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My Menu – Smart QR-Based Outlet System

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Abstract: The "My Menu – Smart QR-Based Outlet System" is a digital platform that modernizes how businesses like restaurants, shops, and service providers share their profiles and product lists and contact details through QR codes. Businesses can add details such as name, timings, images, and location, then generate a QR code for customers to access their profile. Built with ReactJS and using localStorage for offline data handling, the system allows dynamic item management (with images, prices, and categories) without needing cloud services. The system now includes additional features such as direct calling via phone number integration, a secure bill payment module, and a customer comment section. These enhancements improve real-time communication, streamline digital transactions, and promote customer engagement. Customers get a read-only view, while owners can manage content via a user-friendly interface. The responsive design supports mobile/desktop use and optional geolocation. This scalable, eco-friendly system offers a modern, cost-effective alternative to printed catalogs. In the updated implementation, the system is developed using a full-stack architecture comprising ReactJS for the frontend, Node.js with Express for backend services, and MySQL as the relational database. To enable Wide Area Network (WAN) accessibility during development and testing, the application is exposed securely over the internet using ngrok. This enhancement allows real-time access across multiple devices and networks, enabling seamless demonstration, testing, and remote customer access while maintaining security and performance.

Keywords: QR Code, ReactJS, Web Application, WAN Access, ngrok, Digital Catalog, Contactless System, User Interface, Business Profile, Smart Menu, Frontend Development, Contactless System, Online Payment, Customer Feedback

I. INTRODUCTION:

1.1 Background

In the modern business environment, digital tools play a crucial role in customer engagement and operational efficiency. Small and medium-sized enterprises (SMEs) across sectors like grocery, retail, and gift shops often lack access to simple, affordable digital systems. Traditional paper-based catalogs or static displays limit interaction and visibility.

My Menu – Smart QR-Based Outlet System offers a solution: a digital platform that allows businesses to display their product catalog via a QR code. Customers can scan the QR using their smartphones to instantly access the business profile, view product listings, and interact with the brand—without requiring any app installation or expensive hardware.

This contactless, user-friendly solution bridges the gap between physical and digital retail, empowering businesses to modernize without complexity or cost.

1.2 Problem Statement

SMEs often struggle with outdated methods of product promotion and customer engagement. Manual catalogs, verbal product descriptions, or printed menus are inefficient and fail to meet the expectations of today's tech-savvy customers who prefer digital interaction.

Without digital presence, these businesses lose potential engagement and sales. Additionally, customers expect real-time access to product information in a convenient format. A cost-effective, easy-to-implement solution is necessary for enabling digital transformation at the local business level.

My Menu addresses this gap by providing a QR-based display platform that creates digital catalogs accessible with a single scan.

1.3 Objective Of The System

The main goal of this project is to create a lightweight, scalable, and accessible system for business digitization. Key objectives include:

- **Business Profile Management:** Create and edit business details like name, logo, contact info.
- **Product Catalog Management:** Add and update item names, prices, images, and descriptions.
- **QR Code Generation:** Automatically generate scannable QR codes linked to the business profile.
- **Customer Interaction:** Provide an interface for customers to view items through QR scanning.
- **Local Data Storage:** Use browser localStorage for data persistence without a backend.
- **Adaptability:** Work across various business types with minimal customization.
- Enable direct communication between customer and business through phone number linking.
- Provide an optional digital bill payment feature for quicker transactions.
- Introduce a comment section allowing customers to share feedback and improve service quality.
- To implement a full-stack web application using ReactJS, Node.js, and MySQL for reliable data handling.
- To enable WAN-based access using secure tunneling (ngrok) for remote access, testing, and real-time demonstrations across different networks.

1.4 Scope Of The Project

This system serves three types of users:

- **Business Owners:** Create profiles and manage their product catalog.
- **Customers:** Scan QR codes and view item details.
- **Admin (Optional):** Oversee and approve profiles if extended to multi-tenant environments.

The platform primarily focuses on digital profile display and customer interaction. While full-scale e-commerce ordering is not implemented, the updated system includes an optional bill payment feature to support quick and contactless transactions. Future expansions could integrate those as optional modules.

1.5 Significance Of The Project

My Menu empowers SMEs to go digital without requiring technical expertise or large investments. It enables businesses to:

- Deliver a modern, contactless browsing experience.
- Instantly update their catalog in real-time.
- Improve visibility and customer engagement.

The project's use of QR codes ensures simplicity and hygiene, while its adaptability across sectors makes it a versatile tool for digital growth.

II. LITERATURE REVIEW / RELATED WORK

In recent years, digital transformation has become crucial for small and medium-scale businesses, particularly in areas such as digital menu management, customer interaction, and contactless service delivery. The widespread adoption of QR code technology has significantly enhanced contactless communication by enabling businesses to provide instant access to digital information through mobile devices. This approach has gained importance, especially after the increased demand for hygienic and touch-free systems. Several studies and practical implementations have explored QR code-based systems for digital menus and product catalogs. Kumar et al. (2023) proposed a QR code-enabled restaurant menu system that allows customers to scan QR codes to access digital menus, thereby improving hygiene and customer convenience. Similarly, Patel and Shah (2022) developed a contactless ordering system integrated with QR codes and mobile applications, which helped reduce service time and improve order accuracy. These studies highlight the effectiveness of QR codes in enhancing customer experience and operational efficiency. In terms of frontend development, ReactJS has emerged as a widely adopted framework due to its component-based architecture, efficient state management, and high performance. Singh and Verma (2021) emphasized that ReactJS is highly suitable for building scalable and dynamic user interfaces, making it an ideal choice for modern web-based applications. Its reusability and flexibility support rapid development and ease of maintenance. On the backend side, Node.js has gained popularity for building lightweight and scalable server-side applications. Research by Brown and Taylor (2020) demonstrated that Node.js, when combined with RESTful APIs, enables efficient handling of asynchronous requests and improves application responsiveness. Additionally, MySQL remains one of the most widely used relational database management systems due to its reliability, structured data storage, and ease of integration with web technologies. Despite these technological advancements, many existing QR-based systems either depend on complex server infrastructures or lack real-

time accessibility across networks, which can be challenging for small businesses. The My Menu – Smart QR-Based Outlet System addresses this limitation by adopting a full-stack architecture using ReactJS for the frontend, Node.js for backend services, and MySQL for persistent data storage. Furthermore, the use of ngrok for WAN access enables secure exposure of the local server to the internet, allowing real-time testing, remote access, and multi-device connectivity without requiring expensive hosting solutions.

III. SYSTEM DESIGN

3.1. Architecture Diagram

- Describes the overall structure of the system.
- Explains user interaction, QR code generation, and data flow between modules.
- Referenced in your document as:

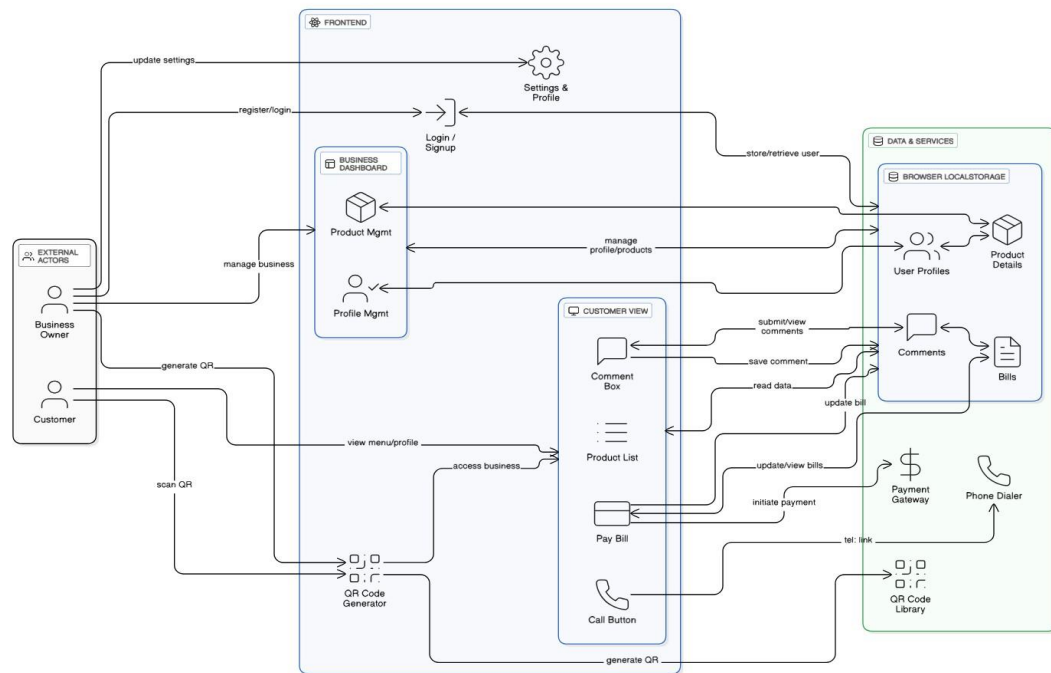


Figure 3.1: Architecture Diagram

3.2. Data Flow Diagram (DFD)

- Illustrates how data moves through the system between components.
- Includes:
 - User Profile Flow
 - Customer Flow
- Referenced as:

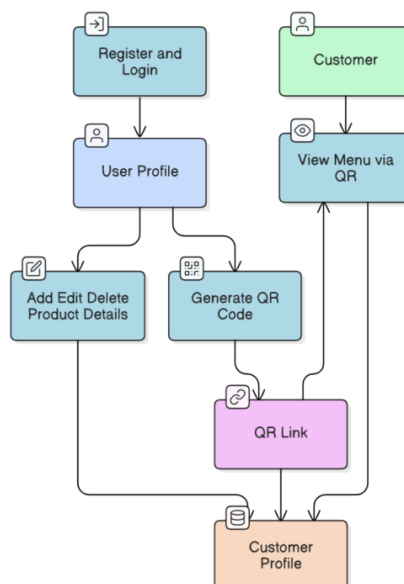


Figure 3.2: Data Flow Diagram

3.3. Use Case Diagrams

- Visual representation of user interactions with the system.
- Includes:
 - Business Owner Use Case (registration, product upload, QR generation)
 - Customer Use Case (scan QR, view catalog)
- Referenced as:

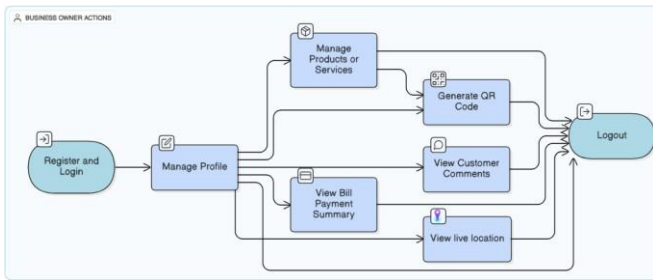


Figure 3.3.1: Use Case Diagram (User Profile)

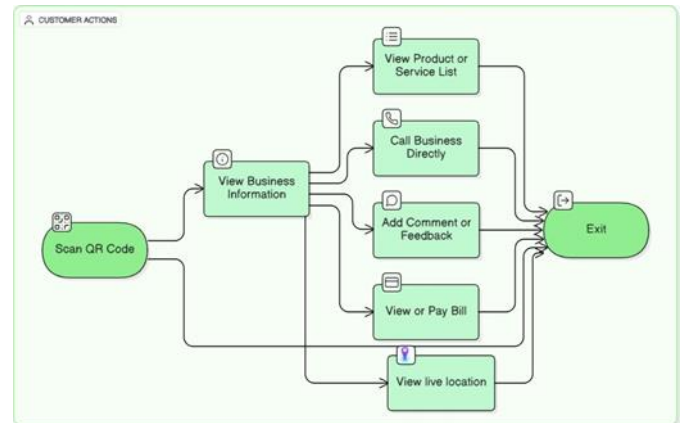


Figure 3.3.2: Use Case Diagram (Customer Profile)

3.4. Sequence Diagram

- Step-by-step flow of actions between system and users.
- Shows:
 - Login → Product add/edit → QR generation → Customer scan
- Referenced as:

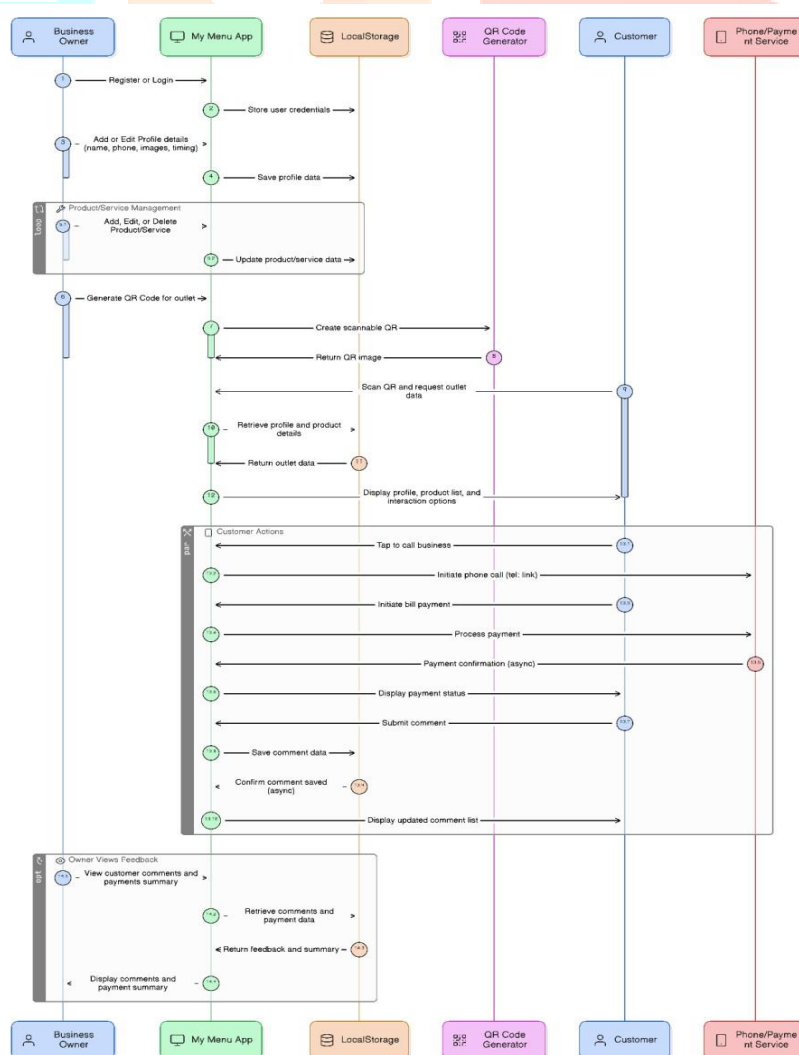


Figure 3.4: Sequence Diagram

3.5. Collaboration Diagram

- Shows component interactions (e.g., UserProfile.js, AddPostModal.js, etc...)
- Referenced as:

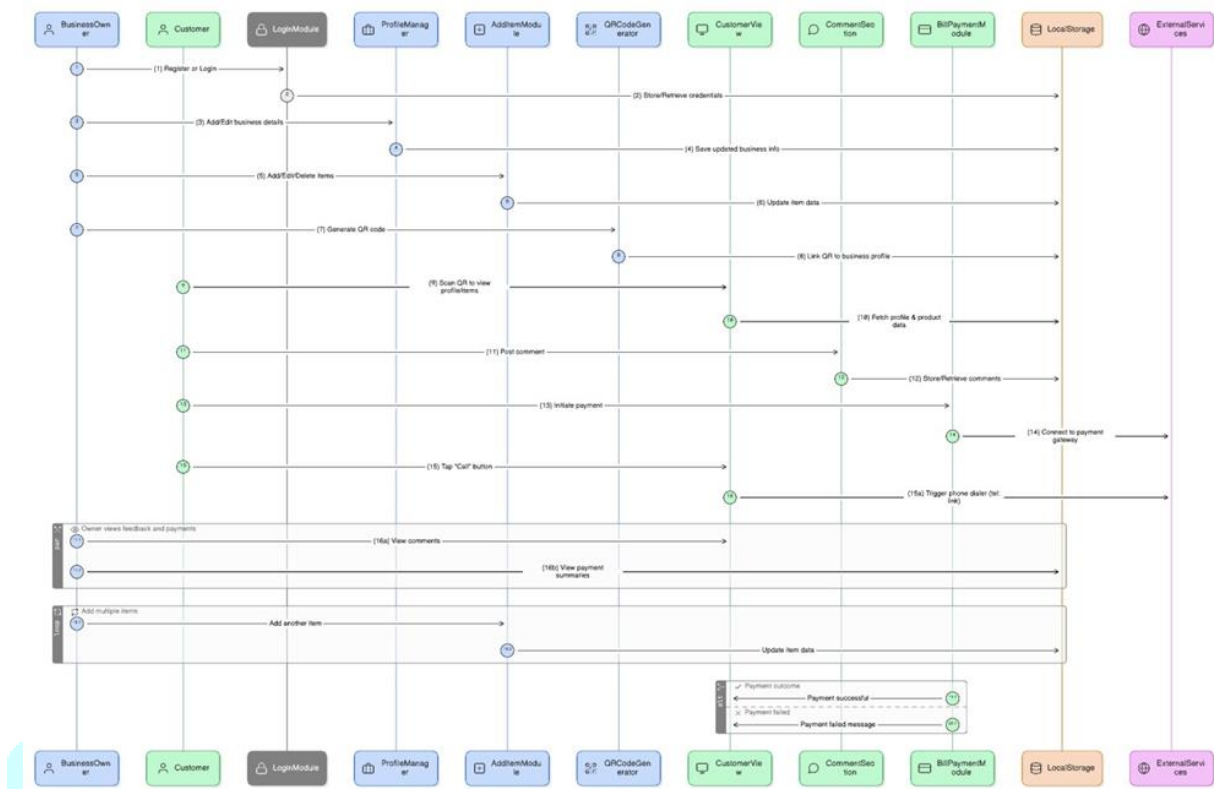


Figure 3.5: Collaborative Diagram

3.6. Database Design

- LocalStorage used as a lightweight database.
- Shows how users, currentUser, and posts are stored.
- Referenced as:

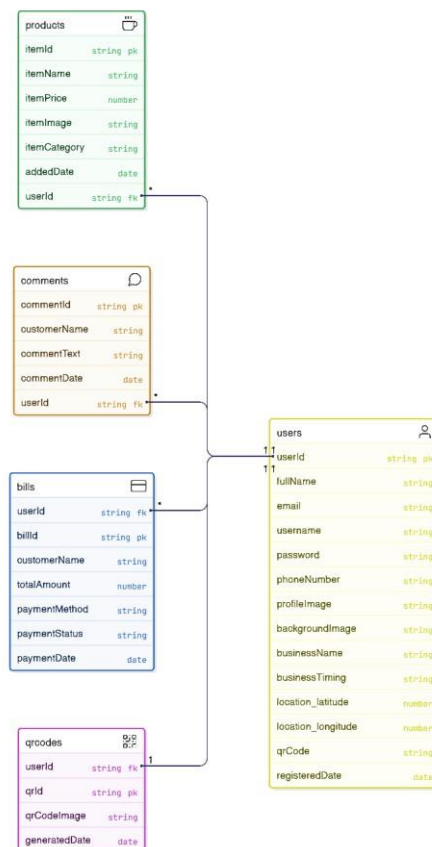


Figure 3.6: Database Diagram

IV. RESEARCH METHODOLOGY

The research methodology employed in the development of the 'My Menu – Smart QR-Based Outlet System' project follows a structured and agile approach. This methodology focuses on delivering a user-centric, scalable, and efficient solution using modern web technologies. The project underwent multiple phases including requirement gathering, design, implementation, testing, and deployment. Below is a detailed breakdown of each phase in the applied methodology:

4.1 Requirement Analysis

Initial research was conducted to identify the pain points in traditional menu and catalog systems, especially for small businesses. Interviews, online sources, and competitor analysis were used to define functional and non-functional requirements.

4.2 Design Phase

The design phase included creating architecture diagrams, data flow diagrams, and UI wireframes. The frontend component architecture was planned using ReactJS, ensuring reusability and maintainability.

4.3 Development Phase

The system was developed using a full-stack architecture with ReactJS for the frontend and Node.js with Express for backend services. MySQL was used for structured data storage, including business profiles, products, payments, and customer comments. Core modules such as user management, item catalog, and QR code generation were implemented in parallel. WAN access was enabled using ngrok, allowing real-time multi-device access, along with features like phone call integration, bill payment, and customer feedback.

4.4 Testing and Validation

Unit testing and manual functional testing were conducted to verify each module's behavior. The application was also tested for responsiveness and cross-browser compatibility. Issues like form validation, dynamic rendering, and data persistence were addressed iteratively.

4.5 Deployment and Review

The final build was reviewed and prepared for deployment on platforms like Vercel for demo purposes. User feedback was collected for usability and visual design, helping shape further enhancements.

4.6 Tools and Technologies Used

- ReactJS for frontend user interface
- JavaScript and JSX for scripting
- CSS for styling
- QR code generation libraries
- MySQL for relational database management
- ngrok for secure WAN access and tunneling
- QR code generation libraries
- REST APIs for frontend-backend communication

V. TESTING AND RESULTS

5.1 Testing Methodology

To ensure the system functions reliably and efficiently, a combination of manual and functional testing techniques was adopted. The focus was on validating all modules, including user registration, profile management, catalog operations, QR code generation, and customer view accessibility. Testing was performed on multiple devices and browsers to ensure compatibility and responsiveness.

5.2 Types of Testing Performed

- **Unit Testing:** Each component, such as login, registration, and catalog display, was tested independently to verify correctness.
- **Integration Testing:** Confirmed smooth data flow and communication between modules (e.g., profile data correctly populates the catalog).
- **Functional Testing:** Ensured all user actions (add/edit/delete items, generate QR, scan QR) produced expected results.
- **Compatibility Testing:** The application was tested on browsers like Chrome, Firefox, Edge, and on mobile devices with different screen sizes.
- **Usability Testing:** End-user feedback was collected to assess UI intuitiveness and ease of navigation.

5.3 Sample Test Cases

Table 5.1: Sample Test Cases

Test Case	Input	Expected Output	Result
User Registration	Valid username, password, images	New user profile created in LocalStorage	Passed
Catalog Item Addition	Item name, price, image, timing	Item displayed in profile and saved	Passed
QR Code Generation	Active user profile	QR code generated and displayed correctly	Passed
Customer QR Scan	Scan QR code using smartphone	Customer-facing catalog loads successfully	Passed
Call Business	Tap business phone number	Dialer opens with business number	Passed
Payment Process	Select “Pay Bill” → confirm payment	Payment confirmation displayed	Passed
Comment Submission	Enter text in comment box → Submit	Comment displayed under business profile	Passed

5.4 Results Summary

The system performed consistently across all testing scenarios. Data persistence using LocalStorage was stable with no loss between sessions. QR code generation and scanning worked flawlessly on all tested devices. Users found the interface simple, responsive, and accessible, confirming the system’s usability and performance goals.

VI. SCREEN SHOTS:

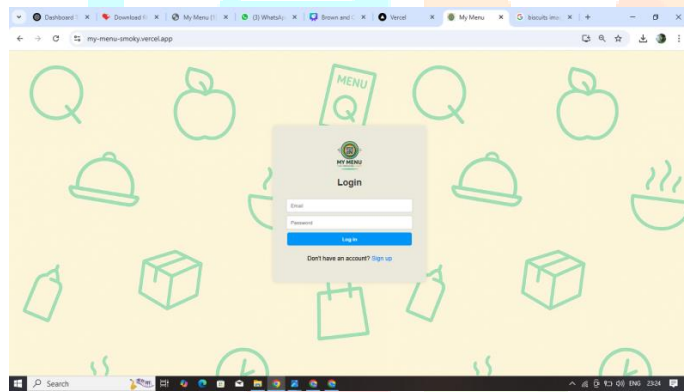


Figure 6.1: Login Page

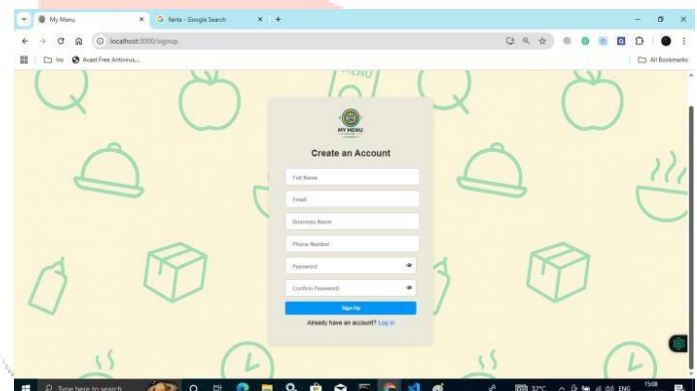


Figure 6.2: Singup Page

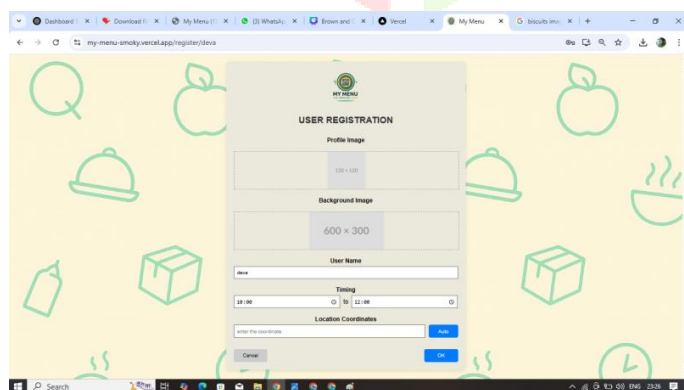


Figure 6.3: User Registeraton Page

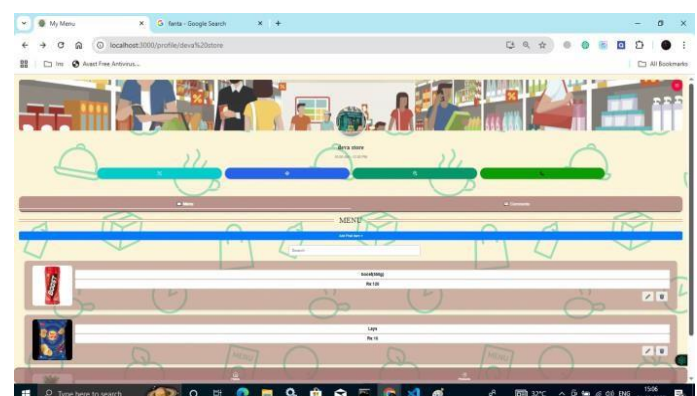


Figure 6.4: User Profile Page

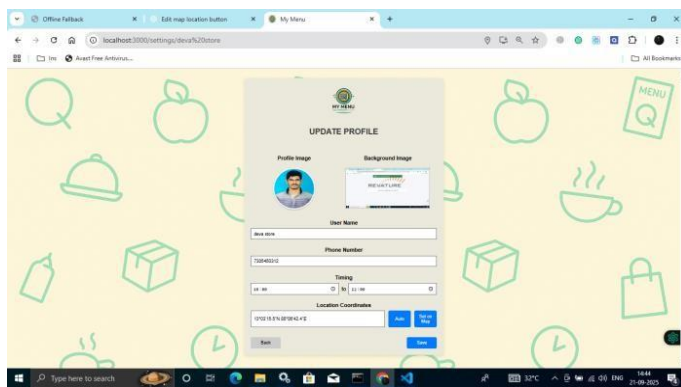


Figure 6.9: User Profile Setting Page

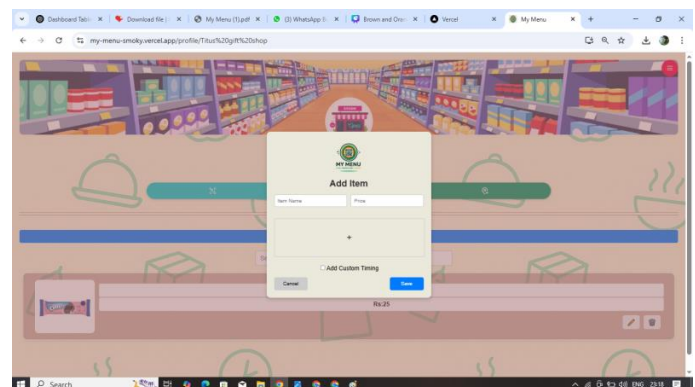


Figure 6.5: Add Item Page

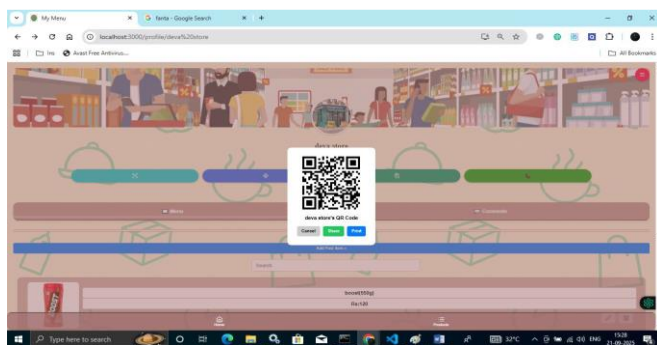


Figure 6.7: Qr Scan Page

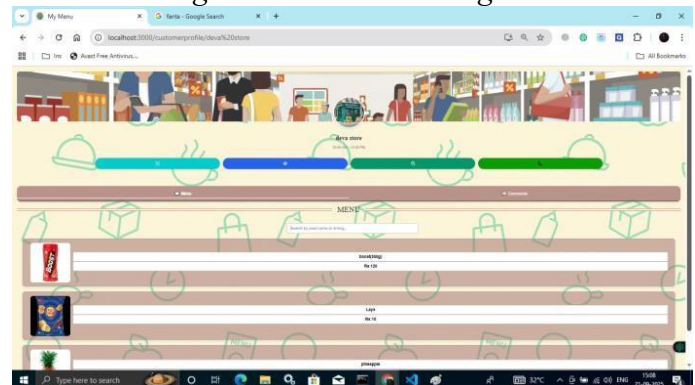


Figure 6.8: Customer Profile Page

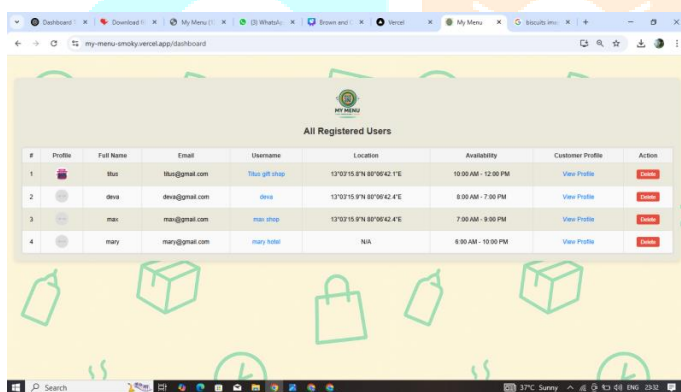


Figure 6.6: Dashboard Page

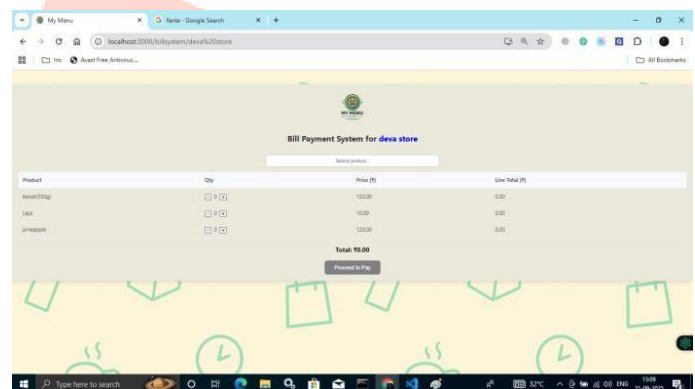


Figure 6.9: Bill Payment System Page

VII. CONCLUSION

The *My Menu – Smart QR-Based Outlet System* has successfully evolved into a comprehensive full-stack digital platform that enables businesses to efficiently manage their profiles, products, and customer interactions through a simple and accessible web interface. By leveraging QR code technology, businesses such as grocery stores, retail shops, and service outlets can provide customers with an interactive and contactless method to explore products and services using their mobile devices.

The updated system incorporates several advanced features, including **direct phone call integration**, **bill payment functionality**, and a **customer comment section**, significantly extending its functionality beyond basic digital catalogs. These enhancements allow customers to instantly communicate with businesses, complete payments conveniently, and provide feedback, thereby improving engagement and strengthening customer–business relationships.

From a technical perspective, the system adopts a **full-stack architecture using ReactJS for the frontend, Node.js with Express for backend services, and MySQL for structured data storage**. This approach ensures reliable data management, improved scalability, and better performance compared to purely client-side solutions. Additionally, the use of **ngrok for WAN access** enables secure exposure of the locally hosted server over the internet, allowing real-time access, cross-network testing, and multi-device compatibility without the need for complex hosting infrastructure.

The modular and scalable design of the system allows for future enhancements such as cloud deployment, data analytics, role-based access control, and AI-driven recommendations. Overall, the upgraded version of the **My Menu – Smart QR-Based Outlet System** successfully fulfills its objective of providing small and medium-sized businesses with an affordable, modern, and efficient digital presence. By integrating QR technology with robust backend services and real-time accessibility, the platform represents a practical and impactful step toward digital transformation in everyday commerce.

VIII. FUTURE ENHANCEMENTS

As the demand for contactless and digital solutions continues to grow across various business sectors, the “My Menu – Smart QR Outlet System” has significant potential for expansion and improvement. The following are planned future enhancements aimed at improving functionality, user experience, and scalability:

- **User Authentication with OTP/Email Verification:** To improve security and prevent unauthorized access, the system will be enhanced with mobile OTP or email-based verification during registration and login processes.
- **Dynamic Admin Dashboard:** A dedicated dashboard for outlet owners will be introduced, providing real-time analytics on menu views, customer engagement, and user location statistics. This will help businesses track trends and optimize their offerings.
- **Multilingual Interface:** To make the platform more inclusive and user-friendly for a diverse audience, support for multiple regional languages will be added for both the owner and customer views.
- **Offline Menu Access:** Future updates will include caching of menu data so that customers can still view the menu by scanning the QR code even when there is limited or no internet connectivity.
- **AI-Based Recommendations:** Machine learning algorithms can be incorporated to recommend top-selling or time-based items (e.g., breakfast, lunch, or dinner-specific highlights) based on user behavior and item popularity.
- **Mobile Application (Android/iOS):** To increase accessibility, a cross-platform mobile app version of the system will be developed using frameworks like React Native or Flutter, offering smoother navigation and native features.
- **Secure Online Payment Gateway (Optional):** If the system evolves to include ordering features, payment gateway integration will allow users to pay directly through the platform using UPI, debit/credit cards, or wallets.

IX. REFERENCE

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