

Smart QR-based Restaurant Dine-in System with Sales Analysis

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Abstract. The modern-day customer has new priorities when it comes to dine-out and the top of them is safety. Most of the restaurant's meal orders rely on the interaction with waiters to place orders into the kitchen. Due to the pandemic situation, there happens to be discomfort interacting with waiters and other staff members of the restaurant. To solve such problems this system is developed. This system covers the whole order process of a restaurant including the interaction between the customer, the waiter, the kitchen, and the cashier through a web application. Additionally, restaurant owners will be able to enhance sales by using this system to analyze data gathered. This system will attempt to replace the traditional manual ordering process. A better user experience that includes food recommendations can indirectly boost customer loyalty to the restaurant. It is a complete product for managing restaurant services with minimal human interaction while providing maximum contactless service.

1 Introduction

Almost every industry is embracing the road to digital transformation and the restaurant sector is no exception. Despite it being classified as an essential business and continuing to reach out to its customers in one way or the other, it incurred heavy losses. The traditional paper based ordering method is being used in most of the restaurants worldwide. In this system the whole process of checking the menu, ordering food to bill receipt is done using paper. Here, the waiter takes the order from the customer and forwards it to the kitchen. There are a lot of problems associated with this system. The most common stumble is that waiters may make mistakes with customers' orders. At times, a waiter may forget to add a specific item ordered by the customers and make changes and forget to give the updated order to the kitchen. It is extremely important for the waiters to rely on the chefs to inform them whether the food is ready or not. The restaurant business has been adversely affected because of the covid pandemic. Hygiene and safety is the prime concern of consumers when they think of moving out to dine. People are afraid of catching the virus in public places and thus, order everything online. This has immensely affected the footfall that a restaurant receives and eventually their sales. Due to the covid norms imposed by the government, the restaurants have to reduce their opening hours and capacity. Many restaurants are using printed laminated paper menus. Since printed menus are one of the most touch surfaces in any restaurant as they go through different hands. They require constant sanitation and also such menus are harmful to the environment. The designed system will help the restaurants to overcome such consequences by means of having a digital menu which is an essential part of contactless dining. This

system aims to automate the entire traditional paper-based menu ordering to a digital and smart ordering system using the QR code. The digital ordering system enables the user to register and log in followed by ordering food and viewing the status of their order. Digital menus can be equipped with recommended and top-selling dishes based on past orders and restaurant suggestions. They can easily add items to their order and pay online. Order details are also forwarded to their registered WhatsApp number. They can also access their previous orders in the restaurant. The manager can view all the orders and the table number from where the order is placed with the customer's details. Any new incoming order will be notified to the chef where he can accept the order and start with his preparation. The manager can also view the payment status. Manager can also see the real-time data of sales and orders. The sales data is graphically visualized to give better insight to the restaurant owner. Also during rush hours the load on the waiters and the chefs will be reduced, and restaurants will perform better than usual and also the human error that occurs when performing tasks manually is also minimized and the presence of queues in the system to accept orders and assign tasks to chefs can reduce congestion in the kitchen. This can be used for better service and planning. This system thereby reduces the manpower and eases the systematic operation of the restaurant.

2 Motivation

The motivation for the project comes from the fact that, although there are multiple types of management systems available, they do not follow contact-less dining practices, which is a necessity today. Restaurant dining is unsafe unless we follow contactless practices. In light of the current social conditions, having in-contact dining practices

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becomes a concern and a threat. To provide a healthier and safer digital restaurant environment in the upcoming days of a better world, our project is taking measures. Developed under a highly efficient digital platform with a visually understandable user interface and application that captures accurate data and generates efficient reports for restaurant management, the solutions combine all the modules necessary to manage a restaurant under one roof.

3 Literature Survey

As technology advanced, a variety of new systems were developed to automate the ordering process. A familiar system which was implemented in various restaurants was a Bluetooth based ordering system where the peripheral interface controller consists of a keypad which acts as a remote control and is placed on the customers table connected to a monitor placed in the kitchen using a Bluetooth module [6]. The Microcontroller will transmit the data via Bluetooth transmitter which will be processed and displayed on the monitor [11]. This system was improved by replacing the PIC board with a touch screen panel and transmitting the data through a Wifi module [7]. Speech recognition technology were also added to place the order using speech commands [15]. Since touch screen devices are currently in vogue, it did not take long for tablet-based menus to make an appearance on the market. Each table will be equipped with a touch screen tablet with an android application installed [10]. A smart menu will be available, and customers can order food by selecting the dish they want and placing the order [9]. A chef's interface will display the placed order, and the order will be marked as completed once it has been prepared [4]. It is possible for the manager to view orders and make changes to the menu at any time [1]. Customers can make their payments in cash or by swiping a credit or debit card after the order process [12]. In addition to checking and verifying the current status of orders, the admin can also check if the payments have been received [8]. The system allows customers to provide real-time feedback at the end of the meal [5]. The recommendation system were also added which focuses on customer reviews and location to provide personalized recommendations to customers [14].Based on previous orders, the Recommendation algorithm suggests dishes to the customers so that they can build his or her order and easily view the most popular dishes [13]. An android application was made available on the Play Store in order to reduce device costs [2]. In order to further improve the system, offers on food and bill payment have been added [3] .

4 Problem Statement

It was recognized that the management system of a restaurant is still being manually operated by waiters and managers and is not automated yet. Due to the covid situation, interacting with restaurant personnel has created discomfort. It is found that transmission of viruses is higher when people interact in a closed environment. Also, most

staff and customers wear face masks which muffle conversation, the chance of miscommunication, misordering, or misinterpretation when receiving orders is greater. It is also a problem that customers have to wait until the waiter responds to them. There are constraints on updating available dishes due to printed menu cards. Customers need to ask the waiter if a particular dish is available or not. Customer has to toil for improvising the dish according to his taste in a crowded quarter. Poor customer service on holidays and weekends when the number of customers increases. This project aims to provide a full-featured system that includes order and payment integration, rather than a menu-only solution.

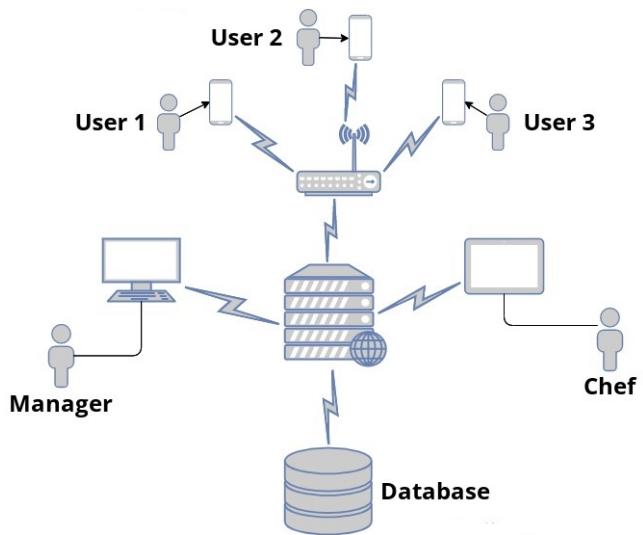


Figure 1. Proposed system architecture

5 Proposed system

The proposed system automates all aspects of the dining experience. The restaurant follows a contact-less dining norm by reducing the human contact in terms of waiters at service to a great extent with the customers. The QR Code on each table redirects the user to the UI of the system with the specific table number. The graphical interface allows registered users to order food and pay bills using their smartphones. The user can also view their past orders, their feedback and ratings, and favorite food items. A confirmation of the order is sent to the customer's registered Whatsapp number after the order is placed. Chefs are notified when new orders arrive. System access is restricted to each department. Data about sales can be analyzed for purposes such as tracking the most popular products, new customer counts, and revenue stats for daily or monthly periods. Restaurant managers can edit the menu items of their restaurant as required and can manage users as well. A daily and monthly report of sales data and user data can be generated and downloaded in CSV and PDF formats. Proposed system includes following modules:

1. Customer Modules

2. Manager Modules

3. Chef Modules

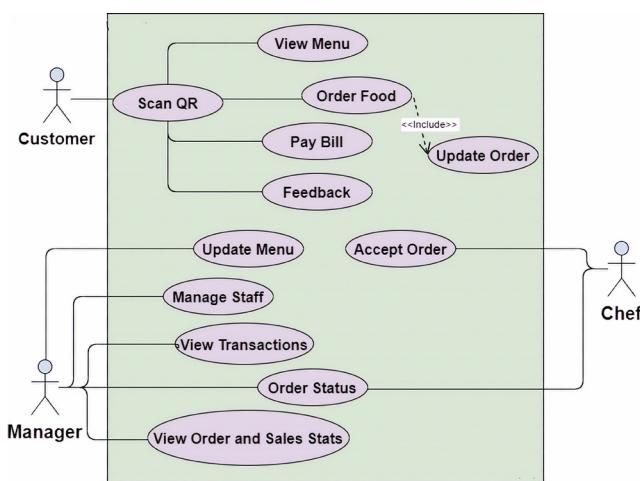


Figure 2. Use Case Diagram

6 Detailed Description of System

Customer modules

The application provides all the modules the customer needs when they visit the restaurant, such as viewing the digital menu, placing an order, and paying online.

Customer modules contains the following:

- **Scanning module:** This is the first module when a customer is starting with the process. When the customer arrives at the restaurant, he scans the QR code on the table which redirects him to the restaurant's website to continue. The QR code contains a unique table ID on top of a URL that will be stored for later process.
- **Login/ Registration module:** In this module, customers are required to log in to the website if they are already registered, using their unique username. New customers must complete the registration process before logging in. The customer must select the number of people with him and continue with the process after logging in.
- **Menu display module:** Customers can view the current menu of the restaurant using this module. In addition to the different categories of dishes, the top selling and recommended dishes are also displayed so they can see what is popular. The product image is included, along with the product name, price, and some description.
- **Cart module:** The customer's cart gets automatically updated as soon as an item is added, showing the subtotal as well as the order quantity. Customers can edit their cart at any time before they place an order. To prevent data loss, items in the cart are also stored in the session. When an order is placed, customers can add additional items and update their orders before making a payment.

- **View previous orders module:** This module allows customers to view past orders in detail, including total prices, payment IDs, and the date of each order.

• **Payment module:** In this module, as soon as a customer clicks on the 'PAY' button, he can view his final bill and proceed with payment. The payment module is integrated with the testmojo API, which provides a secure payment gateway. After completing the payment process, the customer can either order again or end his session followed by a feedback.

• **Feedback Module:** In this module, customers can evaluate each dish, comment on the ordering process, and suggest improvements to the restaurant's hospitality.

• **Notification module:** A notification will be sent by WhatsApp with order details upon placing an order. After successful completion of payment, customers will receive a notification with the amount received for an order ID. Payment receipts are also sent by testmojo API to their registered email address.

Manager modules

This includes all the features a manager needs to manage a restaurant. This includes analysis of orders, product management, order and sales management.

Various modules included here are:

- **Analysis module:** This module provides a variety of data visualizations to the restaurant manager including bar graphs, line graphs, and pie graphs. The module also gives customer and product statistics as well as order information and daily and monthly revenue estimates.
- **Product management module:** Managers can perform CRUD operations on products, such as adding categories, adding new products based on categories, updating the current products, and deleting them. Furthermore, they can manage the current date's menu, based on its availability.
- **Sales module:** Managers can get all the details of a product's sales with this module. It contains the details such as product details, customer ID, quantity ordered, order ID and date of order. Incoming orders are notified by beep sound to the manager and a record of the seen/unseen status of each order is maintained.
- **Bill history module:** This module allows the manager to view all billing information, including past orders, and delete them. It provides additional information such as total price, payment status, and payment ID for each order.
- **Report module:** This module helps the manager to download the report of sales, orders and customers in various formats like PDF and CSV.

Chef Modules

It includes modules which help the chef to view the incoming orders in a detailed manner and update the status of each order.

Modules included here are:

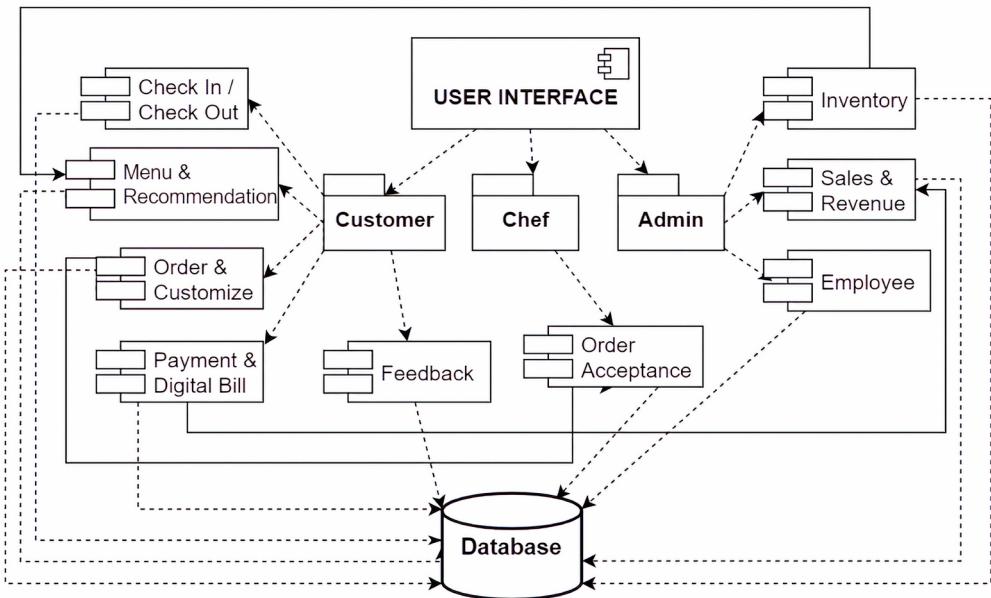


Figure 3. Detailed design of system

- View orders module:** It allows the chef to be notified with a beep sound of when an order is coming in. The chef can then view a detailed list of what is in each order along with the quantity.
- Update Status module:** This module allows the chef to update each order's status to 'Accepted', 'In Progress', or 'Rejected'.

7 Outcome and Results

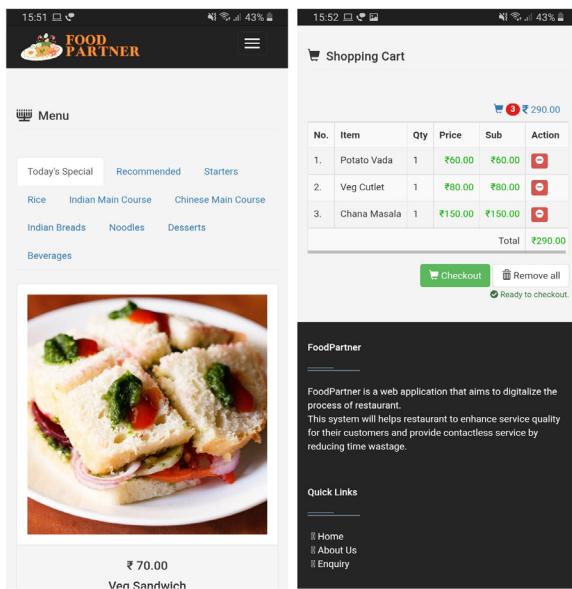


Figure 4. Smart Menu and cart view

The customer lands on the index page as shown in Fig. 4, after scanning the QR code placed on the table where

he can see the menu, including today's special, recommended dishes, and various dishes sorted by category. On this page, the customer can view each dish details and put them in the cart.

The order is sent to the chef for confirmation, and the customer is notified after confirmation. The customer then reviews the final bill and makes payment. Upon completing the payment part, the customer receives a notification on their registered WhatsApp number, after which they can then submit their feedback.

In the Manager dashboard, the manager can see various analysis data, such as the number of customers present and revenues today. They are notified of any incoming orders, and they can view all sales data including past orders. They can also download these data as PDFs or CSVs. This dashboard is built using technologies like PHP and various data visualization libraries, including CanvaJs and HighCharts Js.

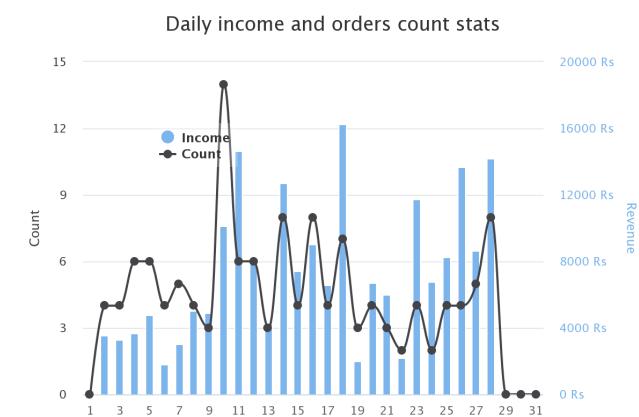


Figure 5. Daily Revenue and order count

Manager dashboard includes various graph based on sales data like date-wise/monthly revenue is shown with a bar chart, the orders count is shown with a line graph, the new-customers ratio and top-selling products are shown with a pie chart, and the current date order details are shown with a bubble graph. This dashboard is built using technologies like PHP and various data visualization libraries, including CanvaJs and HighCharts Js.

An example of this is seen in Fig. 5, where the bar graph shows the revenue generated on a daily basis and the line graph shows the order count on that day. This information allows the manager to analyze revenue generation and the frequency of orders being placed in the restaurant.

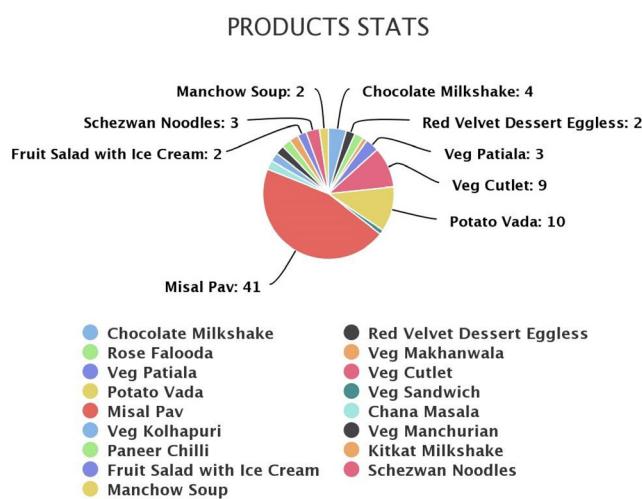


Figure 6. Product Stats

The pie chart in Fig. 6 shows the sales of dishes in the restaurant in real time. This information helps the restaurant manager to identify the most popular dishes for customers to order. Manager can also view this in full screen mode and even download it in form of report.

Manager can also see the count of new customer coming to restaurant on that specific day. Also the manager can view the order details of specific day.

CustomerID	OrderID	Table No.	Payment Status	Action
#33	#115	7	Pending	<input type="button" value="Q view Bill"/> <input type="button" value="Delete"/>
#33	#113	3	✓MOJO2127305A01973666	<input type="button" value="Q view Bill"/> <input type="button" value="Delete"/>
#33	#112	3	✓MOJO2127505A01973664	<input type="button" value="Q view Bill"/> <input type="button" value="Delete"/>
#33	#109	3	✓MOJO2126L05A76564725	<input type="button" value="Q view Bill"/> <input type="button" value="Delete"/>
#39	#106	2	✓MOJO2125905A11774310	<input type="button" value="Q view Bill"/> <input type="button" value="Delete"/>
#33	#105	4	✓MOJO2125605A11774200	<input type="button" value="Q view Bill"/> <input type="button" value="Delete"/>
#33	#104	4	✓MOJO2125G05A11774199	<input type="button" value="Q view Bill"/> <input type="button" value="Delete"/>

Figure 7. Bill History view

Fig. 7 represents the bill history where all the order details are present along with its payment status. Manager

can view each detail order, can also delete them if they want and can also download these data as reports in PDF and CSV format.

8 Conclusion

The proposed system provides an easy, convenient, and low-cost method for ordering meals with a contactless dining experience. By encouraging no-contact interaction and personal hygiene, restaurants can lower their risk of transmitting viruses. As a result, diners who find that hygiene and safety standards are satisfactory are more likely to become repeat diners. Such repeat diners promote restaurants for their value to customers, ultimately improving the goodwill of the restaurant. Furthermore, contactless dining helps improve order accuracy, preventing miscommunication between staff and diners. This allows diners to focus on food, ambiance, and service. Machine learning can be applied to gathered data to make food recommendations and boost restaurant revenue. In the restaurant business, data analysis is essential for increasing income and sales. During rush hours, the restaurant load would be balanced effectively, and customer service would be better than usual. By including reservation and take-away features, restaurants can improve even further. Thus, investing in a contactless dining solution will not only provide a safer dining experience in the short term but also position the restaurant to meet changing consumer behavior in the future.

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