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Food Reservation and Real-Time Availability Monitoring System for Saint Columban College Canteen

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ABSTRACT

School canteens operate inefficiently because they rely on manual procedures which leads to prolonged lines and slow service and the lack of timely food availability updates. The existing system restricts students along with faculty and staff from obtaining reliable meal information leading to longer waits and diminished customer contentment.

This research introduces a Food Reservation and Real-Time Availability Monitoring System developed for Saint Columban College Canteen to handle the identified challenges. The system operates as a unified digital solution which streamlines food reservation alongside menu browsing and availability status looking-up. Through the web-based interface users can check daily food options and submit reservation requests as well as watch current food availability updates. The system delivers canteen staff tools to handle menu management tasks and daily serving setup and booking processing and sales data visual analytics.

This system helps canteen staff reduce queues and improve bookings flow and maintains up-to-date food status information. It ensures smooth restaurant activities along with supporting an organization's digital transformation targets.

Key words: Food reservation system, Real-time availability monitoring, Digital canteen management, Web-based platform, Reservation analytics, School canteen operations

1. INTRODUCTION

School canteens serve as essential facilities in educational institutions, providing students, faculty, and staff with accessible, affordable, and nutritious meals. However, many canteens in the Philippines continue to operate through manual processes that lead to long queues, slow transactions, and inconsistent communication of food availability. These inefficiencies contribute to customer dissatisfaction and increased congestion during peak hours, emphasizing the need for digital transformation in campus service operations [1][2].

Recent studies emphasize the significant impact of integrating digital tools into food service systems. Online reservation platforms reduce waiting times, enhance order accuracy, and allow users to conveniently pre-order meals before arriving at the canteen [1][2].

Real-time monitoring of menu availability also helps customers make informed choices and avoid delays caused by sold-out items. These findings highlight how technology can improve operational efficiency and user satisfaction in school canteen environments [3].

Despite these proven benefits, many institutions—especially in Mindanao—continue to rely on traditional canteen operations. At Saint Columban College in Pagadian City, rising student and staff populations intensify lunchtime congestion, making it difficult for the canteen to manage orders effectively. Without a digital platform, customers lack access to real-time menu updates, resulting in long lines, slower service, and reduced overall satisfaction [3][4].

To address these challenges, this study proposes the development of a Food Reservation and Real-Time Availability Monitoring System for the Saint Columban College Canteen. The system provides a web-based platform where customers can browse menus, view real-time availability, and reserve meals in advance. For canteen staff, it enables menu management, daily serving updates, reservation monitoring, and performance reporting. These features aim to streamline daily operations, reduce manual workloads, and enhance service efficiency [4][5][6].

Integrating this system into the institution’s workflow aligns with Saint Columban College’s digital transformation

initiatives. By modernizing canteen operations, the system is expected to improve operational efficiency, enable data-driven decision-making, and create a more seamless and responsive service experience for the school community [1][5][6].

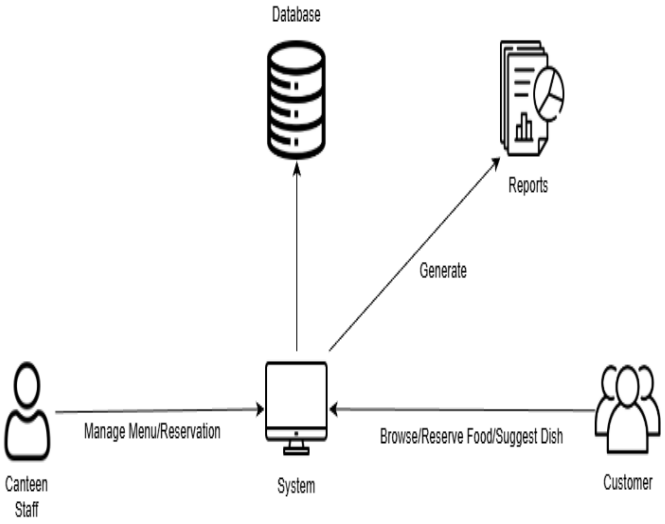

Figure 1: Product Perspective Diagram .

Figure 1 shows how the Food Reservation and Real-Time Availability Monitoring System works from a product standpoint, focusing on how the staff and customer use it. The system serves as a centralized platform that connects customers, canteen staff, and the database to streamline canteen operations. Customers can browse the menu, check real-time food availability, reserve meals, and submit dish suggestions. Canteen staff can manage menu items, update daily servings, and process reservations directly through the system. All actions taken by users are stored in the database, ensuring accurate tracking of menu updates, reservations, and customer requests. Through this integrated workflow, the system improves service efficiency, reduces manual workload, and enhances the overall customer experience.

2. METHODOLOGY

2.1 Research Design

The development of the Online Reservation and Real-Time Availability Monitoring System for the SCC Canteen followed the **Waterfall model**, a linear and sequential software development approach in which each phase must be completed before proceeding to the next. This model was selected because the system requirements were clearly defined at the beginning of the project and remained stable throughout the development process, making it suitable for small- to medium-scale systems with well-understood objectives.

The development process began with **requirements analysis**, where the functional and non-functional needs of the canteen were identified, including menu browsing, real-time food availability monitoring, meal reservations, and dish suggestion submission. This was followed by the **system planning and design phase**, which focused on defining the system architecture, database structure, and user interface layout for both customers and staff.

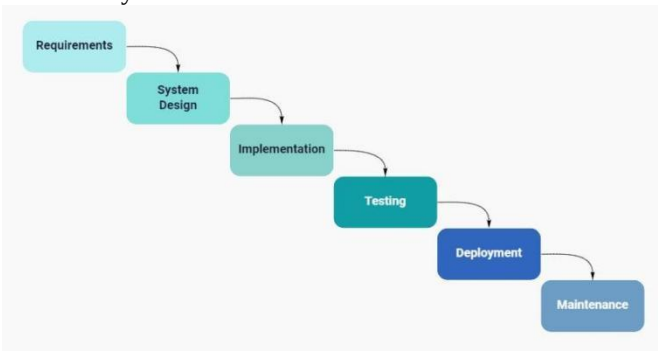

Figure 2: Process Model

Figure 2 shows the overall system development flow, which begins after the design is finalized and proceeds to the implementation phase, where the system's core features are developed and integrated with the database to support real-time updates. This is followed by testing and evaluation to ensure that the system functions correctly, processes reservations accurately, and updates food availability in real time. Once verified, the system is deployed for actual use in the SCC Canteen, with provisions for maintenance and support to address future enhancements and system improvements.

To assess the quality of the developed system, the ISO/IEC 25010 Software Quality Model was used as the evaluation framework. The system was reviewed from both technical and user perspectives, involving customers and canteen staff. Feedback gathered during testing sessions helped identify strengths and areas for improvement, ensuring that the system met operational needs while delivering a smooth and efficient user experience.

2.1 Functional Suitability: The system's ability to support essential canteen operations such as menu management, real-time food availability monitoring, online meal reservations, and dish suggestion submission for customers;

2.2 Performance Efficiency: The responsiveness of the system and its efficient use of computing resources when processing reservations, updating food availability, and retrieving menu information in real time.;

2.3 Compatibility: The system's capability to function properly across different web browsers, devices, and network environments commonly used by customers and canteen staff.;

2.4 Usability: The ease of use, clarity of navigation, and overall user-friendliness of the interface for customers placing reservations and staff managing menu items and orders.;

2.5 Reliability: The stability of the system during operation, accuracy of reservation records, consistency of real-time availability updates, and the system's ability to handle errors without data loss.;

2.6 Security: The protection of user and reservation data through controlled access, secure data handling, and proper authentication mechanisms to prevent unauthorized use.;
2.7 Maintainability: The ease with which the system can be updated, modified, and enhanced to accommodate future changes in menu offerings, canteen policies, or system features.

2.2 Technical Specifications

A. The system is built around a web-based platform that integrates both customer and staff functionalities to support efficient canteen operations:

- Frontend: HTML5, JavaScript, CSS
- Backend: PHP
- Database: MySQL
- Hosting: Infinity Free App
- Development Environment: Visual Studio Code

3. RESULTS

The Online Reservation and Real-Time Availability Monitoring System for the SCC Canteen was developed using the Waterfall model, following a structured and sequential process aligned with established software engineering standards. The development began with planning and requirements analysis to clearly define system objectives and user needs, followed by the design phase, which specified the system architecture, database structure, and user interfaces. The implementation phase then translated these designs into functional components through coding and database integration, after which comprehensive testing was conducted to verify system functionality, data accuracy, and real-time update performance. Upon successful validation, the system was deployed for operational use, demonstrating its effectiveness in supporting online meal reservations, real-time food availability monitoring, and efficient management of canteen operations.

3.1 Review

During the initial phase, the team gathered data by consulting with the main stakeholders, including canteen staff, students, and faculty members. Surveys and interviews were conducted to identify the functionalities required in the system, such as menu browsing, real-time availability checking, meal reservations, and dish suggestion submissions. The collected information guided the planning and design phases while considering the schedules and budget constraints.

3.2 Planning

In this phase, the project's objectives, scope, and key deliverables were clearly defined to establish a roadmap for system development. Responsibilities were assigned to team members according to their expertise, ensuring efficiency and accountability. A resource management plan was also developed, covering manpower, schedules, and budget allocations. This planning ensured that the project progressed smoothly, stayed within financial limits, and maintained a structured approach to creating a reliable and user-friendly platform for SCC Canteen operations.

3.3 Design

Key design decisions for the Online Reservation and Real-Time Availability Monitoring System for the SCC Canteen were established during the early planning stages. The primary objective of the design phase was to translate functional requirements into a clear and efficient system architecture capable of supporting real-time operations. Emphasis was placed on usability, data accuracy, and seamless interaction between customers and canteen staff within a centralized web-based environment.

3.3.1 Technical Specification

The system is designed as an integrated, web-based platform that provides separate, role-based interfaces for customers and canteen staff within a unified system. This architecture allows each user group to interact with the platform according to their specific needs while maintaining a consistent underlying framework.

Customers can access digital menus, view real-time food availability, make meal reservations, and submit dish suggestions. By centralizing these functions, the system reduces manual inquiries and uncertainty, enabling users to make informed reservation decisions and ensuring that displayed information remains current and consistent.

Canteen staff are provided with a dedicated administrative interface for managing menu items, configuring daily serving quantities, and monitoring incoming reservations. Real-time processing of reservation records and availability updates enables timely decision-making and efficient responses to daily demand fluctuations, maintaining accuracy between system data and actual food availability.

At the core of the platform is a centralized data management layer that ensures data integrity, controlled system access, and reliable system operations. Continuous data synchronization propagates updates across all connected devices in real time, supporting operational transparency, consistent performance, and service efficiency across multiple user sessions.

The following components serve as the foundation of the platform:

HTML, CSS, JavaScript for the web interface
PHP for server-side processing
MySQL for database management
Visual Studio Code as the development environment

3.3.2 Use Case Diagram

This use case diagram illustrates the key functionalities of the Online Reservation and Real-Time Availability Monitoring System for SCC Canteen and how users interact with the system. It helps define the scope of the system and provides a clear understanding of what the system needs to accomplish from the users' perspective, which is essential during the planning and design phases.

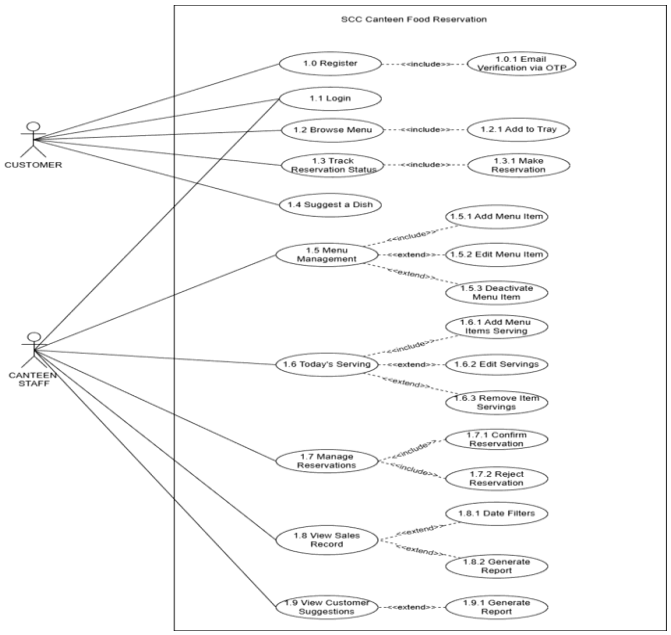

Figure 3: Use Case Diagram

Figure 3 shows the system's use case model, illustrating the interactions between the two primary user groups: customers and canteen staff. Customers can register and log in, browse the digital menu, check real-time food availability, make and track reservations, and submit suggestions for new dishes. These functions are designed to be intuitive and centralized, reducing manual inquiries and enabling customers to make informed meal selections.

Canteen staff access a dedicated administrative interface that allows them to manage menu items, define daily dish availability, update serving quantities, process incoming reservations, and review sales records and customer suggestions. All user interactions and operational data are stored in a centralized database, supporting efficient data management, real-time system updates, and streamlined workflows for both customer and staff operations.

3.3.3 Interface Design

A thoughtfully designed interface shapes how users interact with the system. Customers navigate through clear menus, buttons, and input fields, making it easy to browse the menu, check food availability, make reservations, and submit suggestions. Staff access a separate administrative dashboard where daily menu items, dish availability, and serving quantities are displayed intuitively, allowing efficient updates and reservation management. Logical groupings, consistent spacing, and visual cues ensure that both customers and staff can complete tasks naturally, without confusion. The combination of functionality and visual clarity supports smooth operation, real-time decision-making, and streamlined management of daily canteen operations.

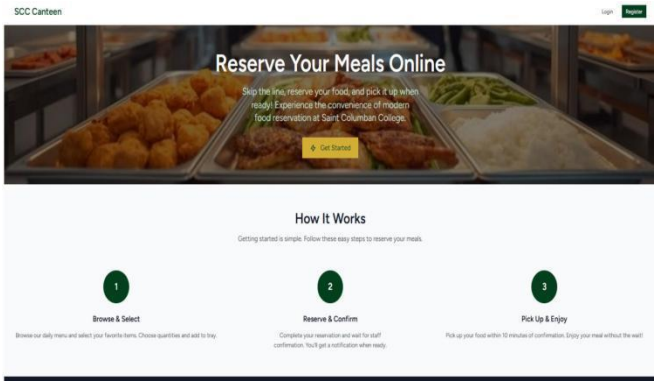

Figure 4: System Landing Page

Figure 4 shows The Landing Page is the system's entry interface, providing direct access to Login and Registration functions. It is designed using a minimalist layout to ensure clarity and reduce user interaction time. The page displays the system name, institutional branding, and two primary call-to-action buttons positioned centrally for immediate visibility. The design follows responsive web standards, allowing accessibility on mobile and desktop devices. Its lightweight structure ensures fast loading performance even under limited network conditions, supporting seamless user onboarding into the reservation system.

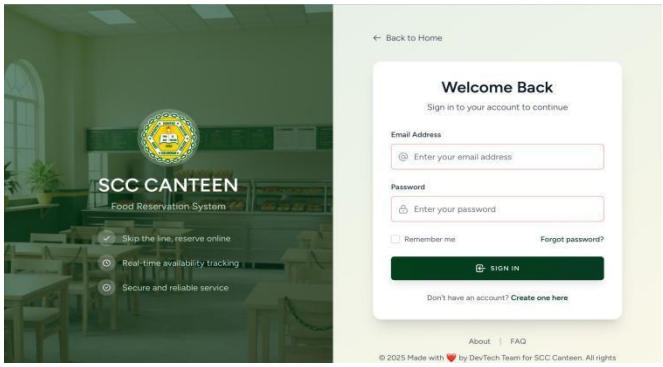

Figure 5: System Login Page

Figure 5 shows The System Login Page provides secure authentication for both customers and canteen staff. It features two input fields for institutional email and password, with form validation to prevent incomplete or incorrect submissions. The design emphasizes clarity and accessibility, using recognizable input labels and a prominently placed Sign In button to streamline user interaction. Error prompts appear when login credentials do not match existing records, ensuring immediate feedback. The interface is optimized for mobile and desktop devices, and the page employs encrypted communication protocols to protect user credentials during transmission.

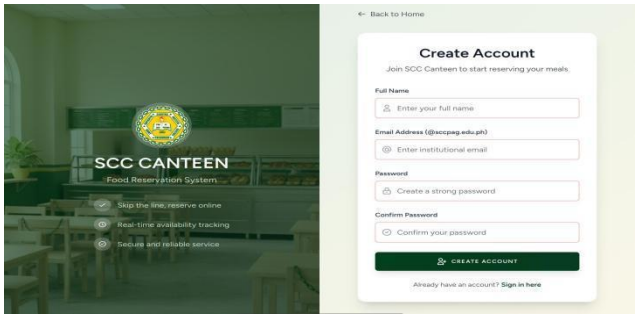

Figure 6: System Create Account Page

Figure 6 shows The Create Account Page enables new users to register by providing their full name, institutional email address, and password, with validation to ensure correct input formats and matching passwords. Upon submission, the system checks email uniqueness and triggers the One-Time Password (OTP) verification process to activate the account securely. The interface uses a simple form layout with clearly labeled fields and a visible Create Account button to support ease of completion across all device types. This page ensures secure onboarding and prepares users for system access through verified authentication credentials.

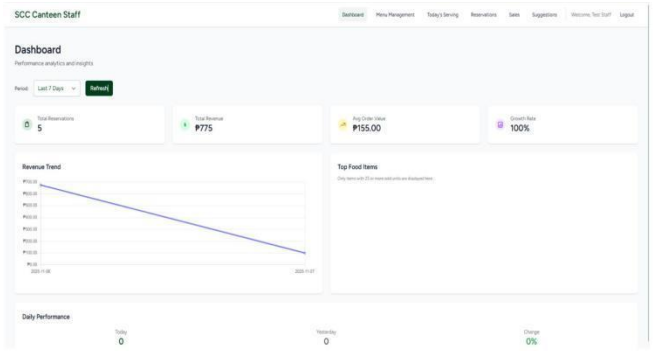

Figure 7: Admin Dashboard

Figure 7 shows The Admin Dashboard Page provides administrators with a centralized interface to manage and monitor the system efficiently. It displays an overview of key metrics, such as total users, total products, and recent activities, using clear and organized visual elements like charts, tables, and summary cards. Administrators can navigate easily to different management functions, including user accounts, product listings, through an intuitive menu or sidebar. The interface is designed for responsiveness across all devices, with clearly labeled buttons and interactive components to support quick decision-making and efficient system control. This page ensures streamlined administrative operations and secure access to critical system functionalities.

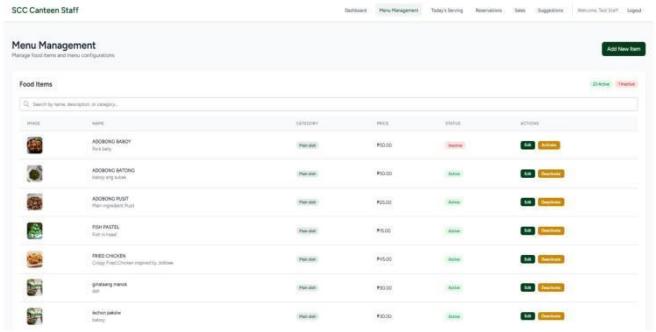

Figure 8: Menu Management Page

Figure 8 shows The Menu Management Page allows administrators to efficiently create, update, and organize the system's menu items or product categories. Administrators can add new menu entries with details such as name, description, price, and image, as well as edit or remove existing entries through clearly labeled buttons and interactive controls. The interface uses a structured layout with sortable tables or cards to display all menu items, supporting quick identification and management of each item. The page is responsive across devices, ensuring ease of use and streamlined menu operations. This page ensures accurate and up-to-date menu information, enhancing overall system organization and user experience.

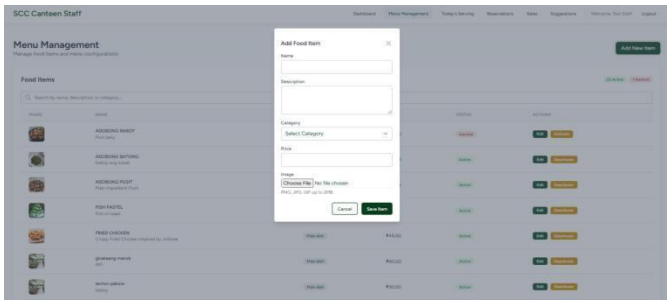

Figure 9: Add Food Item

Figure 9 shows The Add Food Item Page enables administrators to add new food items to the system's menu. Administrators can input essential details such as the food name, description, price, category, and image, with validation to ensure all required fields are correctly completed. Upon submission, the system stores the new item in the database and updates the Menu Management Page automatically. The interface uses a simple form layout with clearly labeled fields and a visible "Add Item" button to ensure ease of use across all device types. This page ensures accurate menu entries and maintains a well-organized, up-to-date menu for users to view.

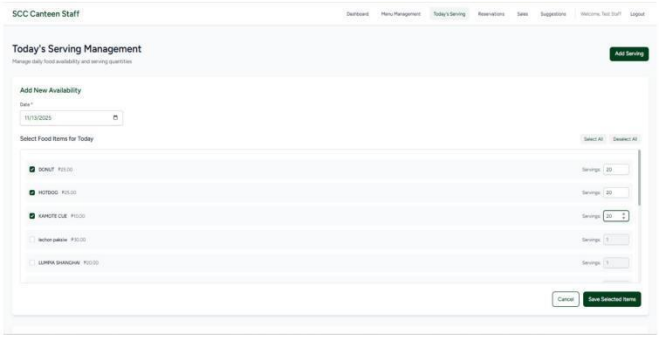

Figure 10: Today's Serving Management

Figure 10 shows The Today's Serving Management Page allows administrators to manage and monitor the food items available for serving on the current day. Administrators can select which menu items are active, adjust quantities, and update availability in real-time to reflect daily changes. The interface uses an organized layout, such as tables or cards, showing all menu items with their current serving status and editable fields for quick modifications. Clearly labeled buttons and controls support efficient updates across all device types. This page ensures accurate daily menu offerings, helping maintain smooth operations and up-to-date information for both staff and users.

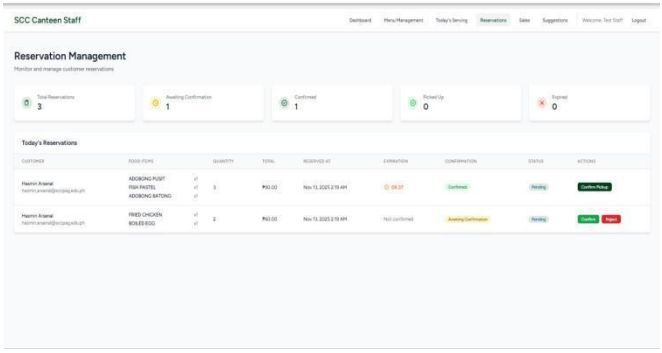

Figure 11: Reservation Management

Figure 11 shows The Reservation Management Page enables administrators to efficiently monitor and manage all user reservations. Administrators can view reservation details such as customer name, contact information, reserved items, date, and time, organized in a clear table or list format. They can also approve, cancel, or modify reservations using clearly labeled buttons and interactive controls, ensuring smooth coordination of daily operations. The interface is responsive across all devices, allowing administrators to manage reservations quickly and accurately. This page ensures streamlined reservation handling, reduces errors, and maintains up-to-date information for both administrators and users.

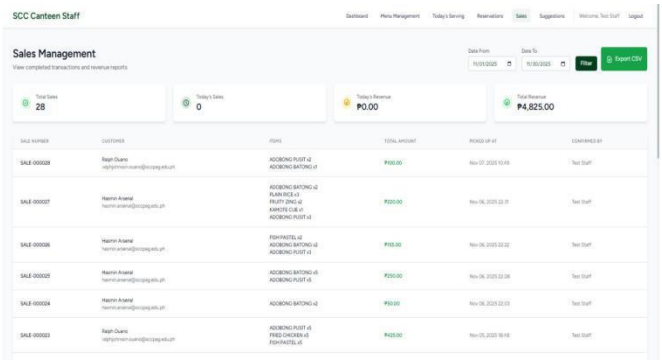

Figure 12: Sales Management

Figure 12 shows The Sales Management Page provides administrators with a comprehensive interface to monitor and manage all sales transactions within the system. Administrators can view detailed information for each transaction, including items sold, quantities, total amount, customer details, and date/time of purchase, presented in a clear table or report format. The page allows administrators to generate sales reports, track revenue, and filter transactions based on specific criteria such as date or product category. The interface is designed to be responsive across all devices, with clearly labeled buttons and interactive controls for efficient sales tracking and management. This page ensures accurate sales monitoring, supports informed business decisions, and maintains organized records for auditing and reporting purposes.

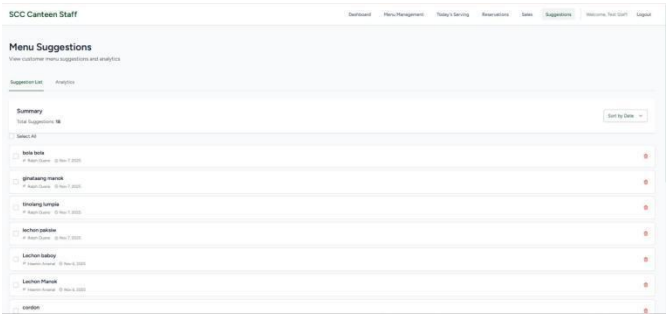

Figure 13: Menu Suggestion

Figure 13 shows The Menu Suggestions Page allows administrators to view, manage, and respond to menu suggestions submitted by users. Users can propose new food items or modifications to existing items, and administrators can review these suggestions in a clear, organized list or table. Administrators can approve, reject, or request additional details for each suggestion using clearly labeled buttons and interactive controls. The interface is responsive across all devices, ensuring easy navigation and management of user feedback. This page ensures that user input is efficiently considered, helping to improve the menu offerings and enhance overall user satisfaction.

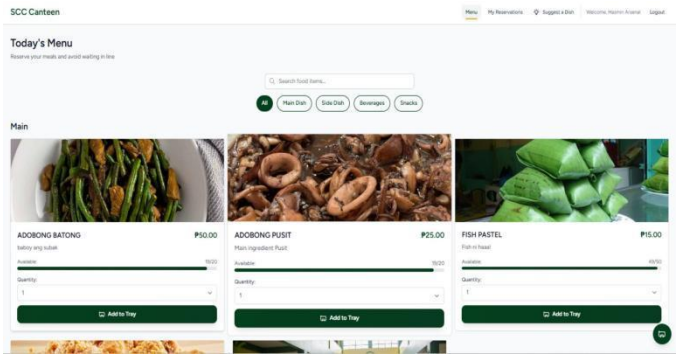

Figure 14: Menu Page

Figure 14 shows The Menu Page on the customer side allows users to browse the available food items in an organized and visually appealing layout. Users can view each item's name, description, price, and image, with options to select quantity and add items to their cart for ordering. The interface includes filters or categories to help users quickly find specific items and supports smooth navigation across devices with responsive design. Clearly labeled buttons, such as "Add to Cart" or "View Details," make interactions intuitive and straightforward. This page ensures a seamless and engaging browsing experience, allowing customers to make informed choices and place orders efficiently.

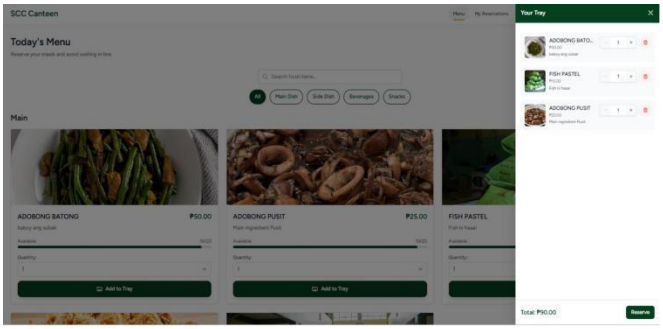

Figure 15: Customers Tray

Figure 15 shows The Customers Tray Page allows users to review and manage the food items they have selected before placing an order. Users can see a list of items added to their tray, including item name, quantity, price, and subtotal for each entry. They can modify quantities, remove items, or proceed to checkout using clearly labeled buttons and interactive controls. The interface is designed to be responsive across all devices, ensuring ease of use and smooth navigation. This page ensures that customers have a clear overview of their selections, facilitating accurate orders and enhancing the overall user experience.

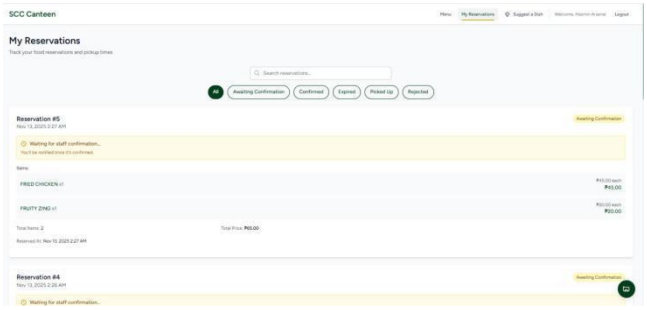

Figure 16: Reservations Page

Figure 16 shows The Reservations Page allows customers to view and manage their existing reservations. Users can see details such as reserved items, date, time, and reservation status in a clear and organized layout. They can cancel reservations if needed through clearly labeled buttons, with the system updating the status in real-time. The interface is responsive across all devices, providing an intuitive and smooth experience for users. This page ensures that customers can easily track and manage their reservations while keeping the system updated with accurate reservation information.

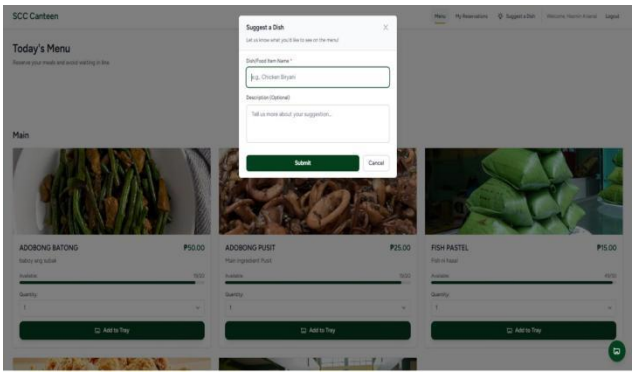

Figure 17: Suggestions Modal

Figure 17 shows The Suggestions Page allows customers to submit feedback or propose new menu items to the administrators. Users can enter details such as the suggestion title, description, and any additional notes, using clearly labeled fields with validation to ensure complete input. Upon submission, the system stores the suggestion and notifies the administrator for review. The interface uses a simple and responsive layout with a visible "Submit Suggestion" button to support ease of use across all device types. This page ensures that customer input is efficiently captured, promoting user engagement and contributing to improved menu offerings.

3.3.4 Testing

Comprehensive testing was conducted to ensure the Canteen Food Ordering and Reservation System was reliable, secure, and functionally accurate:

- Unit Testing: Validation of individual back-end features, including menu management, sales tracking, reservation handling, and user authentication.
- Integration Testing: Verification of module interactions across the system, including menu browsing, tray management, reservation processing, sales tracking, and suggestion handling.
- System Testing: Assessment of end-to-end workflows to ensure seamless operation of the platform across multiple user scenarios and web browsers, addressing usability, navigation, and interface consistency.
- User Acceptance Testing: Feedback from potential customers and staff administrators to identify practical usability issues and guide final refinements.

3.3.5 Deployment

The deployment phase involved making the Canteen Food Ordering and Reservation System fully operational and accessible to its intended users. The web application was hosted on a suitable server, configured for secure access, and optimized for compatibility across common web browsers.

Prior to full release, system access was provided to a select group of administrators and test users to monitor performance, identify potential issues, and confirm the effectiveness of menu management, tray handling, reservations, sales tracking, and suggestion features. Training was provided to administrators to familiarize them with system functionalities, workflow management, and secure handling of user data.

The deployment phase ensured that the Canteen Food Ordering and Reservation System was fully functional, user-friendly, and ready for real-world use, providing both administrators and customers with a convenient, accessible, and efficient platform for managing food services and interactions.

3.3.6 Maintenance

Ongoing maintenance is handled by the college's IT Department, including:

- Regular system updates and security patches
- User support and troubleshooting
- Performance monitoring and optimization
- Feature enhancements based on user feedback

4.CONCLUSION

The Canteen Food Ordering and Reservation System addressed key challenges in managing daily food services and reservations. Instead of relying on manual logs and inquiries, the platform centralizes menu listings, food availability, reservations, and customer suggestions digitally. This shift reduces errors, improves accuracy, and ensures that information on available dishes and serving quantities is always up to date. Customers can make informed decisions when reserving meals, while staff can efficiently manage menu items, daily dish availability, and incoming reservations. Real-time updates and a centralized database allow smooth operations, reduce administrative workload, and improve overall transparency within the canteen.

Testing confirmed that the system meets functional requirements, is user-friendly, and performs reliably under multiple scenarios. Since deployment, the platform has streamlined daily canteen operations, minimized manual coordination, and enhanced the efficiency of both customer and staff interactions, providing a more organized, accessible, and responsive service environment.

ACKNOWLEDGEMENT

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