Faculty of Electrical Engineering

SEEL4213 Software engineering

Group Project Report

Section 01
Group 02

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CHAPTER 1

INTRODUCTION

1.1   Introduction

The advent of restaurant software has transformed the restaurant industry, equipping establishments with state-of-the-art tools to enhance sales and operational efficiency. As the restaurant sector flourishes, both new and established eateries encounter challenges in effectively managing their staff and catering to customer needs. Even successful restaurants find it challenging to meet the demands of a large customer base while ensuring an exceptional dining experience. To tackle these issues, a service is essential to assist restaurant administrators in efficiently overseeing their operations, leading to increased daily sales and an enhanced experience for administrators, staff, and customers. One technology that proves beneficial is QR code technology. Modern phones and tablets easily scan QR codes, facilitating the assignment and verification of customer occupancy at specific tables. Furthermore, QR codes serve as a digital catalog, displaying available items and indicating sold-out items. Additionally, the system can offer users promotions and virtual coins that are redeemable for complimentary items from the restaurant. By integrating these technologies, restaurants can streamline their operations, elevate customer satisfaction, and boost sales.

1.2   Problem Background

The restaurant industry is expansive and caters to a substantial customer base, emphasizing the importance of prompt food service. Failing to meet this demand promptly can lead to complications. The core problem arises when customers arrive at a restaurant only to discover a lack of available tables or experience delays in receiving their orders. Queueing also poses an inconvenience for many patrons. To address these concerns, the system should empower users by providing real-time information about table availability and estimated wait times for their food orders. This proactive approach ensures that customers are well-informed and can plan accordingly, mitigating the challenges associated with table availability and timely food service.

1.3   Project Aim

The Project aim is to develop a responsive restaurant web system for woodfire restaurants focused to enhance the user experience in woodfire restaurants by using latest technologies in the software engineering world which can give users an enhanced experience and make the management of staff and customers much easier.

1.4   Project Objectives

The objectives of the project are:

- To analyse and collect customer requirements to develop for food ordering management system for woodfire
- To design the customers system from the collected requirements as well as the admin side.
- To develop a web application that will, implement the system as stated in the design phase.
- To test the usability of the web application as customers and as an admin.

1.5   Project Importance

This project holds significant importance for restaurants aiming to efficiently manage a large user base and enhance the dining experience. By implementing this solution, restaurants can optimize overall returns, improve customer satisfaction, and effectively organize their customers to enhance productivity and operational efficiency. Furthermore, this project has academic value as it enables exploration of the dynamic landscape of software technology. Through an examination of the latest technologies and their potential applications, valuable insights into future possibilities and current industry practices can be gained. Additionally, studying the historical aspects of software development provides a solid foundation for understanding the evolution of the field. The objective of this project is to broaden knowledge of both traditional and contemporary software paradigms, fostering the acquisition of valuable insights and expertise that can facilitate professional growth and informed decision-making within the software development field.

CHAPTER 2

SYSTEM DEVELOPMENT METHODOLOGY

The waterfall model is a development process that divides the development into distinct stages, each representing a specific phase of the project. This approach derives its name from the metaphor of a waterfall, symbolizing the natural flow of one phase into the next. Opting for the waterfall model in web application development can be advantageous for various reasons:

1. Clear, Defined Process: The waterfall model offers a clear and well-defined development process, making it suitable for projects with precisely outlined requirements and scope.

2. Easy to Understand: The linear nature of the waterfall model simplifies comprehension and adherence. This attribute is beneficial for team members who may be new to web application development.

3. Suitable for Smaller Projects: Well-suited for smaller projects with fixed requirements and scope, the waterfall methodology proves effective in such scenarios.

4. Progress Tracking: Tracking progress becomes straightforward with the waterfall methodology as each stage entails specific deliverables that must be completed before progressing to the subsequent stage.

However, it is crucial to acknowledge that the waterfall model may not be universally applicable to all web application development projects. Its rigidity may pose challenges, particularly in projects characterized by rapidly changing requirements or a high level of uncertainty. In such cases, alternative approaches like agile development may be more fitting. Nevertheless, considering that the project's requirements are already well-established and stable, the waterfall model remains a suitable choice in this context.
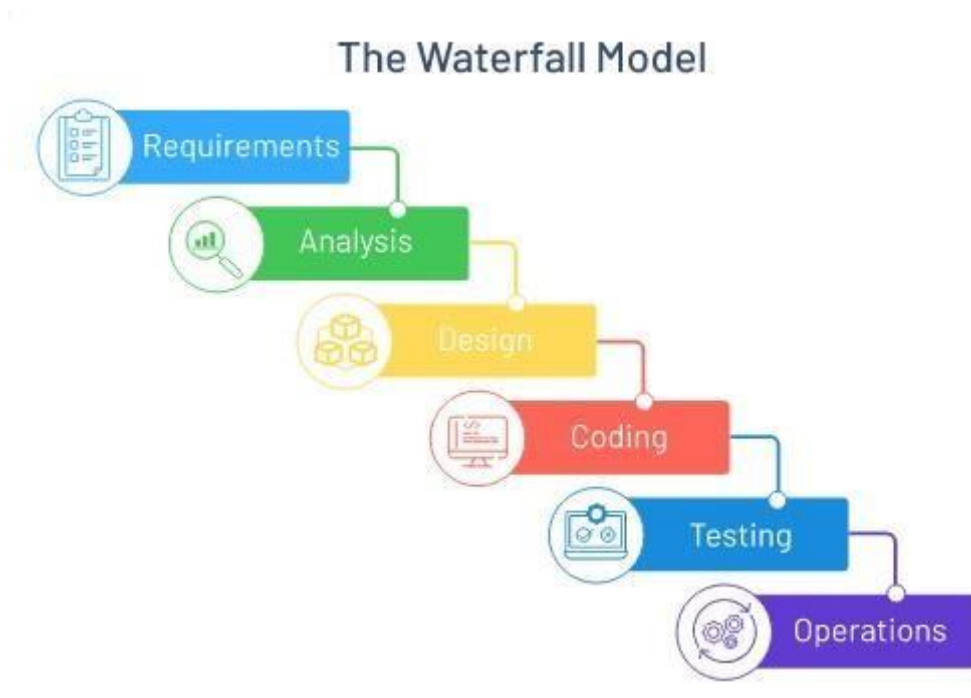
The Waterfall Model

Figure 3.1:   Waterfall model

2.1 Phases of the Chosen Methodology

The waterfall model represents a linear software development approach, progressing in a downward sequence, akin to cascading waterfalls. This model, known for its simplicity and ease of comprehension, is well-suited for small projects characterized by well-defined requirements and minimal changes. The distinct phases of the waterfall model include:

1. Requirements Gathering: During this initial phase, the software requirements are gathered from the client and stakeholders, specifically from Woodfire Restaurant in this context. The collected requirements are analyzed and documented in a requirement specification document.

2. Design: In this phase, the system and software architecture are intricately designed to meet the requirements outlined in the first phase. For this application, the chosen software design architecture is the MVC model.

3. Implementation: The actual development of the system occurs in this phase, with the code being written in the programming language selected during the design phase (PSM2).

4. Testing: This phase involves testing the software to ensure it meets the required standards as defined by stakeholders.

5. Deployment: The software is deployed in the production environment during this phase, making it accessible to users.

6. Maintenance: Post-deployment, the software undergoes maintenance to address any defects discovered and to implement changes or enhancements as necessary.

The waterfall model strictly adheres to a linear progression, requiring completion of each phase before moving on to the next. This characteristic may render it inflexible and less suitable for projects with dynamic requirements or intricate systems. However, given that the development of this system follows a linear schedule and the requirements are well-specified, the utilization of the waterfall model is deemed the most appropriate choice.

2.2 Technology Used to Develop

The MERN stack is a well-known collection of web development technologies. The following are its constituent parts: MongoDB is a NoSQL database used to store data for an application. Express: A web application framework that runs on the server and is used to develop the backend of an application. The application's frontend is constructed using React, a JavaScript toolkit for constructing user interfaces. Node.js is a runtime environment that enables server-side execution of JavaScript. There are a few reasons why the MERN stack is a viable choice for designing a restaurant system:

- MERN's whole stack is written in JavaScript, allowing a single language to be used for the frontend and backend of an application. This makes application development and maintenance simpler.

- MERN is built on current technologies that are widely used and well- supported. This can make it simpler to locate developers knowledgeable with the stack, as well as resources and support for the technologies.

- MERN is adaptable and scalable, thus it may be used to create a broad variety of applications, ranging from simple, single-page apps to huge, complicated systems. This might make it a smart alternative for constructing a restaurant system with a range of features and specifications.

2.3 System Requirement Analysis

Hardware & Software	Explanation
Operating system	Windows 10
Internet Connection	To connect with the internet which will help with the development process
Storage	Storage is used to store data permanently. There are two main types of storage: hard disk drives (HDDs) and solid- state drives (SSDs). HDDs use spinning disks to store data, while SSDs use interconnected flash-memory chips. SSDs are generally faster and more reliable than HDDs but are typically more expensive on a per-gigabyte basis.
Visual Studio Code IDE	Used as a platform to develop the system
MongoDB	Used as a Database for the system
Heroku	Used to Deploy the web application
Laragon	Used for software development locally

diagram.io	Used to draw all needed diagrams
Input/output devices	Input/output (I/O) devices are used to communicate with the system. Examples include keyboards, mice, monitors, printers, and speakers.
Peripheral devices	Peripheral devices are devices that are connected to the system but are not essential for its operation. Examples Monitor, Mouse and Keyboard.

Table 3.1: List of Hardware & Software Specification

The segment on System Requirement Analysis provides a comprehensive examination of the requirements for the system being developed. The goal is to define the necessary hardware and software needed by the system to ensure its successful implementation.

Device	Explanation
Phone	A web application to be used by users in the restaurant since phones are convenient and easy to carry
Internet Router	The internet router is needed for the use of the application to connect with the database

Table 3.2: List of Devices for the Application

HAPTER 3

REQUIREMENT ANALYSIS AND DESIGN

3.1 Introduction

Requirement analysis and design represent critical phases in the software development process. Requirement analysis focuses on identifying and comprehending the needs and expectations of stakeholders, including users, customers, and business owners. This phase involves gathering and documenting various requirements for the software system, encompassing both functional and non-functional aspects, along with any constraints or limitations. The primary objective of requirement analysis is to precisely define the desired functionality and behavior of the software system.

Design, on the other hand, entails devising a plan for the implementation of the software system. This phase involves determining the overall architecture of the system, specifying the individual components and technologies to be employed. Detailed technical specifications and a comprehensive plan for system testing and debugging are also developed during the design phase.

Collectively, requirement analysis and design serve as the foundation for the subsequent development and implementation of a software system. Thorough and accurate completion of these phases is crucial to ensuring that the final product aligns with stakeholder needs and operates as intended. In this chapter, numerous diagrams, including activity diagrams, sequence diagrams, ERD (Entity-Relationship Diagrams), SRS (Software Requirements Specification), SDD (Software Design Document), and STD (Software Test Document), will be presented in the appendices to organize the document effectively.

3.2 Requirement Analysis

In this segment all needed UML diagrams like activity Diagrams, Sequence Diagrams, Use Case Diagram, Use Case Description and the database design (ERD)
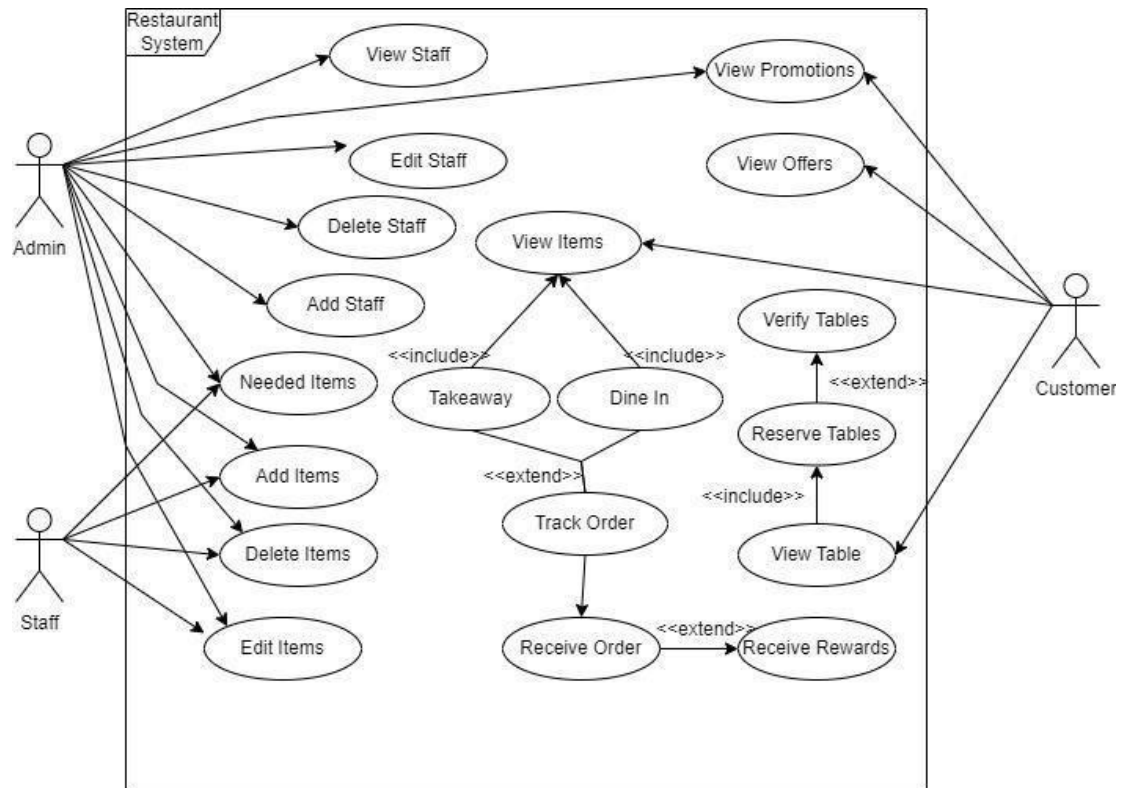
Figure 4.1:   Main Use Case Diagram

Since the remaining figures are related to the SRS and the SDD all of the figures willbe given the Appendix area.

3.2 Project Design

A restaurant software system is a valuable tool for restaurant owners and managers, offering comprehensive management capabilities across different facets of their business. This system enables the tracking of customer data, efficient scheduling of employee shifts, report generation, and facilitates the processing of online orders and reservations. The design of a restaurant software system demands meticulous attention to customer preferences and expectations. Crucially, the design should prioritize attributes such as user-friendliness, reliability, and scalability since the system plays a pivotal role in the daily operations of the restaurant. The effectiveness of the software system hinges on its ability to seamlessly integrate into and enhance the various aspects of restaurant management.

3.3 Database Design

The need for a database design is done to help with the development of the system there is also the need to specify primary keys in the database to help with data manipulation and data presentation as well as data management.
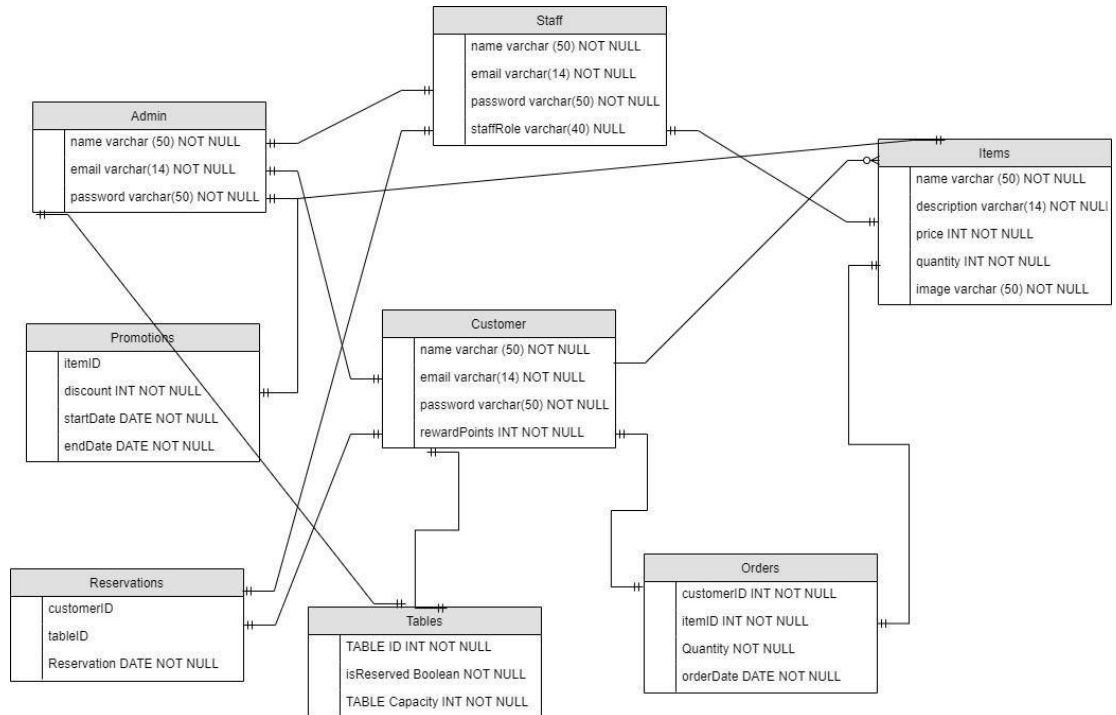

Figure 4.2:   ERD Diagram

3.4 Interface Design

In this section, we will present the design of the user interface (UI) for the system. The design will encompass all the pages of the system, taking into consideration established best practices for optimal user experience (UX). Given the visual and illustrative nature of this aspect, all design elements, including images and illustrations, will be provided in the appendix segment. This comprehensive showcase aims to offer a detailed and visually informative representation of the UI design, ensuring a user-friendly and aesthetically pleasing experience for system users.
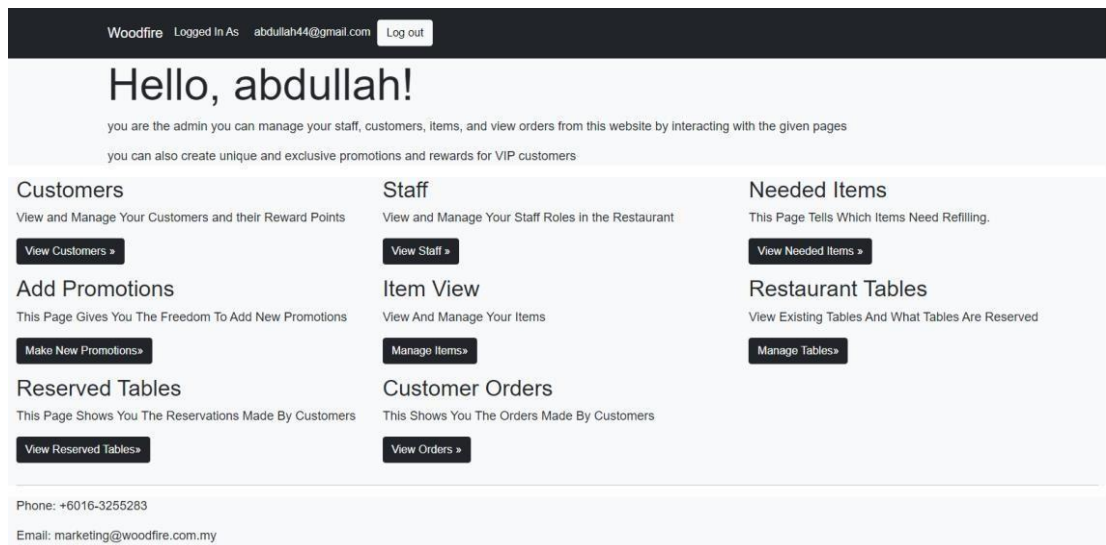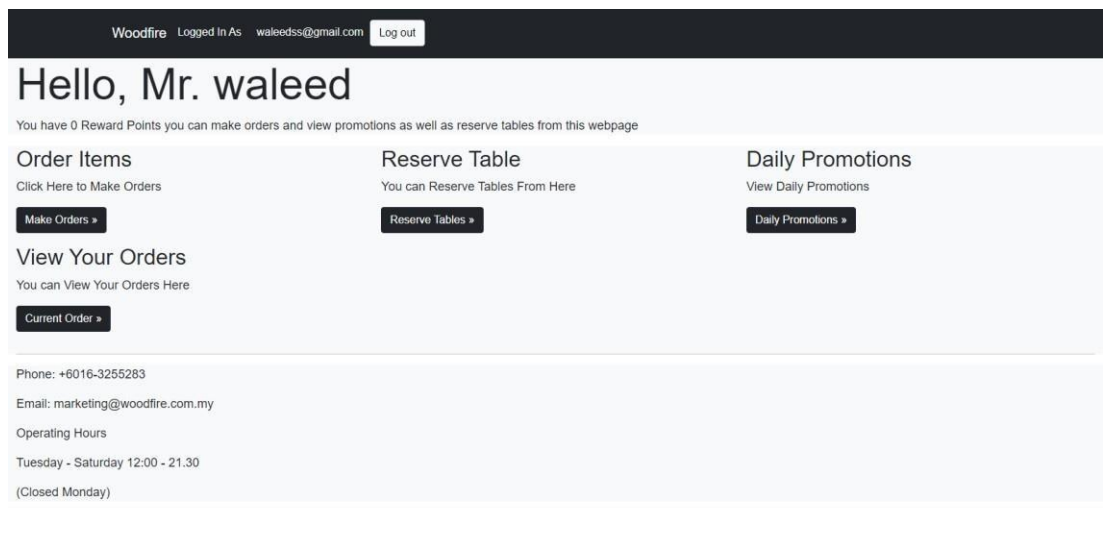
Figure 4.3:   Admin View

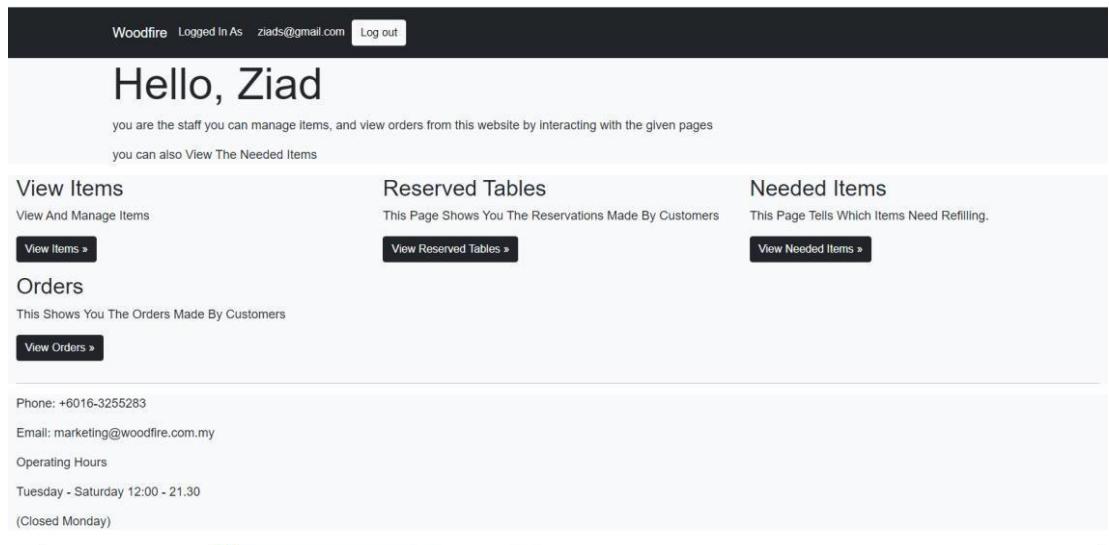Figure 4.4:   Customer View

Figure 4.5:   Staff View

CHAPTER 4

CONCLUSION

4.1 Introduction

In conclusion, this PSM1 has undertaken a comprehensive documentation process to outline the various aspects of the proposed system. The journey began with an introduction that laid the groundwork for the project. Subsequently, a literature review was conducted to delve into the chosen technology, the MERN stack. A significant decision was made to adopt the waterfall model for the system's development, providing a structured and sequential approach.

The pivotal fourth chapter covered the essential elements of software development, encompassing Software Requirement Specification (SRS), Software Design and Architecture, and Software Testing documentation. This segment played a crucial role in furnishing all necessary documentation vital for the systematic development of the proposed system. Each chapter has contributed to building a comprehensive understanding of the project, from its inception to the detailed specifications and design considerations.

By following this documentation journey, a robust foundation has been laid for the subsequent phases of development and implementation. The adherence to best practices, technological considerations, and a structured approach provided in this documentation aims to ensure the successful realization of the envisioned system. The journey continues towards the practical execution of the system, guided by the insights and planning encapsulated in this documentation.

4.2 Achievement of Project Objectives

The system provides multiple channels for table reservations, including the convenient use of QR codes. Managing restaurants can be challenging, and to alleviate this, the system empowers administrators to efficiently oversee their menu, staff, customers, and tables. Additionally, the system enhances the dining experience for customers by rewarding them for their purchases, thereby making their overall experience more enjoyable. Furthermore, the system offers a feature where it recommends daily promotional items to administrators, contributing to increased sales and a proactive approach in enhancing the overall customer experience. The multifaceted capabilities of the system aim to streamline restaurant management, improve customer satisfaction, and boost sales through thoughtful features and functionalities.

4.3 Suggestions for Future Improvement

The Woodfire Ordering Management System has the potential for future enhancements by integrating cutting-edge technologies. Given the continuous evolution of technology, there are opportunities for improvement within the system. One avenue for advancement involves the integration of artificial intelligence (AI) to collect data from customers, thereby enhancing the daily recommendation function. By leveraging AI, the system can intelligently analyze customer preferences and behaviors, making the recommendation feature more personalized and beneficial.

Another potential improvement is the automation of the staff promotion function. The system could be designed to intelligently recognize and reward exceptional performance by staff members. For instance, if a staff member consistently performs well in their restaurant duties, the system could automatically initiate a promotion for that staff member. This automation not only streamlines the promotion process but also ensures that recognition is timely and based on merit. These advancements align with the continuous pursuit of leveraging the latest technologies to optimize the functionality and efficiency of the Woodfire Ordering Management System.

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