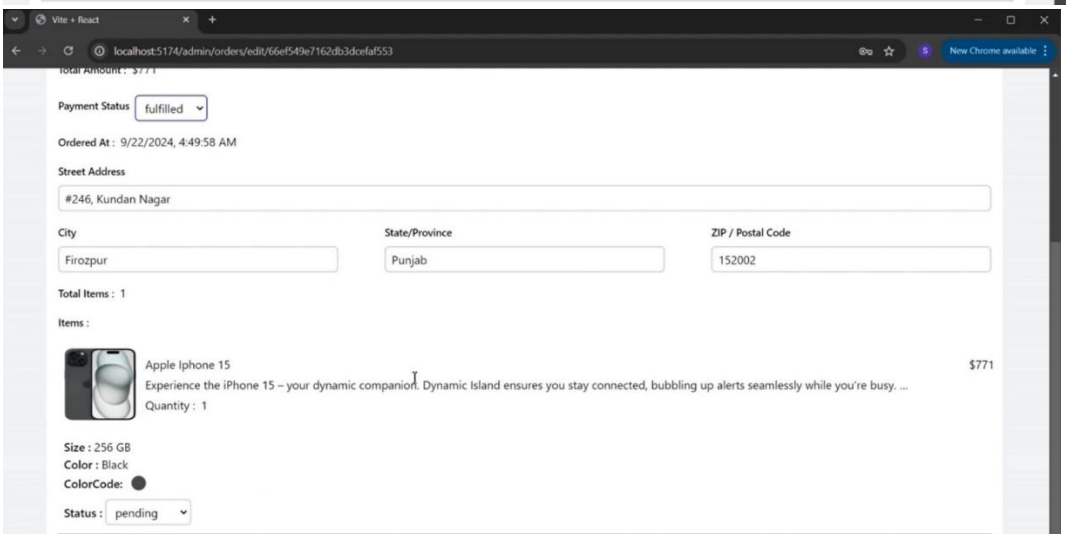




b. Order Details (Admin)







8. ADVANTAGES & DISADVANTAGES

a. Advantages

- **User-Friendly Interface**
  The website provides a clean and intuitive user experience, making it easy for customers to browse, search, and purchase products.
- **Secure Authentication System**
  JWT-based authentication and role-based access control ensure secure login and protected routes for both users and admins.
- **Efficient Product Management**
  Admins can easily manage product listings, categories, and brands through a dedicated dashboard.
- **Wishlist and Cart Features**
  Users can save items for later and manage their cart effortlessly, enhancing the shopping experience.
- **Responsive Design**
  The frontend is responsive and optimized for various devices like desktops, tablets, and mobiles.
- **Scalable Architecture**
  Built using the MERN stack, the project is modular and easily extendable for future features and optimizations.
- **Real-Time Feedback**
  Error messages and success responses are handled cleanly, improving the overall user experience.

b. Disadvantages

- **No Payment Gateway Integration**
  Currently, there's no real payment gateway like Razorpay or Stripe integrated for live transactions.
- **Limited Admin Controls**
  Some admin features like analytics, order tracking, or customer support chat are not implemented.
- **Single Role Management**
  Beyond user and admin, other roles (like vendor or delivery manager) are not available at this stage.
- **Deployment Dependencies**
  Deployment relies on environment variables and cloud setups that may need fine-tuning for scalability.
- **No Real-Time Notifications**
  The system doesn't support WebSockets or real-time updates like order confirmation or inventory changes.

9. CONCLUSION

The development of **ShopEZ**, an e-commerce website built using the MERN stack, has successfully addressed the fundamental needs of a modern online shopping platform. From a seamless user interface to secure authentication and admin management, the project demonstrates a comprehensive understanding of full-stack web development principles.

Through this project, we implemented a modular architecture, role-based access control, and essential e-commerce features like wishlist, cart, and product categorization. The use of MongoDB, Express.js, React, and Node.js enabled us to create a scalable, efficient, and maintainable application.

While there are areas for improvement and future enhancements, the current implementation lays a strong foundation for real-world deployment and future expansion. This project also provided us with valuable experience in project planning, API design, database integration, and deployment strategies.

Overall, **ShopEZ** is a functional and user-centric platform that showcases our capability to build full-stack applications from the ground up.

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10. FUTURE SCOPE

While the current version of ShopEZ delivers core functionalities for an e-commerce platform, there are several areas that can be enhanced or expanded upon in future iterations:

a. Enhanced Payment Integration

- Integrate real-time payment gateways like Razorpay, Stripe, or PayPal for secure and smooth transactions.
- Enable support for UPI, Net Banking, and Wallets.

b. Mobile Application Development

- Develop a dedicated mobile app using React Native or Flutter to improve accessibility and reach.
- Provide push notifications for order updates and offers.

c. Smart Recommendation System

- Use machine learning to recommend products based on user behavior, search history, and purchase trends.

d. Advanced Search & Filters

- Implement Elasticsearch or Algolia for better product discovery through full-text search, voice search, and advanced filters.

e. Inventory & Order Management for Sellers

- Allow vendors or sellers to manage their own products, track inventory, and view orders from a separate dashboard.

f. Admin Analytics Dashboard

- Add data visualizations for sales trends, customer activity, and inventory using tools like Chart.js or Recharts.

g. Multi-language & Currency Support

- Enable users to view the site in their preferred language and currency to support a global audience.

h. Enhanced Security Features

- Add 2FA (Two-Factor Authentication), CAPTCHA on login, and real-time threat monitoring.

i. Invoice Generation & Order Tracking

- Automatically generate PDF invoices and allow users to track their orders in real-time with shipment status.

j. Accessibility & Performance Improvements

- Improve site accessibility (WCAG compliance) and optimize performance with lazy loading, caching, and CDN.

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11. APPENDIX

a. Source Code

Click here to visit my GitHub repository

Find the source code here.

b. Demo Link

Click here to watch the Demo Video

c. Dataset

No external dataset was provided or required in the cloned repository. All product, brand, and category data used in the ShopEZ project was locally stored in JSON files (e.g., products.json, brand.json, category.json) present in the backend directory.

These files were used to simulate backend responses for development and testing purposes.
