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QR CODE BASED CAFETERIA FOOD ORDERING AND PAYMENT SYSTEM

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Abstract: Traditional methods of placing food orders and settling bills in restaurants often lead to confusion, errors, and unnecessary delays. To address these challenges, a QR code-based food ordering system has been proposed to streamline the ordering process. Customers can scan a QR code available at their table using a smartphone, which instantly provides access to the restaurant's menu. They can then select and customize their orders without waiting for a waiter.

This system also allows secure and convenient bill settlement directly through the customer's device, enhancing overall efficiency. The traditional approach—where waiters manually take orders using pen-and- paper or printed menus—can lead to miscommunication between staff and customers, and often requires customers to wait for service. By leveraging QR code technology, these issues can be mitigated, providing a faster, more accurate, and user-friendly ordering experience.

Moreover, the system benefits restaurant staff by enabling easy management of menus and real- time tracking of orders. Since smartphones are widely used today, implementing such a system ensures accessibility for nearly all customers. Overall, the QR code-based food ordering system offers a practical and modern solution to improve both customer satisfaction and operational efficiency in restaurants.

Keywords: QR Code Ordering System Digital Menu ESP32 Microcontroller Contactless Food Ordering Smart Cafeteria IoT-based Food Service Online Ordering System Real-time Order Management Automated Billing Customer Experience in Cafeterias Embedded Systems in Food Service Wireless Communication in Cafeterias.

I.INTRODUCTION

In recent years, nearly every industry has been moving toward digital transformation, and the restaurant sector is no exception. Traditional paper-based food ordering methods, still widely used in restaurants worldwide, involve manual processes—from checking the menu and placing orders to receiving bills. In this system, waiters take orders and relay them to the kitchen, which often leads to errors such as forgotten items or miscommunication between staff and chefs. The COVID-19 pandemic further highlighted the limitations of conventional ordering methods, as hygiene and safety became primary concerns for customers. Many patrons preferred contactless interactions to minimize the risk of infection, leading to a surge in online and digital food ordering.To address these challenges, QR code-based food ordering systems have emerged as an effective solution. By scanning a QR code provided at a table or counter, customers can access a digital menu on their smartphones or devices. This allows them to browse menu items, customize orders, and securely make payments, all without direct interaction with restaurant staff. The QR food ordering system not only simplifies the ordering process for customers but also enhances operational efficiency for restaurants. It maintains a customer database, including order history and contact information, which can be leveraged for loyalty programs and personalized offers. Real-time updates to menus, pricing, and availability can be managed easily. Orders are displayed on kitchen monitors for efficient processing, and SMS notifications inform customers about their order status, such as Order Placed, Accepted, Declined, or Delivered. Payments can be made via UPI apps or in cash, and a unique order ID ensures accurate tracking.

II.LITERATURE SURVEY

Several studies have explored the implementation of automated and digital food ordering systems to improve efficiency and customer experience in restaurants. Chavan et al. (2015) proposed a customizable online food ordering system using a web-based application. Their system enabled users to place orders with a single click via an Android application for tablet PCs. The frontend was developed using Java and Android, while MySQL was used for the backend database. The system assumed that customers would use smartphones to confirm pre-saved orders, which were then displayed on kitchen

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screens and printed as order slips for processing. This approach facilitated convenient pre-order transactions and improved order accuracy. Thakare et al. (2014) designed and implemented a digital dining system using Android technology. By leveraging customer order history, the system could make personalized recommendations, helping users quickly select their desired items. The digital menus provided detailed information, including images of dishes and preparation processes, enhancing customer decision-making and engagement. Other research has focused on integrating wireless local area networks (WLAN) and radio frequency identification (RFID) technology into electronic restaurant systems. These systems aim to streamline the order management process, reduce human error, and offer a user-friendly interface for both customers and restaurant staff. Overall, the literature indicates that automated and smart food ordering systems can significantly improve service efficiency, customer satisfaction, and operational management in modern restaurants. QR-code only / Digital-menu systems Multiple studies describe simple QR-code → web- menu implementations where customers scan a table QR and use a browser UI to place orders. These works highlight quick deployment and low cost (no app required), but often lack real-time kitchen integration and automation features. Examples include several engineering project papers and conference articles that present prototype web-menu systems and report improvements in ordering speed and reduction in physical menu costs. IRJMETS+1

III.BLOCK DIAGRAM

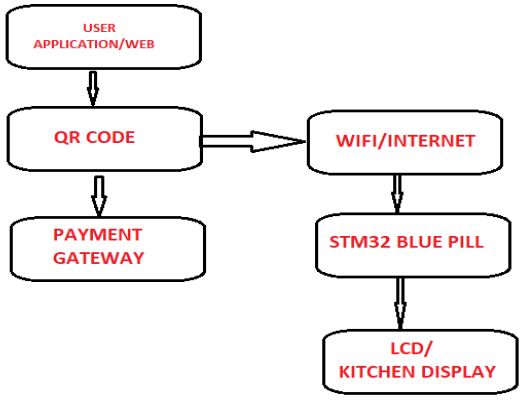

Fig : Block Diagram for Cafeteria Management System

IoT / Microcontroller (ESP-class) integrated systems

Researchers who need real-time local control (kitchen displays, buzzer alerts, waiter notifications) often use microcontrollers such as ESP8266/ESP32 to bridge the web server and local devices. ESP32 is frequently chosen for its dual-core CPU, built-in Wi-Fi/Bluetooth, and ability to host lightweight web servers or MQTT clients — enabling lower latency order delivery, direct notifications to kitchen displays, and simple hardware interfacing (LCDs, buzzers, thermal printers). Prototypes and papers have demonstrated ESP32-based waiter alert systems and smart restaurant modules that forward scanned QR orders to local receivers. These solutions improve responsiveness compared to purely cloud-only architectures. ResearchGate+1

Summary of Workflow:

The Cafeteria Food Ordering System using QR Code works through a simple and efficient process. Each table has a unique QR code that, when scanned by a customer, opens a digital menu on their smartphone. The customer selects food items and places the order online. The order details are sent to the ESP32 microcontroller, which connects via Wi-Fi to the kitchen display or server. The kitchen staff receives the order instantly, prepares the food, and updates the order status. The system also supports online billing and payment. Administrators can update the menu, view sales reports, and manage customer feedback. Overall, this workflow ensures contactless, quick, and accurate food ordering with real-time ESP32-based communication between the customer and kitchen.

METHODOLOGY

The proposed Cafeteria Food Ordering System using QR Code follows a structured methodology to design, implement, and test the complete system. The methodology consists of the following key stages:

1. System Design :

The overall system architecture is designed to connect customers, the web interface, and the kitchen through a common network and ending with sound output, all orchestrated by the Arduino Uno microcontroller.

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1. QR Code Generation QR codes containing table IDs and URLs are generated using online or software-based tools and placed on cafeteria tables for customer access.
2. Front-End Development A user-friendly web interface is developed using HTML, CSS, and JavaScript. It displays the menu, item details, and total billing. The interface allows customers to select food items and place orders online.
3. Back-End and Database A server-side script (such as PHP, Firebase, or Node MCU-based server) handles incoming orders, stores data in a database (MySQL or Firebase), and communicates with the ESP32 microcontroller.
4. ESP32 Integration the ESP32 acts as the central controller. It connects to Wi-Fi, receives order details from the web server, and sends them to the kitchen display or printer. It ensures real-time updates of order status and communication between modules.
5. Order Display and Notification The received orders are displayed on an LCD or monitor in the kitchen. The ESP32 can also trigger buzzers or LEDs to alert staff of new orders.
6. Testing and Evaluation The complete system is tested for functionality, response time, order accuracy, and user satisfaction. Performance parameters like order transmission delay and Wi-Fi stability are evaluated.

IV.SOFTWARE IMPLIMENTATION

The software implementation includes three key layers — frontend web application, back- end database and APIs, and embedded firmware.

Frontend Development

The web-based frontend is developed using HTML, CSS, and JavaScript frameworks. It is hosted on Vercel, a cloud deployment platform that supports serverless hosting for websites and APIs. The web interface provides a user-friendly digital menu, enabling customers to browse available food items, view prices, and add them to the cart.

Backend Development

The backend logic relies on Firebase Realtime Database, which provides JSON- based hierarchical storage. Firebase automatically synchronizes updates with all connected clients, ensuring real-time data flow between the user interface and the ESP32 kitchen display.

Embedded Firmware

The ESP32 firmware is developed in Embedded C using the Arduino IDE.

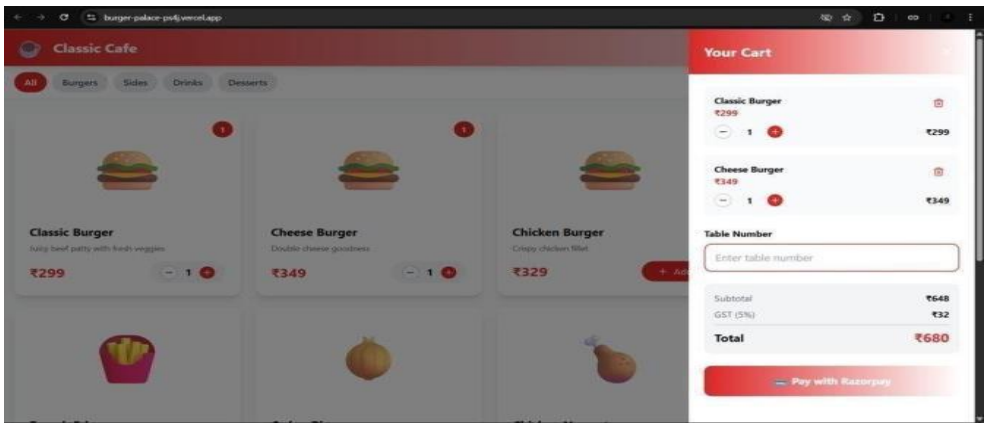

Figure: Cart and checkout interface showing total price

V.APPLICATION

The Cafeteria Food Ordering System using QR Code can be implemented in various environments to improve efficiency, accuracy, and customer satisfaction. Its versatility makes it suitable for both small and large-scale food service operations. Key applications include:

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Educational Institutions

Use case: College and school cafeterias can place QR codes on tables.

Benefits: Reduces long queues during peak hours, minimizes manual errors, and allows students and staff to browse menus digitally. It also helps administration track popular items and manage inventory efficiently.

Corporate Offices

Use case: Office canteens and corporate cafeterias.

Benefits: Enables employees to place orders before reaching the cafeteria, reducing waiting time. Digital records help management analyze consumption patterns, optimize stock, and streamline payment processes.

Educational Institutions: Fast and contactless cafeteria service in schools and colleges.

Corporate Offices: Quick employee meal ordering and reduced waiting time.

VI.RESULT & CONCLUSION

The survey of Cafeteria Food Ordering Systems using QR Code highlights the significant advantages of integrating digital technology.

with traditional food services. QR-based ordering improves speed, accuracy, and customer satisfaction while reducing manual effort for cafeteria staff. The integration of ESP32 microcontrollers enables real-time order management, kitchen display updates, and seamless communication between the user interface and backend systems.

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