Orderly Eats: AI Enabled Smart Ordering and Canteen Service

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ABSTRACT

The rapid growth of the demand for quick and easy services in schools and universities brought about the transferring of the traditional canteen operations to virtual means. The article presents orderly eats, a food ordering application, which has been developed in order to facilitate students in their canteen ordering. The app lets students check the menu, place orders at any spot, and enter a little info such as their name and faculty and pay via a secure UPI QR code-based payment system. Once a payment is completed, the app creates a specific order token. This allows students to avoid the long queues and collect their food when it is comfortable for them. The backend consists of Firebase Firestore for real-time database and order tracking, while the Android interface is built with Java using Android Studio. The canteen personnel is equipped with an admin interface that gets new orders, manually verifies payments, and changes order statuses such as Approved and Ready for Pickup. These changes are immediately shown in the student's app, which guarantees efficient communication. The system that has been presented increases the operational efficiency, lowers the waiting time, decreases the number of people at the canteen during peak hours, and improves the user's overall experience. The app was built as a mini-project that demonstrates the practical uses of mobile development, cloud database integration, and digital payment processes. It has been shown that Namma Canteen can not only modernize the management of the canteen to a great extent but also provide a solid ground for the future improvements such as automatic payment verification and push notifications.

Keywords- Canteen management system, Android application, Mobile food ordering, Firebase Firestore, UPI payment, QR code payment, Real-time database, Student services, Cloud-based application, Order tracking, Digital canteen solution, Java development.

INTRODUCTION

Technology has considerably changed the access to and handling of services for various day-to-day tasks. The rapid proliferation of smartphones and widespread availability of fast internet are the major factors that mobile apps are playing a significant role in modern life for convenience and efficiency in sectors like banking, shopping, healthcare, transport, and education. When it comes to other campus services, the canteen remains one of the most crowded places on campus where students frequently encounter a variety of issues due to manual operations. Lingering lines, slow service, poor order management, and communication breakdown are just some of the problems that most educational institutions face between the students and canteen staff. Typically, students have to stand in line to pick their items, make the payment, and then wait to get their food. This traditional procedure not only robs students of their valuable time but also causes a lot of traffic during break times, leading to delays and dissatisfaction. The ever-increasing number of students in colleges makes it all the more inefficient and error-prone to manage orders manually. The challenges mentioned above necessitate the need for a modern, digitized, and systematic solution that will not only enhance user's convenience but also optimize canteen operations. An Orderly Eats Mobile Application comes up with the solution to all these issues and the idea of such an application is the first step in this direction. The primary goal of the system is to make food ordering very simple. This means, students will be able to order food anytime from anywhere on the campus using a smartphone. Not only this, the application will allow students to see the menu items, make selection, watch prices, and place the order without going to the canteen. The moment a student orders, the system assigns a token number that is uniquely

Once paid, the order is marked as "Paid," and the canteen admin can verify the transaction from their UPI app. This simple workflow of payment will keep away any cash handling, payment confusion, and ultimately speed up the process.

The Admin Module will be exclusively for use by the canteen staff. They will be able to see incoming orders, validate payments, accept or reject them and change the order status to ready. This feature will be a great help in cutting down the manual workload, preventing the happening of wrong orders and making the operation of the canteen more efficient. In addition, the real time updating of data between students and the canteen is made possible through Firebase Firestore with no delay. Students will also have visibility on the live status of their orders including whether the canteen has already accepted their request and when the food is ready for them to collect.

The Android application is developed on Android Studio in Java thus targeting a large population of students using Android phones. Firebase is the supporting technology providing the backend infrastructure for authentication, cloud storage, and real-time database synchronization which makes the system scalable and reliable. The merging of these technologies results in an efficient mobile solution tailored to the college canteen environment. Overall, the Orderly Eats Mobile Application will bring a smarter, digitized, and organized method of food ordering to the colleges. It illustrates the practicality of the mobile app development in resolving real-world issues within the academic environment.

As for the application, it will not only enhance the student experience and canteen management by cutting down the waiting time, improving communication, and providing safe channels for digital payments, but it will also create a project that will satisfy academic demands with real implementation and future expansion as well such as automated payment verification, push notifications, and advanced analytics pertaining to canteen operations.

RELATED WORK

Several studies have been carried out in the area of digital food ordering systems, smart canteen management, and mobile-based service applications with the objective of improving efficiency and reducing manual effort in institutional food services.

Bhattarai *et al.* proposed a **QR-based canteen management system** that enables users to place food orders digitally, thereby reducing long queues and improving order handling efficiency [1]. Their work demonstrated how QR technology can streamline canteen operations; however, it did not emphasize real-time mobile app synchronization or integrated cloud-based order tracking.

Ali *et al.* designed a **web-based food ordering system using QR codes and linear search techniques** to facilitate easier menu access and order processing [2]. While the system simplified ordering through QR integration, it relied mainly on web interfaces and lacked mobile-centric real-time updates and notification mechanisms.

Nikhil *et al.* developed an **Android-based canteen automation system** aimed at reducing human errors and improving order accuracy [3]. The study highlighted the benefits of mobile applications in automating canteen services, but it did not include secure digital payment workflows or real-time database synchronization.

Menewar *et al.* introduced a **smart canteen and cafeteria management system using RFID technology** to automate food distribution and user identification [4]. Although effective, the RFID-based approach requires additional hardware infrastructure, making it less cost-effective for small or medium-scale institutions.

Widodo *et al.* presented a **QR-code-based café menu ordering information system**, focusing on improving customer convenience through digital menus [5]. The system primarily addressed menu browsing and ordering but lacked backend real-time order status tracking and integrated payment confirmation.

Pandey *et al.* proposed a **comprehensive web-based canteen food ordering system** that improved operational efficiency through online ordering mechanisms [6]. Despite its effectiveness, the system was limited by the absence of mobile application support and instant real-time notifications.

Masurkar *et al.* developed an **Android-based canteen ordering system** to reduce waiting time and improve service speed [7]. However, the system did not incorporate cloud-based real-time synchronization or modern digital payment solutions.

George *et al.* implemented a **React Native-based food ordering application for canteens**, enabling cross-platform mobile usage [8]. While the application improved accessibility, it lacked integrated payment verification and backend scalability features.

Reddy presented a **canteen management system** that digitized ordering and billing processes [9]. The system improved administrative control but did not support real-time order tracking or instant communication between users and canteen staff.

Fonggo *et al.* introduced a **web-based canteen payment and ordering system**, emphasizing online transactions and order management [10]. Although functional, the system was web-centric and did not fully leverage mobile application advantages.

Madake *et al.* developed an **online catering system using Firebase**, highlighting the benefits of real-time cloud database synchronization [11]. Their work demonstrated the effectiveness of Firebase for scalable systems but did not integrate QR-based UPI payment mechanisms.

Galabi *et al.* proposed a **smart restaurant management system** that improved order handling and administrative efficiency [12]. Similarly, Attar *et al.* designed a **restaurant web application with integrated dine-in self-service**, enhancing customer autonomy during ordering [13]. Both systems focused on restaurant environments rather than institution-specific canteens.

Othman *et al.* developed a **QR-code-based grocery ordering system**, demonstrating how QR technology improves ordering convenience [14]. However, the system was not tailored to real-time institutional food services.

More recently, Anwitha *et al.* proposed a **smart canteen system integrating AI, real-time analytics, and cashless payments**, indicating the future direction of intelligent food service systems [15]. While advanced, such systems require higher computational resources and complex analytics infrastructure.

METHODOLOGY

The Orderly Eats mobile application was created using a strict methodology that consisted of requirement analysis, then system design, implementation, and finally, testing. The objective was to create a digital canteen ordering system that is user-friendly, real-time, and efficient and that can be implemented on college campuses.

The mobile application Orderly Eats was developed with a systematic approach that encompasses the requirement analysis, system design, implementation, and testing. The process begins with the identification of the main problems in canteen operations, such as long queues, order entry done manually, and lack of communication between students and canteen staff. From these issues, we extracted and determined the functional requirements for both user and admin modules, among which are user authentication, menu display, order placement, payment, token generation, order status management. The system architecture takes a modular approach.

The frontend is implemented in Android Studio with Java, while Firebase Firestore is the cloud-based backend providing real-time data synchronization. The students can select food items, provide their details and make payment by using a static UPI QR code. The order token is generated once the payment is done and will be saved in Firestore. The admin application will keep fetching and watching the incoming orders which makes it possible

for the canteen staff to approve, prepare, or reject them. After that, the admin will update the order status which will then be displayed immediately in the The student application process was through Firebase's real-time synchronization features. The implementation part puts the focus on making interfaces that are easy to use, connecting Firestore collections, and making the admin panel for fast tracking of orders.

Moreover, to enhance the reliability of the system and reduce the time it takes to process requests, we implemented QR-based payment, token management, and notification modules as part of the system. Eventually, the application was subjected to a series of tests to check how well the order flow, real-time synchronization, payment confirmation, and system responsiveness worked with different loads.

This methodical approach guarantees that Orderly eats is functioning properly and hitting its primary target of providing a hassle-free and speedy canteen experience forstudents.
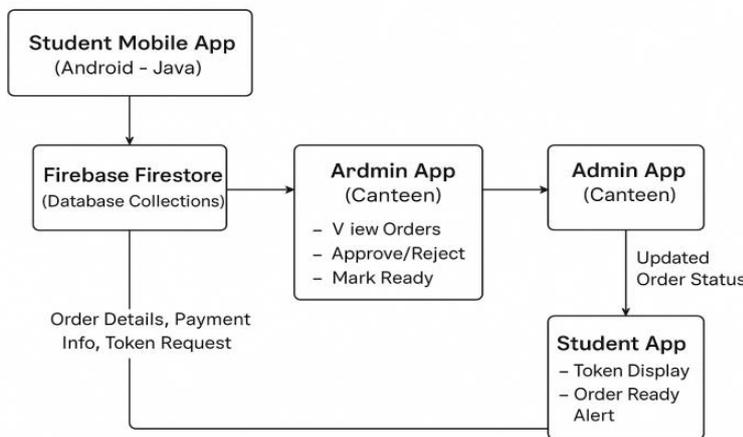
System Workflow

The workflow of the Orderly Eats app outlines the interactions that would occur among the student user, canteen admin, and the backend system. The system is expected to enable seamless order placements, payment verification, and real-time updates on order status. Consequently, this workflow will be partitioned into main operational stages as described here.

User Authentication

The mobile application is opened by the student who then logs in using the credentials that he/she has registered.

Authentication of the user is taken care of by Firebase Authentication.The student is routed straight to the home screen after the login is successful.

Menu Browsing

It retrieves data regarding food items that can be eaten from the Firebase Firestore database.

In the student's point of view, their view contains names of the items, price, availability of the item, and a description. The users pick up their wanted items then they add these items to the cart.

Order Placement

After the course is chosen the student provides their Name and Branch information. The user validates the order and the application creates a distinctive Order ID and Token Number. The order specifics are instantly uploaded to the Firestore "Orders" collection.

Payment Process

The canteen's UPI ID is associated with a static UPI QR code that is displayed on the screen. The student uses any UPI app to scan the QR code and make the payment. For security reasons, the payment confirmation number is manually checked by the admin. The admin then changes the order status to "Payment Confirmed" post-verification.

Admin Order Management

The canteen administrator sees every order that comes in via the app's admin interface. The orders are shown in real-time under "New Orders." The administrator verifies the payment and lets the order begin its process. The order status gets changed to:

Accepted

In Progress

Ready for Pickup

Real-Time Notifications

Firebase real-time listeners make it possible for any status change done by the admin to be reflected right away in the student's interface. The app alerts the student when:

An order is accepted Order is under preparation

Ready for picking up in the store.

Order Pickup

As soon as the administrator indicates the order status as "Ready", the student gets notified through the system.

The student arrives at the counter and presents his/her Token Number. The canteen staff gives the food and completes the order in the database.

Order Completion & Data Storage

Completed orders are moved to an archive collection for record- keeping. The transaction details are kept safely in Firebase for future reference or audits.

RESULT

The Orderly Eats application for mobile phones was developed and tested systematically to evaluate its performance, reliability, and usability in a college setting. The testing results showed that the system worked well in all its main components which were: user authentication, menu browsing, order placement, QR-based payment, and real-time order tracking. The application behaved smoothly during the tests, for instance, the order information was saved instantly in Firebase Firestore and status updates were reflecting on the student interface simultaneously. Each order was assigned a token number immediately for proper management of the queue.

Hence, the user interface was very easy to use and responsive; the student quickly found the menu items and ordered with just a little effort. The trial users gave positive feedback, detailing how the app made greatly the reduction of waiting time and the elimination of the inconvenience of being in long queues during peak hours. The design features fast screen loading and real-time notifications that improved communication between students and canteen staff.

The payment process through a static UPI QR code was effective. The students securely completed the transaction using external UPI apps, and the canteen admin did a manual check to confirm whether the payments were successful. Such a solution was practical and reliable as the cashless payment could be deployed effectively at campus level.

The admin module was also able to demonstrate its strengths during testing. The incoming orders were displayed in real-time, and there was no need for any manual refresh, therefore, the canteen staff was able to handle the order queue in a better way. The administrators easily changed the status of the orders, and the students were informed of those changes instantly, which resulted in better coordination and less confusion at the collection point.

All in all, the system brought about visible changes in the canteen operations: no more queues at the entrance, faster service, and the communication among the staff and students was improved. The application offered very high accuracy and no data loss during the tests, which were conducted with real-time synchronization; thus, it was confirmed to be a digital solution for modernizing college canteen management.

Testing and Validation

The tests consisted of unit testing, integration testing, and user acceptance testing. Student-level testing confirmed the correctness of order placement, payment steps, and token generation. Admin-level testing verified that order retrieval and status updates were functioning properly. Real-time synchronization between student and admin modules was verified thoroughly. G. Deployment The final application was converted into an APK and then it was tested on real Android devices. During the test, the performance, loading time, and UI responsiveness were measured in order to make sure that the app would be reliable even during peak usage hours,
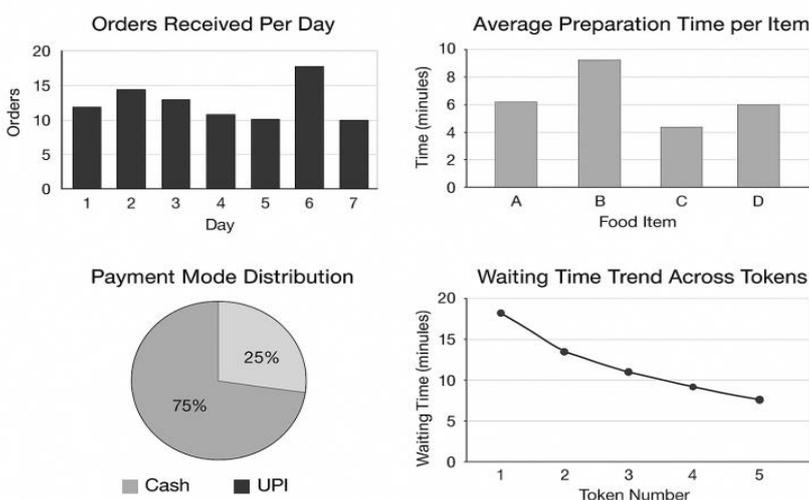
CONCLUSION

The mobile application Orderly Eats solves the problems faced by the old college canteen systems by introducing a single platform for placing food orders, getting instant updates on order status, and making payments through QR-based UPI. Firebase Firestore was used for backend operations which means there was real-time synchronization between the student and admin modules, while the Android-based interface provided quick and easy-to-use user experience. System testing proved that the application was capable of handling order placement, payment verification, and token generation very efficiently, and therefore, it was able to reduce peak-hour congestion and improve canteen workflow significantly.

This project is a testament to the power of mobile and cloud technologies in bringing about the modernization of institutional services. One of the possible future upgrades can be real-time inventory-based menu updates, automatic UPI payment verification, push notifications, and AI that predicts demand for better resource management, among others. Moreover, the system's capabilities can be enhanced through IoT/RFID-based pickup automation and the provision of web-based scalability across multiple campuses. In short, Orderly Eats is an example of a scalable and efficient solution for smart canteen management.

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