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Software Engineering

Group Project
Cafeteria Management System

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Abstract

The cafeteria industry plays a crucial role in daily life, serving food and beverages to a diverse range of customers, including students, employees, and the general public. With the rapid advancement of technology, implementing a Cafeteria Management System (CMS) is essential to optimizing operations, improving service quality, and ensuring a seamless dining experience. To address the challenges in cafeteria management, our team has chosen to develop the project: "Building a Cafeteria Management System."

This report outlines the entire process of designing, developing, and implementing the system, focusing on enhancing efficiency and streamlining cafeteria operations. The Cafeteria Management System is designed to digitize and automate key processes, including order management, inventory tracking, and billing automation. Additionally, the system enables real-time monitoring of transactions, menu updates, and inventory levels, while ensuring secure payment processing and user-friendly access for both customers and staff. By integrating modern technology and data-driven decision-making, the CMS aims to enhance operational efficiency, reduce manual errors, and improve customer satisfaction, making it a robust solution for modern cafeteria management.

Keywords: Cafeteria Management System, Management System, Order Management System, Inventory Tracking, Point of Sale (POS)

Market Demands and Problem Analysis

Project's Description

The Cafeteria Management System (CMS) is designed to enhance the efficiency and accuracy of cafeteria operations by automating food ordering, inventory management, billing, and reporting processes. The primary objective of this project is to develop a digital platform that streamlines customer interactions, optimizes kitchen workflows, and improves overall service delivery. The system will feature an intuitive interface for customers to place orders, an admin panel for staff to manage inventory and track sales, and a secure payment gateway for cashless transactions. In addition, real-time analytics and reporting tools will be integrated to help cafeteria managers make data-driven decisions. By reducing manual errors, improving service speed, and ensuring smooth coordination between different cafeteria operations, the CMS will serve as a robust and scalable solution tailored to modern cafeteria needs.

Problem Analysis

Managing the cafeteria involves a number of crucial elements used to maximize operating procedures, enhance service standards, and guarantee efficient operations:

- **Order and transaction management:** helping clients place orders, monitoring their progress, handling payments, and keeping track of past transactions.
- **Inventory and materials management:** Monitoring stock levels, updating material quantities, forecasting consumption demand, and minimizing food waste.
- **Staff Management:** Support check-in and check-out for employees, records working hours, and tracks staff performance.
- **Client Services:** Adding promoting services like vouchers or references to ensure that the client has the best experiences and be able to contribute to the development of the store.
- **Data reporting and analysis:** Supports a variety of payment methods such as cash, bank cards, e-wallets, ensuring fast and secure transactions.

A Cafeteria Management System not only automates the process, but also improves operational efficiency, minimizes manual errors, and improve the customer experience.

Market Demands On the System

In the age of IoT (Internet of Things) and rapid technological advancements, Cafeteria Management Systems (CMS) have become indispensable in modern food service operations. The integration of smart technology, automation, and data-driven solutions has revolutionized the way cafeterias operate, improving both efficiency and user experience.

The application of IoT enabled devices allows real-time inventory tracking, automated order processing, and seamless communication between customers, staff, and kitchen operations. Features such as self-service kiosks, mobile app ordering, and contactless payments provide customers with a faster, more convenient, and personalized dining experience. Meanwhile, cloud-based management systems enable cafeteria administrators to monitor sales, track food consumption, and optimize workflows from anywhere.

In addition, AI-powered analytics and smart recommendation systems help cafeterias better understand customer behavior, forecast demand, and improve decision-making. The integration of advanced security protocols and encrypted transactions ensures data privacy, secure payments, and fraud prevention.

Using the latest technological advances, the CMS not only improves operational efficiency but also creates a more seamless and satisfying experience for both customers and staff, making it an essential tool for the future of cafeteria management.

Developing Diagrams

To visualize the Cafeteria Management System (CMS) operations and its functional structure, we have utilized various diagrams and functional breakdowns, including:

- **Functional Hierarchy Diagram:** Lists the core functions of the system and how they interact with one another. This helps in understanding the overall architecture of the CMS.
- **Use Case Diagrams and Specifications:** Illustrates how different users (such as customers, staff, and administrators) interact with the system in various real-world scenarios. This provides a clear overview of user roles and system responses.

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- **Activity Diagrams:** Depicts the step-by-step workflow of the system, outlining processes like order placement, inventory management, staff check-in/check-out, and transaction processing.

These diagrams help provide a structured visualization of the CMS, ensuring a clear understanding of system functionalities and user interactions.

Project Planing and Milestones

Our team has created a general project plan to guide the development of the Cafeteria Management System (CMS), which includes the following key components:

- **Project Timeline:** Defining the major phases of the project and estimating the expected duration for each phase, including research, design, development, testing, and deployment.
- **Required Resources:** Identifying essential resources such as team members, their skill sets, and the necessary tools or technologies to successfully complete the project.
- **Risk Assessment:** Recognizing potential risks that may arise during the project, such as technical challenges, time constraints, or resource limitations, and establishing strategies to mitigate them.
- **Task Execution and Collaboration:** Ensuring that all team members work together efficiently, following the project plan to complete the assigned tasks within the set deadlines.

By following this structured plan, the team aims to develop a functional, efficient, and user-friendly Cafeteria Management System while minimizing risks and ensuring smooth project execution.

System Design Specification

General Introduction

This section outlines the overall requirements for a Cafeteria Manager System, detailing its functionalities, workflow, and non-functional requirements to ensure efficient operation. The system consists of multiple components, each catering to a specific role in the cafeteria's workflow.

- **Back-End Server:** responsible for handling all system logic, processing requests, managing the database, and performing data analysis. It ensures seamless communication between different parts of the system, processes customer orders, manages inventory, and handles payments. Additionally, it generates reports and analytics to assist in managerial decision-making.
- **Manager:** serves as the primary interface for overseeing the cafeteria's operations. It provides analytical reports on sales trends, popular menu items, and inventory levels. Through this interface, the manager can make informed decisions regarding stock replenishment, pricing adjustments, and employee role management. It also allows configuration of system settings and permissions for different staff members.
- **Storage Manager:** responsible for inventory tracking and stock management. It provides a clear overview of available ingredients, monitors stock levels, and alerts staff when supplies are running low. The system helps optimize restocking schedules and reduces waste by ensuring ingredients are used efficiently. It also integrates with the Back-End Server to provide real-time data on inventory consumption and replenishment needs.
- **Cashier:** functions as the cafeteria's Point of Sale (POS) system. It enables cashiers to place orders, calculate bills, and process payments efficiently. The system supports multiple payment methods, including cash, card, and digital wallets, ensuring a smooth checkout experience for customers.
- **Bartender:** designed to streamline beverage preparation. It displays a real-time list of drinks that need to be prepared and allows bartenders to confirm when a drink is ready. Once a drink is prepared, the system notifies waiters, ensuring timely and accurate delivery to customers.

Technology

- **Java:** Served as primary language for handling Backend server, responsible for handling most of the logic operation as well as data provider for all tasks required.
- **HTML:** To organizes website display information.
- **CSS:** To color and design the view of website through HTML tags.
- **JavaScript:** To handle some basic logic, likely button clicks, modify number of product displays. Besides, it is also used to send and receive data between the website and the server.

Manager:

The Manager User Interface is designed specifically for users in the managerial role, providing access to key administrative functions. It includes three primary features:

1. **Check Storage:** Display a user interface for the user to monitor, view the list of ingredients in the storage. By selecting a specific item, it will lead them to another tab for more detail about that item (expiry date, name, description, weight)
2. **Create Staff Accounts:** Enables the user to create new account for staff and assign role (storage manager, bartender, cashier)
3. **Sale Analysis:** Display a chart of sales classified by time. This helps the manager to quickly analyze sales trends and monitor performance based on real-time data visualization.

Storage Manager:

There are 5 main menus: Dashboard, Import, Inventory, History and Analytics.

- **Dashboard:** This menu aggregates all the remarkable factors of the restaurant operation which the storage manager can supervise: a report on daily transaction (Analytics menu), ingredients that are expired or running out (Inventory menu).
- **Import:** This menu allows the manager to enter information about the imported ingredients.
- **Inventory:** contains 4 sub-menus
- **Order:** The order will be sent from the bartender and analyzed into the corresponding ingredients needed. This makes it easier to track the number of export ingredients.

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- **All ingredients:** lists all the ingredients in the inventory.
 - **Expiring:** lists all the ingredients that are near expiration to prioritize first to export.
 - **Running out:** lists all the ingredients that are running out of quantity. This will alert the storage manager, and the storage will never run out of ingredients.
 - **History:** Records all the imported ingredients and their suppliers.
 - **Analytics:** This records the daily transactions tracking the imports and exports of the ingredients used during the day. This menu also reports the most sold ingredients and most stocked ingredients.

Cashier and Customer:

Cashier and Customer UI is designed specifically for the shop's customers. Customers scan the QR code to access the shop's website. This interface includes 3 parts:

- **Classification:** Divide into different categories to give customers a better experience searching and choosing drinks
- **Menu:** Includes drinks based on each category for customers to choose. For each item, there will be an illustration and price. Customers can adjust the quantity (increase/decrease) based on their needs
- **Cart:** The shopping cart includes the products the customer has selected according to the correct number of customers. The price will be calculated correctly according to the number of customers selected for each product as well as the total value of the shopping cart. The customer's choices will be saved before each time the "Confirm order" button is pressed to send the shopping cart.

Bartender Manager:

The system consists of four main screens that facilitate the ordering and preparation process efficiently:

- **List of Orders:** Displays all customer orders in real time, allowing staff to track and manage ongoing orders seamlessly.

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- **Take Order:** Provides an intuitive interface for customers or staff to place drink orders, selecting items, customizing preferences, and confirming their selections.
 - **Confirmation:** Displays the completed drink and notifies the cashier that the order is ready for pickup and payment processing.

References

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Contribution

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Appendix