

# Canteen Automation System

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**Abstract**—In today's fast-paced world, efficient management of canteens has become crucial to meet the demands for quick service and enhanced user experiences. Traditional manual systems are often plagued by long queues, and a lack of data-driven insights. To address these challenges, we propose a Canteen Automation System that uses mobile technology to streamline operations and provide a friction-less experience for both customers and canteen staff. This system enables users to register online, browse menu, and place orders through a dedicated Android application. It offers advantages such as automated ordering, detailed order summaries, reduced paperwork, and time efficiency. With distinct logins for students, teachers, canteen staff, and administrators, the system provides tailored functionalities to each stakeholder. Additionally, personalized recommendations based on users' order history enhance the overall user experience. In this paper, we present the design and implementation of the Canteen Automation System, outlining its key features and functionalities. We also discuss the benefits it offers to canteen operations and user satisfaction. Furthermore, we explore the potential for future enhancements and research opportunities in the realm of automated food service systems.

**Index Terms**—Canteen automation, Online food ordering, Mobile technology, Automated ordering, Personalized recommendations

## I. INTRODUCTION

Canteens and food service establishments play a vital role in satisfying hunger needs of students, faculty, and staff in educational institutions. Long queues, inefficient seating arrangements, and manual transaction systems often result in chaos and dissatisfaction among customers, especially during peak hours. Recognizing these challenges, there is a growing need for innovative solutions to streamline canteen operations and enhance user experiences.

To address these issues, we propose the development of a Canteen Automation System—an integrated solution leveraging computerized equipment and mobile technology to automate and optimize various aspects of canteen management. This system aims to eliminate bottlenecks, reduce human errors, and provide a seamless experience for both customers and canteen staff. Key features such as personalized recommendations, detailed order summaries, analysis of sales further

contribute to improving the overall user experience. Moreover, the system offers distinct logins for users, canteen staff, and administrators, each tailored to meet their specific needs and responsibilities.

In this paper, we provide an overview of the design and implementation of the Canteen Automation System, highlighting its functionalities and benefits for stakeholders. Additionally, we discuss potential avenues for future enhancements and research opportunities in the field of automated food service systems, emphasizing the importance of continuous innovation in meeting the evolving demands of canteen management

## II. EXISTING SYSTEM

The current canteen automation system suffers from inefficiencies such as long queues due to token-based authentication and static online ordering. Lack of priority access for staff, delivery-to-cabin facilities, and after-service support further hinder user experience. Moreover, the absence of a wallet system and AI integration limits transaction efficiency and personalized recommendations. These deficiencies highlight the pressing need for comprehensive enhancements to elevate functionality and improve user satisfaction within the canteen environment.

- 1) **Ordering System:** The current ordering system relies on token-based authentication and cash transactions, leading to long queues and waiting lines, which negatively impact the user experience.
- 2) **Online System:** Although there is an online system available, it is hosted on a static website or app without dynamic features such as order status updates or waiting time notifications, resulting in a subpar customer experience.
- 3) **Menu Management:** The menu is not regularly updated to reflect inventory changes, daily specials, or offers, further detracting from the overall appeal of the canteen.
- 4) **No Priority for Staff and Teachers:** There is no provision for staff and teachers to have priority access

or a separate ordering method, causing inefficiencies and frustration during peak times.

- 5) **Lack of Delivered-to-Cabin Facility:** The absence of a system allowing teachers and staff to order food directly to their labs or offices diminishes convenience and adds unnecessary complexity to the process.
- 6) **After-Service Lacking:** There is currently no mechanism in place to prompt staff to return utensils or clean up after consuming food in their cabins or labs, leading to potential hygiene issues and clutter.
- 7) **No Wallet System:** Customers are required to make online transfers through third-party apps for every transaction, resulting in inconvenience and slower order processing times.
- 8) **Lack of use of AI:** No system currently gathers user data based on their order history and gives results or preferences for the users to order their food.

In conclusion, the existing canteen automation system exhibits numerous deficiencies, ranging from inefficient ordering processes and outdated menu management to a lack of priority access for staff and teachers. Moreover, essential features such as delivery to cabins and after-service support are notably absent. These shortcomings not only hinder user convenience and satisfaction but also pose challenges to the overall efficiency and hygiene standards of the canteen operation. Thus, there is a clear imperative to address these issues and implement robust solutions to enhance the system's functionality and user experience.

### III. MOTIVATION

Our motivation for conducting this research stems from the critical need to address the numerous deficiencies present in the existing canteen automation system. The identified shortcomings, including inefficient ordering processes, outdated menu management, and the absence of essential features such as priority access for staff and teachers, highlight significant gaps in the system's functionality and user experience. Moreover, the lack of delivery to cabins and after-service support further exacerbates these challenges, impacting both user convenience and the overall efficiency of the canteen operation.

By addressing these issues through innovative solutions and robust system enhancements, our research aims to not only improve the functionality and usability of the canteen automation system but also enhance user satisfaction and hygiene standards. Through this endeavor, we aspire to contribute to the advancement of canteen automation technology, ultimately benefiting both users and canteen operators alike.

### IV. LITERATURE SURVEY

[1] This paper entitled "Canteen Automation System Using Android" provides an application for ordering food items online, it makes the ordering process much easier for both customers and canteen staff and it saves a lot of time.

[2] The research provides a way to properly manage the canteen's resources and thus manage the overall load of the

system. In a heavy-load situation, this kind of a managed system would lead to better accessibility of the system for the consumers as well as the better utilization of the canteen's resources by the organization.

[3] In the research conducted by Monik Shah, Shalin Shah, Mohd Danish Shaikh and Kaustubh Tiwari, it enables the end users to register online, read and select the food from e-menu card and order food online by just selecting the food that the user want to have using android application.

[4] This research paper proposes a time saving and easy-to-use application which helps to manage a vast and unorganized crowd. Users are able to place orders online and track the current status of all orders.

[5] It provides a Web interface to the admin to create and modify the menu for its respective organization and an application to the consumers for placing the order online without having to stand in long queues and before reaching the food counter saving time. In addition to this the chef can keep track of orders and improve the menu based on user preferences.

[6] The research entitled "CANTEEN AUTOMATION SYSTEM" proposes a website, user can log in to the web site and choose the order and place it when confirmation and proceed towards creating payment. We have used JavaScript, React, HTML, Django, CSS, MongoDB, and the xampp platform for the implementation of the project.

[7] This paper proposes a project which aims to replace the existing manual canteen management system with a computerized one, using readily available hardware and software. This Android-based Canteen Automation System promises several benefits: reduced errors, increased security, faster transactions, and improved data management. By automating tasks and eliminating redundant entries, it frees up resources, allowing staff to focus on other important activities and improving overall efficiency. Ultimately, this system seeks to enhance performance and deliver better services to clients.

[8] This research proposes a time-saving Android app. Users order directly, skipping server calls. The app replaces risky paperwork with a digital platform, simplifying management and reducing data loss. By integrating internet technology gradually, users and staff of varying tech-experience can benefit. Order via the app, and staff see it instantly on a linked web app. This Android-web system offers improved efficiency and convenience for diverse organizations.

[9] This research tackles long queues by proposing an automated online system built with Python, HTML, and Django. Replacing long lines with a website and database, users simply log in, choose their food, confirm, and pay. This web-based solution promises faster service and hassle-free ordering for customers, while simplifying management and reducing errors for cafeterias.

[10] This system lets users skip the queue, browse the menu, choose their food, and pay securely through UPI – all from their phone! This real-time app ensures orders are ready when you arrive, offering you the flexibility to schedule pick-up

times. Plus, unique logins for students and faculty provide a secure and personalized experience.

[11] This research proposes an app which allows customers to order food quickly on their phones, saving time for busy schedules. It replaces manual ordering with a secure mobile system, streamlining operations and protecting privacy. Customers browse, choose, and pay within the app, while chefs see orders instantly for faster preparation.

[12] The research entitled "Canteen Automation System Using Android" provides an app that lets customers browse, choose, and pay for food instantly on their phones. Real-time menus, dynamic pricing, and secure checkout make ordering a breeze. For staff, the app displays orders clearly, reducing errors and speeding up service.

[13] This project proposes an Android app for college students to order food online. Skip the line, browse the menu, select your meal, and confirm with a one-time password. No cashiers needed - the app automatically deducts payment, saving you time and hassle.

[14] This research proposes a new app for students and faculty. Order and pay securely through the app via e-wallet or UPI, skipping the queue. No more late dashes to class - your order awaits! Enjoy a convenient, safe, and hassle-free way to grab lunch on the go.

[15] This research tackles them with an automated system! Users order ahead through an app, skipping lines and freeing up time. Secure e-wallets eliminate cash handling hassles, and strong encryption safeguards data. Designed for administrators, the system efficiently manages meal details, reducing workload and boosting productivity.

## V. METHODOLOGY

In this study, we propose a comprehensive methodology to design, develop, and evaluate a canteen automation system aimed at improving the efficiency and convenience of canteen operations. Firstly, we conducted a thorough analysis of existing manual canteen processes to identify inefficiencies and pain points. Based on this analysis, we defined the requirements for the automation system, including functionalities such as order management, inventory tracking, payment processing, and user authentication.

Subsequently, we employed an iterative development approach, leveraging modern software engineering practices such as Agile methodology to iteratively design, implement, and test system components. Throughout the development phase, we actively sought feedback from canteen staff and users to ensure that the system meets their needs and expectations. Finally, we conducted user acceptance testing to gauge user satisfaction and identify areas for further improvement.

- 1) **Analysis of Manual Processes:** Conducted a comprehensive analysis of existing manual canteen processes. Identified inefficiencies and pain points to inform system requirements.
- 2) **Requirements Definition:** Defined system requirements based on the analysis findings. Identified key function-

alities including order management, inventory tracking, payment processing, and user authentication.

- 3) **Iterative Development Approach:** Employed an iterative development approach using Agile methodology. Designed, implemented, and tested system components iteratively to ensure continuous improvement.
- 4) **Stakeholder Feedback Integration:** Actively sought feedback from canteen staff and users during the development phase. Incorporated feedback to tailor the system to meet user needs and expectations.
- 5) **User Acceptance Testing:** Conducted user acceptance testing to gauge user satisfaction. Identified areas for further improvement based on user feedback. The methodology outlined in this paper provides a structured approach for the successful implementation of a canteen automation system, with the potential to revolutionize canteen operations in various settings.

## VI. PROPOSED SYSTEM

The proposed Canteen Automation System represents a comprehensive solution to address the challenges faced by traditional manual canteen management systems within educational institutions. Leveraging the latest advancements in digital technology, the system aims to streamline canteen operations, enhance user experiences, and optimize resource utilization. At the core of the system is a user-friendly Android application that facilitates online registration, menu browsing, and order placement for students and faculty.

One of the key features of the proposed system is its ability to provide personalized recommendations to users based on their order history. By analyzing past preferences and consumption patterns, the system offers tailored suggestions to users, thereby enhancing their overall dining experience. Additionally, the system offers detailed order summaries and order history tracking functionalities, providing transparency and accountability in transactions.

For canteen staff, the proposed system offers streamlined workflows and efficient task management tools. Cooking staff can easily view incoming orders, update order statuses, and prioritize tasks through a centralized platform. Moreover, the system facilitates the addition of new food items, ensuring that cooking staff have access to accurate information at all times. By automating various aspects of food preparation and order management, the system enables cooking staff to focus on delivering high-quality food in a timely manner. Administrators benefit from the proposed system through its advanced analytics capabilities and comprehensive management tools.

Administrators can create and update menus, track sales and revenue trends, and forecast demand for specific items during different hours of the day. By centralizing data and providing actionable insights, the proposed system empowers administrators to make informed decisions that optimize resource allocation and enhance overall performance.

- 1) **Implementation of AI :** Giving personalised recommendation to users based on their order history.

- 2) **User-Friendly Interface:** Design an intuitive and user-friendly interface for students, teacher and canteen staff. Ensure the system is accessible on various devices, such as computers, tablets, and smartphones.
- 3) **Mobile App:** Mobile app is developed that allows users to access the system from anywhere on the campus. Features like menu browsing, ordering, and payment options in the app are included.
- 4) **Preordering:** Pre-ordering system is implemented that allows users to place orders in advance. An order status is provided for users to pick up their orders according to status.
- 5) **Easy Payments:** Support various payment methods, including contactless payments through UPIs or Cards.
- 6) **Priority for Teachers and Staffs:** Teachers and Staff can get priority while ordering food. Canteen staff can deliver the food to the Teacher's cabin and take away the utensils afterward.
- 7) **Menu Customization:** Allow users to customize their orders based on dietary preferences or restrictions. Highlight healthy and popular menu choices.
- 8) **Feedback and Ratings:** Include a feedback system for users to rate and review their dining experiences. Use this feedback to make improvements and adjustments.
- 9) **Data Analytics:** Analytics tools are implemented to gather insights into user preferences, popular items, and peak hours.
- 10) **Sustainability Initiatives:** Features are incorporated that promote sustainability, such as digital receipts.

## VII. WORKING

### A. For Students and teachers:

The Canteen Automation System offers students a seamless and convenient way to access food services within educational institutions. Through a dedicated Android application, students can register online, browse an electronic menu, and place orders with ease.

The system provides personalized recommendations based on each student's order history, enhancing the overall dining experience. Detailed order summaries ensure transparency and accuracy in transactions, while the option to view order history allows students to track their consumption patterns.

Teachers have the option whether they want their food in the lab/cabin or they will take it from the canteen. By leveraging technology to streamline the ordering process, the Canteen Automation System aims to reduce waiting times and improve satisfaction levels among students.

Detailed order summaries ensure transparency and accuracy in transactions, while access to order history empowers students to monitor their consumption patterns over time. Furthermore, teachers are afforded the flexibility to choose whether to have their meals delivered to their lab/cabin or opt for pickup from the canteen. The flow diagram for the above process is as followed:

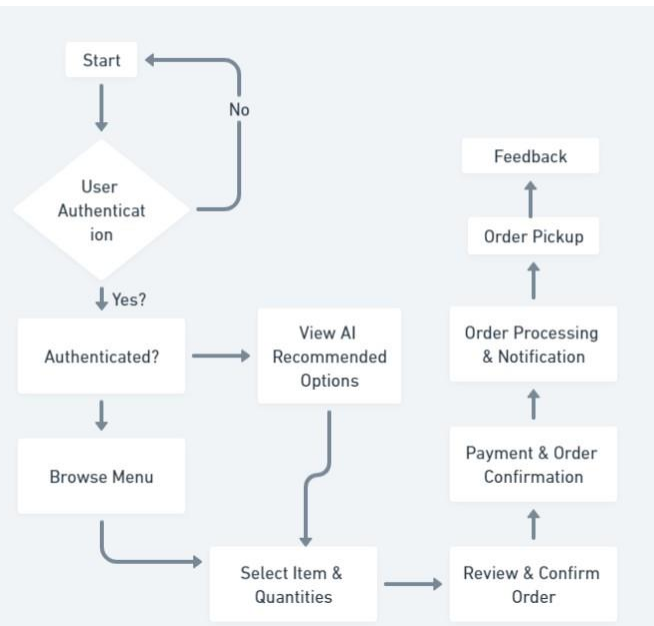


Fig. 1. Flow diagram for Students

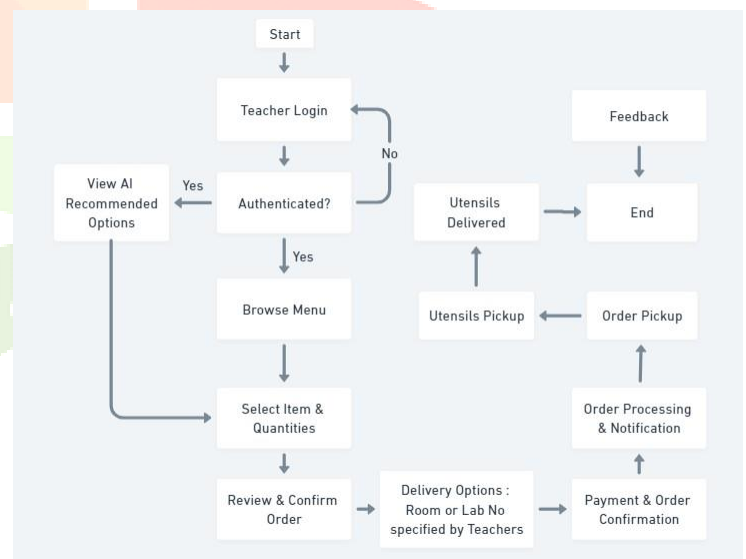


Fig. 2. Flow diagram for Teachers

### B. For Administrator:

Administrators benefit from the Canteen Automation System through its comprehensive set of features for managing canteen operations. The system provides administrators with tools for creating and updating menus, as well as modifying item details and categories as needed. Through advanced analytics capabilities, administrators can generate sales reports, track revenue trends, and forecast demand for specific items during different hours of the day. By centralizing data and providing actionable insights, the Canteen Automation System empowers administrators to make informed decisions that optimize resource allocation and enhance overall performance.

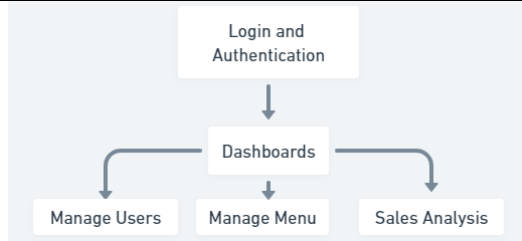
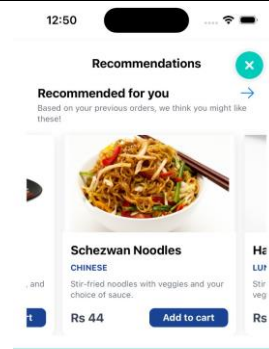


Fig. 3. Flow diagram for Admin



C. For Cooking Staffs:

The Canteen Automation System simplifies the tasks of cooking staff by automating various aspects of food preparation and order management. Through the system, cooking staff can access a centralized platform to view incoming orders and update order statuses in real-time. The system provides detailed information about each order, including item descriptions, quantities, allowing cooking staff to prioritize tasks efficiently. Additionally, the system offers features for adding new food items. By streamlining communication and eliminating manual errors, the Canteen Automation System enables cooking staff to focus on delivering high-quality food in a timely manner, thereby enhancing overall operational efficiency.

VIII. IMPLEMENTATION

A. For Students

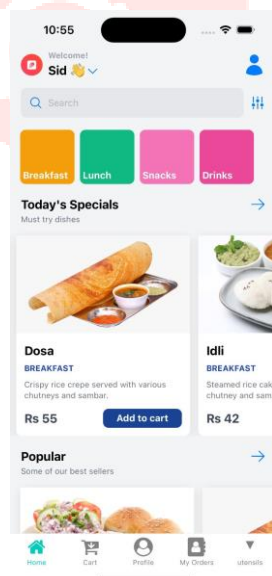


Fig. 4. Main Menu Browsing

Fig. 5. AI Recommendation for Ordering

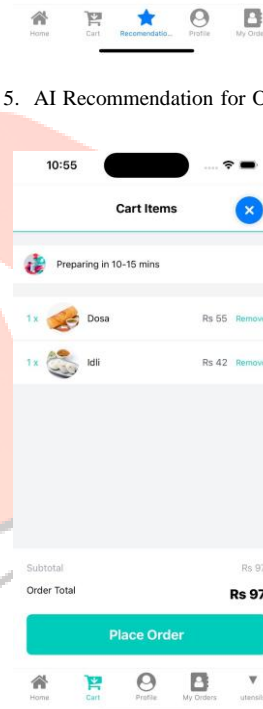


Fig. 6. Order Cart

B. For Teachers

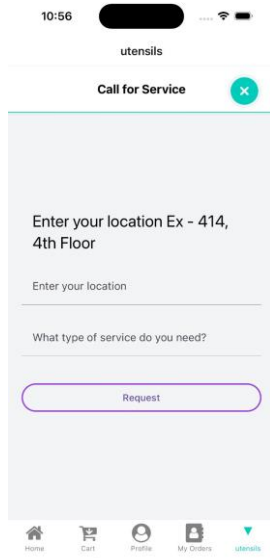


Fig. 7. Utensils service

C. For Canteen staff and Admin

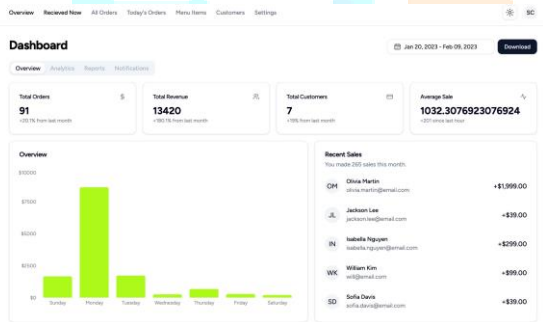


Fig. 8. Admin Dashboard

Order ID	Customer Name	Customer Email	Customer Phone	Status	Date	Time
6530a0255d987...	Yeah Noohade	2020.yeah.noah...	9876504578	Completed	19 Oct 2023	09:49 AM
6530a7955d987...	Yeah Noohade	2020.yeah.noah...	9876504578	Completed	19 Oct 2023	09:50 AM
6533a4e4f95d5...	Yeah Noohade	2020.yeah.noah...	9876504578	Completed	21 Oct 2023	08:19 PM
6533a51a796d5...	Yeah Noohade	2020.yeah.noah...	9876504578	Completed	21 Oct 2023	08:20 PM
653355e0d3796d...	Yeah Noohade	2020.yeah.noah...	9876504578	Completed	22 Oct 2023	10:33 PM

Fig. 9. Orders Tracking and Analysis

Image	Menu Item ID	Name	Description	Price	Quantity	Tags	Category
	652baab8f025742...	Pav Bhaji	It consists of ...	50	10	veg, popular, customer favorite	SNACKS
	652baee1c0e88d...	Dosa	Crispy rice cre...	55	30	veg, popular, customer favorite	BREAKFAST
	652baee1c0e88d...	Idli	Steamed rice ca...	42	40	veg, popular, customer favorite	BREAKFAST
	652bae0f1c0e88d...	Mini Lunch	A compact meal...	64	20	veg, popular	LUNCH
	652bae0f1c0e88d...	Schezwan Noodles	Spicy-fried nood...	44	30	veg	CHINESE

Fig. 10. Customizing Menu

IX. TECHNOLOGY STACK

The technologies used in the project are as follows:

Frontend and Backend Technologies:

Frontend:

- **App** - React Native using Expo, Nativewind, React Native Paper, React Tanstack Query, TypeScript
- **Admin Panel** - Next.js, Tailwind CSS, React Tanstack Query, Shaden UI, TypeScript

Backend:

- Node.js, Express.js, TypeScript, Gemini AI Pro

X. FUTURE SCOPE

Our canteen automation system, initially deployed in-house, will soon expand to serve colleges, universities, offices, and institutions. Alongside deployment, we'll integrate a loyalty program to incentivize patronage. Enhanced inventory management will optimize stock levels and minimize wastage. The system will introduce intelligent sitting arrangement optimization to maximize space utilization and improve the dining experience. Our vision is to establish the system as a leading solution in the food service industry, known for its efficiency and customer-centric approach. Through continuous refinement, we aim to transform canteen operations, delivering unparalleled value to our partners and clients.

XI. CONCLUSION

Our exploration of the Canteen Automation System reflects our commitment to improving efficiency, customer satisfaction, and overall performance. In this presentation, we've highlighted the issues tied to traditional canteen management and demonstrated how this new approach directly tackles these challenges. By making order processes smoother, reducing mistakes, simplifying payments, improving inventory control, and utilizing data-driven insights, the Canteen Automation System has the potential to transform our canteen operations. Looking ahead, we foresee a future where customers enjoy quicker service, accurate orders, and hassle-free payments. Meanwhile, our staff can dedicate more attention to exceptional service and food quality maintenance.

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