

Smart Cart Companion—A Real Time Billing Assistant for Supermarkets

Mr. Suhan Pagare¹ Mr. Prasad Patil² Mr. Chinmay Aher³ Mrs. V. M. Gangurde⁴

^{1,2,3,4}Department of Computer Technology

^{1,2,3,4}MVP's Rajashri Shahu Maharaj Polytechnic, Nashik, India

Abstract — The QR-Based Android Application for Smart Shopping in Malls offers a modern solution to traditional billing inefficiencies. By enabling customers to scan product QR codes, manage a virtual cart, and generate bills instantly, the system reduces queue time, minimizes manpower, and enhances customer satisfaction. Integrated with secure payment gateways and real-time databases, it supports a fast, contactless, and efficient shopping experience.

Keywords: Smart Shopping System, QR Code Technology, Android Application, Automated Billing, Contactless Payment, Retail Digitalization

I. INTRODUCTION

The QR-Based Android Application for Smart Shopping in Malls is a mobile-driven solution designed to modernize the traditional retail experience by automating the billing process and minimizing human intervention. In conventional mall environments, customers often face long queues, manual product scanning, and delays at checkout counters, especially during peak hours or festive seasons. These issues lead to customer dissatisfaction, increased operational costs, and inefficiencies in resource management. This project addresses these challenges by enabling shoppers to scan QR codes attached to products using their smartphones, instantly retrieving item details such as name, price, and description, and adding them to a virtual cart. Once shopping is complete, the application automatically calculates the total bill and facilitates secure payment through integrated gateways like Google Pay or Paytm. Built using Android Studio with Java/Kotlin, the app incorporates QR scanning libraries (ZXing or ML Kit), Firebase for real-time database and authentication, and MySQL for backend data storage. The system also includes an admin dashboard for mall staff to manage inventory, monitor transactions, and analyze customer behavior. Designed with scalability in mind, the solution can be adapted for use in supermarkets, grocery stores, and departmental outlets with minimal changes. By reducing manpower dependency, improving billing accuracy, and enhancing customer convenience, the QR-Based Android Shopping Application supports digital transformation in retail and delivers a fast, contactless, and efficient shopping experience.

II. SYSTEM OVERVIEW

The proposed system for QR-Based Android Application for Smart Shopping in Malls is a mobile-based system that enables customers to scan product QR codes, manage a virtual cart, and generate bills instantly, eliminating the need for manual checkout. Built using Android Studio with Java/Kotlin, and integrated with Firebase and secure payment gateways, the system streamlines billing, reduces manpower, and enhances customer convenience. Its scalable design supports deployment in malls, supermarkets, and retail

outlets, promoting a fast, contactless, and efficient shopping experience.

III. LITERATURE SURVEY

- 1) The evolution of smart shopping systems has gained momentum with the integration of QR code technology and mobile applications. Mahapatra and Kumar (2021) introduced a QR code-based Android platform that simplifies the shopping process by allowing customers to scan products and generate bills automatically. Their work highlights the importance of reducing queue time and minimizing manual errors in retail environments. Similarly, Senthil and Karthik (2020) proposed a smart shopping cart using QR and IoT technologies, which automates billing and enhances customer convenience. These studies demonstrate the growing demand for contactless, efficient shopping systems that leverage mobile platforms and real-time data processing.
- 2) Further research by Singh and Sharma (2022) focused on Android-based QR scanning systems for automated billing in retail stores. Their approach emphasized real-time cart management and secure payment integration, aligning closely with the objectives of the proposed QR-Based Android Shopping Application. Das and Bhowmick (2019) explored the role of cloud technology in supporting scalable smart shopping systems, enabling seamless data synchronization and centralized product management. Kumar and Patel (2020) extended this concept by integrating IoT-enabled retail management using QR identification, which improves inventory tracking and billing accuracy. These contributions collectively validate the technical feasibility and practical benefits of QR-driven retail automation.
- 3) Hussain and Tiwari (2023) added a data analytics perspective by showcasing mobile QR applications that support smart billing and customer behavior analysis. Their work highlights how QR-based systems can generate insights into shopping patterns, helping retailers optimize operations and improve customer engagement. The proposed QR-Based Android Shopping Application builds upon these foundations by combining QR scanning, real-time cart management, secure payments, and cloud-based databases into a unified system. It addresses the limitations of manual billing, supports digital transformation in malls, and delivers a fast, scalable, and user-friendly shopping experience.

IV. OBJECTIVES

- 1) To develop an Android-based application that allows users to scan QR codes of products and automatically fetch details such as name, price, and description.
- 2) To create a virtual shopping cart where customers can add, view, or remove items in real time before checkout.

- 3) To automate the billing process by calculating the total price of all selected items and generating the final bill instantly.
- 4) To integrate secure payment options such as Google Pay or Paytm for cashless and convenient transactions.
- 5) To minimize human intervention and reduce the need for manpower at billing counters.
- 6) To reduce customer waiting time and eliminate long queues at checkout points.
- 7) To ensure data accuracy and reliability through the use of a centralized product database (Firestore/MySQL).
- 8) To promote digital transformation in retail and shopping mall operations by leveraging QR and mobile technologies.
- 9) To provide a scalable system that can be extended for supermarkets, grocery stores, and departmental outlets.

V. IMPLEMENTATION DETAILS

A. Java/Kotlin

Java and Kotlin are the primary programming languages used for developing the Android application. Java is a class-based, object-oriented language known for its portability, robustness, and security features. Kotlin, fully interoperable with Java, offers concise syntax and modern programming constructs, making it ideal for Android development. These languages enable the creation of responsive user interfaces, efficient background processing, and seamless integration with Android libraries and APIs. The application logic, including QR scanning, cart management, and billing calculations, is implemented using these languages within Android Studio.

B. Android Studio

Android Studio is the official Integrated Development Environment (IDE) for Android development. It provides a comprehensive suite of tools for designing, coding, testing, and debugging the application. Features such as real-time code analysis, layout preview, and emulator support streamline the development process. Android Studio also supports Gradle-based builds and version control integration, ensuring efficient project management and deployment.

C. Firebase

Firebase serves as the backend platform for the application, offering real-time database services, user authentication, cloud storage, and analytics. It enables seamless synchronization of product data, user sessions, and transaction records across devices. Firebase Authentication ensures secure login and user management, while Firebase Realtime Database allows instant updates to the virtual cart and billing system. Cloud Firestore or Realtime Database can be used depending on scalability needs.

D. QR Code Scanner (ZXing / ML Kit)

The application uses QR code scanning libraries such as ZXing (Zebra Crossing) or Google's ML Kit to decode product QR codes. These libraries provide fast and accurate scanning capabilities using the device's camera. Each product in the mall is tagged with a unique QR code that, when scanned, retrieves product details like name, price, and

description from the database and adds them to the virtual cart.

E. Virtual Cart and Billing Module

The virtual cart is a dynamic interface within the app that displays scanned items in real time. Users can add, remove, or modify items before checkout. The billing module calculates the total cost of all items in the cart and generates a digital bill. This module ensures accuracy and transparency in pricing, reducing the likelihood of manual errors.

F. Payment Gateway Integration

To enable cashless transactions, the application integrates with secure payment gateways such as Google Pay and Paytm. These APIs allow users to complete purchases directly from their smartphones. The integration ensures encrypted, real-time payment processing, enhancing user trust and convenience.

G. MySQL (Optional)

In addition to Firestore, MySQL may be used for structured data storage, particularly for maintaining product catalogs, user profiles, and transaction logs. It supports complex queries and relational data management, making it suitable for administrative dashboards and reporting tools used by mall management.

H. Admin Dashboard

An admin panel is developed for mall staff to manage product listings, monitor user activity, and analyze sales data. It provides tools for updating product prices, managing inventory, and viewing transaction history. This dashboard ensures smooth backend operations and supports decision-making through data insights.

VI. ADVANTAGES

- The application eliminates long queues by allowing customers to scan products and complete billing directly from their smartphones.
- It automates the billing process with high accuracy, reducing manual errors and improving transaction reliability.
- Secure cashless payments are enabled through integration with gateways like Google Pay and Paytm, enhancing convenience and safety.
- The system reduces manpower requirements at billing counters, helping retail businesses lower operational costs.
- Its scalable design allows easy adaptation for supermarkets, grocery stores, and departmental outlets, making it suitable for various retail formats

VII. APPLICATIONS

- The system can be implemented in shopping malls to automate billing and enhance customer convenience during high-traffic hours.
- It is ideal for supermarkets and grocery stores where fast, contactless checkout improves operational flow and reduces staffing needs.

- Departmental stores can use the application to streamline product scanning and enable self-service billing for customers.
- Retail chains can deploy the system across multiple outlets to maintain consistent billing accuracy and centralized inventory control.
- The application supports digital transformation in retail by integrating mobile technology, QR scanning, and secure payment systems for a modern shopping experience.

VIII. CONCLUSION

This project delivers a transformative solution for modern retail by combining mobile technology, QR code scanning, and secure digital payments into a unified shopping experience. The Android-based application empowers customers to independently scan products, manage their virtual cart, and complete transactions without relying on manual billing counters. Through real-time database integration and automated billing, the system ensures accuracy, speed, and convenience—reducing operational overhead while enhancing customer satisfaction. Its scalable architecture makes it suitable for malls, supermarkets, and departmental stores, positioning it as a forward-thinking tool for digital retail transformation. Overall, the project bridges the gap between traditional shopping and smart automation, offering a reliable, efficient, and future-ready retail solution.

REFERENCES

- [1] S. Mahapatra and R. Kumar, “QR code-based smart shopping system using Android,” *IJIRCCCE*, vol. 9, no. 3, pp. 1458–1465, 2021.
- [2] M. Senthil and B. Karthik, “Smart shopping cart with automatic billing using QR and IoT,” *IRJET*, vol. 7, no. 6, pp. 2105–2110, 2020.
- [3] P. Singh and N. Sharma, “Android-based QR scanning for automated billing in retail,” *Journal of Retail Innovation and Technology*, vol. 5, no. 1, pp. 42–49, 2022.
- [4] R. Das and S. Bhowmick, “Smart shopping system using QR and cloud,” *CICN Conference*, pp. 558–563, IEEE, 2019.
- [5] D. Kumar and S. Patel, “IoT-enabled retail management with QR identification,” *IJETER*, vol. 8, no. 11, pp. 100–105, 2020.
- [6] A. Hussain and V. Tiwari, “Mobile QR application for smart billing and analytics,” *IJCA*, vol. 185, no. 18, pp. 25–30, 2023.