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ONLINE FOOD ORDERING SYSTEM FEATURING CHATBOT FOR CAFETERIA IN UITM TAPAH

Azuwa Jalaludin[1], **Azilawati Azizan**[2*], **Nurkhairizan Khairudin**[3]

[1,2*,3] *College of Computing, Informatics and Mathematics, Universiti Teknologi MARA, Perak Branch, Tapah Campus, Perak Malaysia*

[1]azuwajalaludinnn@gmail.com, [2*]azila899@uitm.edu.my, [3]nurkh098@uitm.edu.my

ABSTRACT

The popularity of online food ordering systems has surged in recent years, offering a convenient solution for customers to place food orders from cafeterias. This trend is ideal for use in university cafeterias as well, which are typically overcrowded and noisy, particularly during peak hours. Therefore, this project aimed to address these challenges by designing a user-friendly web-based food ordering system in the context of cafeterias at the University Teknologi MARA (UiTM) Tapah Campus. The primary objective was to simplify the process for customers to select their desired meals, add them to a virtual cart, and effortlessly submit their orders and eliminating the need for long queues. The next objective is to enhance usability; hence, we integrated the Google Dialogflow chatbot feature into the website. The chatbot is an intelligent assistant that provides guidance, answers queries, and ensures a seamless ordering experience. The last objective is to validate the usability of the proposed system. Following the systems development life cycle (SDLC), our project successfully delivered an online food ordering system with an integrated chatbot for the universities' cafeteria. The system addresses queuing issues, improves cafeteria operations, and enriches customer experiences. The system received about 70% positive feedback and was considered easy to access and use by most users. Meanwhile, the chatbot's usability produced highly positive feedback with 100% of the users thought the chatbot was easy to use and helpful.

Keywords*: Cafeteria, Chatbot, Online Food Ordering System, UiTM Tapah.*

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1. Introduction

The old-fashioned manual ordering of food in university cafeterias often leads to long queues and frustrating delays, leading to significant inconvenience. A common practice when taking orders at a cafeteria is to write down each food order on a sheet of paper and then give the orders to the kitchen for further processing (Samariya, Raval, & Matariya, 2015). While the orders are being processed in the kitchen, the sequence of the food order might be switched with other orders. Furthermore, if the consumer wants to place more orders, he or she must go to the cafeteria's counter to do so. This procedure is not only ineffective but can also lead customers to bypass the queue.

On the contrary, a systematic online food ordering system, as emphasized in the study by Li, Mirosa, and Bremer (2020), not only facilitates the placement of orders but also enables customers to easily track their order status. This transition to digital ordering mechanisms has been highlighted as a means to enhance the overall quality of cafeteria orders, as noted by Kurniawan, Sutawan, and Amalia (2019). Beyond the immediate conveniences, this digital revolution also has the potential to increase the efficiency and effectiveness of purchasing and selling operations (Ilamsyah, Robertz, & Fitriani, 2019). Furthermore, this digitized approach contributes to strengthening the security of the ordering process, thus offering additional benefits (Nizar et al., 2023).

In addition to improve the user experience within the ordering system, chatbot technology has emerged as a critical component in enhancing the efficacy of online applications. Research by Aslam (2023) highlights the integral role of chatbot in enhancing user engagement and support. These AI-powered conversational agents adeptly address user inquiries, streamline navigation, and provide real-time assistance, thus fostering a more dynamic and user-centric interaction (Tamara, Tumbuan, & Gunawan, 2023).

Hence, this project proposes an online food ordering system equipped with a chatbot to be implemented in university cafeterias. This initiative aims to enhance the convenience of the university community by providing them with the ability to place their food orders using either their smartphones or computers. Furthermore, the integration of a chatbot feature into the system provides real-time assistance, answering queries and suggesting popular dishes. This system will definitely improve efficiency, reduce wait times, and increase customer satisfaction.

2. Related Works

2.1 Food Ordering System

In the evolving landscape of dining experiences, the shift from traditional manual food ordering methods to modern online systems has transformed the way customers interact with cafeterias and restaurants.

In the past, customers had to wait in line at the food store or place their orders using staff, pen, and paper. Traditional manual food ordering involves customers physically visiting the cafeteria, waiting in queues, and placing orders with staff, which can be time-consuming, especially during busy periods. This method is prone to errors due to handwritten orders and manual processing, leading to inefficiencies and longer wait times. Additionally, it requires customers to be present on-site, limiting accessibility and inconveniencing those with busy schedules. In contrast, modern online food ordering systems offer convenience as customers can place orders using their devices from anywhere. These systems streamline order processing, reducing wait times, and ensuring accurate orders through digital communication. With 24/7 availability, customers can order according to their schedules, and features like visual menus and order tracking enhance the user experience. Moreover, online systems gather data on customer preferences, aiding cafeterias in their offerings and enhancing customer satisfaction (Kan & Wai, 2020).

Most restaurants today prioritize fast order preparation and delivery over offering a richer dining experience. Moreover, today's generation prefers something that saves time and simplifies their food choices (Roy, Spiliotopoulou, & de Vries, 2022). Customers can view and order meals and drinks from anywhere using the website. Thus, this technology of current online ordering system benefits many customers and café owners in universities by making it simple for them to order food from anywhere on campus with a sufficient choice of menu options, in less time, and for less money (Hatim et al., 2019).

2.2 Chatbot

A chatbot is a computer program or an artificial intelligence (AI) system designed to imitate human conversation through text or voice interactions. Chatbots are programmed to understand and respond to user queries and inputs, providing information, assistance, and sometimes even entertainment (Nicolescu & Tudorache, 2022). They are used in various applications, such as customer service, virtual assistants, e-commerce, healthcare, and more. Chatbots utilize natural language processing (NLP) techniques to interpret and generate human language. They can understand the context, intent, and sentiment behind user messages, allowing them to provide relevant and contextually appropriate responses (Adamopoulou & Moussiades, 2020). Chatbots can operate through messaging platforms, websites, mobile apps, and other communication channels.

There are different types of chatbots, ranging from rule-based chatbots that follow predefined scripts, to AI-powered chatbots that use machine learning to improve their interactions over time (Haristiani, 2019). AI-driven chatbots often use large datasets to learn from previous conversations and adapt their responses accordingly (Nirala, Singh, & Purani, 2022). In various applications, chatbots aim to enhance user experiences by providing instant responses, reducing the need for human intervention, and offering efficient and consistent interactions around the clock.

In the meantime, several well-known APIs have emerged as alternatives for constructing enhanced conversational experiences in the field of chatbot development (Shakhovska, Basystiuk, & Shakhovska, 2019). Google's Dialogflow stands out as a popular choice, offering natural language processing and contextual understanding to create robust chatbots. Microsoft's Bot Framework provides a versatile toolkit for building and deploying chatbots across diverse platforms, complemented by its integration with Azure services. IBM's Watson Assistant empowers developers to create AI-powered chatbots with multilingual support and sophisticated context management (Adam, Wessel, & Benlian, 2021). Meanwhile, Rasa, an open-source conversational AI platform, caters to those seeking in-depth customization through its NLP and dialogue management capabilities. Amazon Lex, a part of AWS, extends the power of Amazon Alexa to developers, enabling voice and text-based interactions. For those drawn to open-source solutions, Botpress offers a visual interface and scripting abilities, while Pandorabots equips developers with AIML scripting to craft AI-enhanced chatbots (Islam, 2023). Whether seeking extensive features, cross-platform compatibility, or flexibility in customization, these APIs serve as valuable resources for creating chatbots tailored to diverse needs and applications.

Today’s online food ordering systems have employed the power of chatbots to elevate their food ordering processes, redefining customer experiences in the digital dining landscape. Notable brands like Domino's Pizza have incorporated AI-driven chatbots such as "DOM" into their platforms, allowing customers to seamlessly customize and track their orders. Starbucks, on the other hand, leverages a chatbot within their mobile app, enabling customers to pre-order drinks and minimize wait times. McDonald's has introduced "McBot" on messaging platforms, responding to customer queries and facilitating orders efficiently. KFC enhances its online ordering experience through the "KFC Bot," adeptly guiding users through the selection and confirmation of their choices. Pizza Hut's "Pizza Hut Virtual Assistant" similarly enhances the ordering process and answers customer inquiries. These situations highlight how chatbots have become important tools in modernizing food ordering, offering intuitive interfaces, personalized recommendations, and instant support. Through this chatbot integration, food service providers can further increase user satisfaction and refine the art of efficient online food ordering.

In summary, the transition from manual food ordering methods to modern online systems has brought about significant improvements in convenience, efficiency, accuracy, and the overall customer experience for food service providers.

3. Methodology

This project uses the systems development life cycle (SDLC) as the main framework. It describes the processes of an information system development project, from the early phase of a feasibility study to the implementation of the finished application (Mahalakshmi & Sundararajan, 2013). Figure 1 shows the diagram of the system development life cycle.

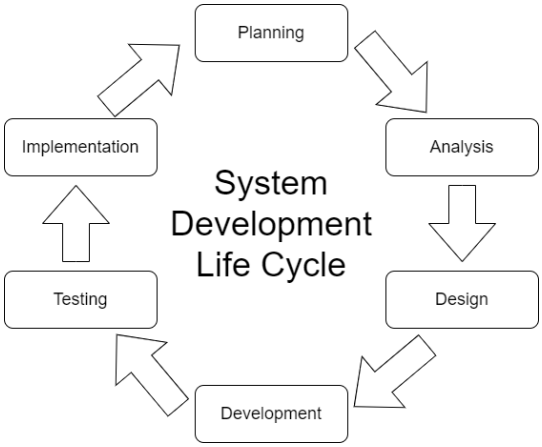

Figure 1. The System Development Life Cycle.

Planning - This initial stage establishes a strong foundation and defines the project's concept. Clear requirements for addressing the online food ordering system were determined during this phase.

Analysis - Several interviews with system users, particularly cafeteria owners and their customers (students and university staff) were conducted in this phase, with the aim of gathering as much information as possible. This data gathering helps in understanding the preferences and expectations of the users for the proposed system. Furthermore, an in-depth analysis of the food ordering process at a university cafeteria helps in the identification of input and output data flows.

Design: This phase outlines the system components, interactions, and parts. Adobe Dreamweaver is utilized for creating the interfaces of the proposed system.

Development - This project used Adobe Dreamweaver and MySQL software to create a two-tier website for staff and admin. The database stores all customer and staff-entered information, including orders.

Testing - Upon development, the system is tested comprehensively by integrating modules into a single system (Ameya Shastri Pothukuchi, Lakshmi Vasuda Kota, 2023). The proposed system underwent testing involving both staff and customer users.

Maintenance - After the project has reached its full efficiency level, the SDLC's maintenance phase begins, such as upgrades, corrections, and replacements. However, this system did not undergo the maintenance phase since it is a prototype version.

3.1 System Flow

To further explain the flow of the proposed system is illustrated with the help of a system architecture diagram as shown in Figure 2.

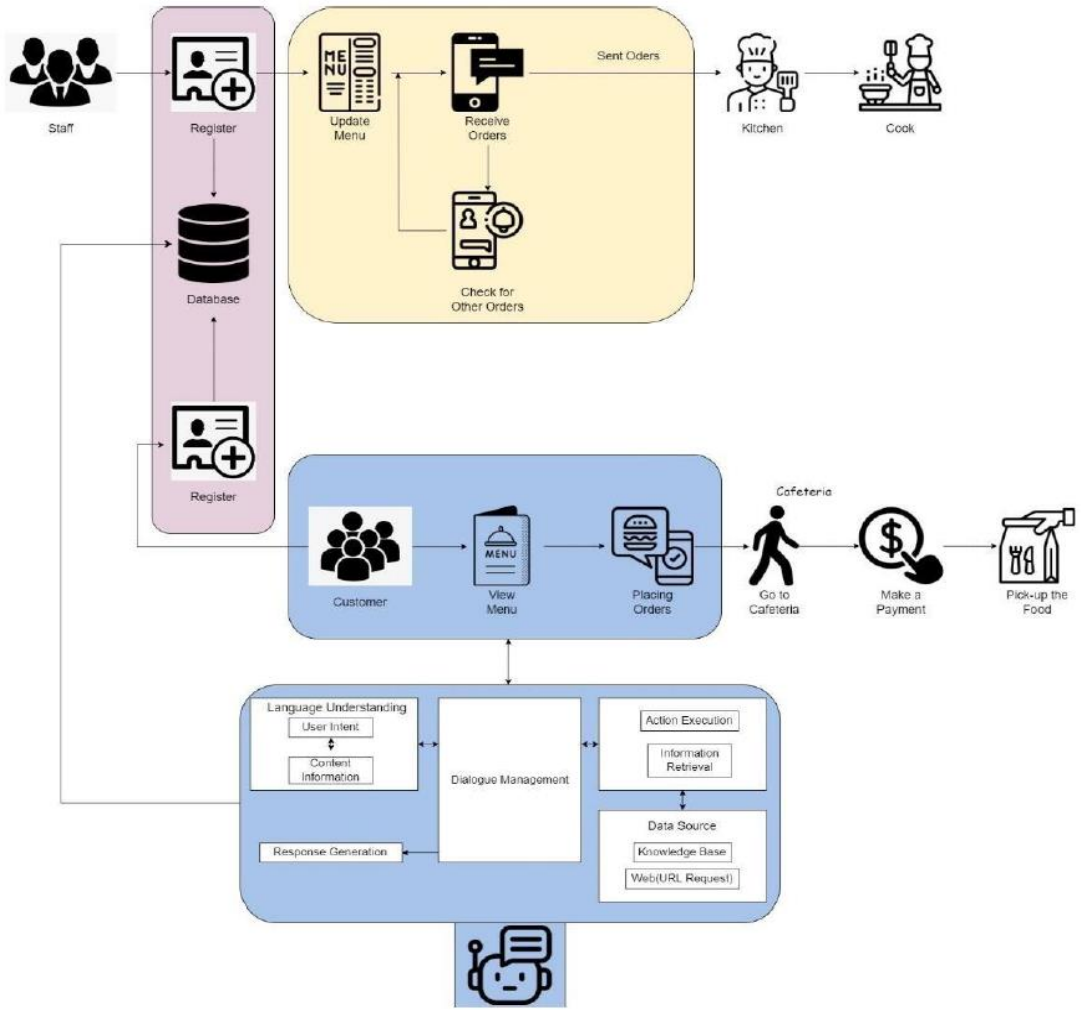

Figure 2. System Architecture.

This system covers two types of users: cafeteria staff and customers. Both staff and customers need to register before they can use the system. Registered staff can enter, update and delete menus in the system. It includes dishes, drinks, prices and pictures of the menu.

When a food order enters the system, that information will be sent to the kitchen staff so that they can prepare the food. Once the ordered food is ready, the kitchen staff will update the order status in the system.

Meanwhile, registered customers can view all menus and place their orders easily. The system offers the convenience of chatbot communication. This chatbot effectively responds to customer inquiries regarding the cafeteria's offerings. To use the chatbots, customers should ask cafeteria-related queries in a simple way. The chatbot is designed to answer common questions, thus enhancing the overall user experience.

The overall development of the system used PHP language, HTML script, CSS, Adobe Dreamweaver IDE and Notepad++.

3.2 User Interface Design

The proposed system aims to reduce complexity while placing food order. Therefore, the user interface design used the concepts of simple, easy and clear. This interface design was created using Adobe Dreamweaver and PHP language.

3.2.1 Admin Interface

Admins need to fill in the username and password to log in to the website. Then the system will display an admin homepage consists of orders, menu, category list, users and site settings. Figure 3 shows the admin login page and homepage.

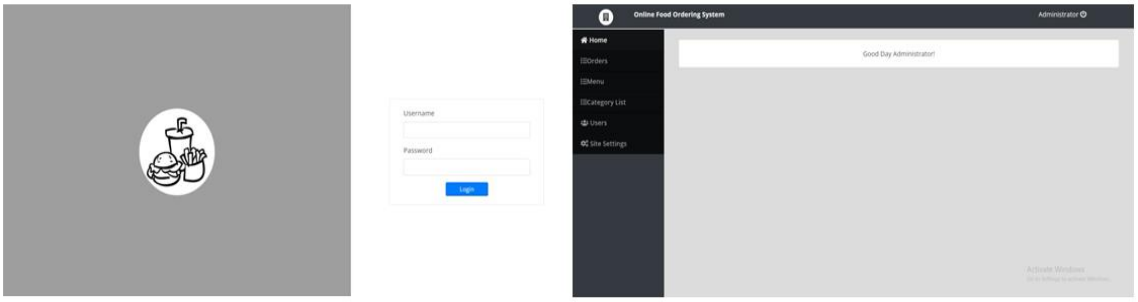

Figure 3. The Admin Login Page and Homepage.

Order page interface will display all the orders that have been submitted by customers. In this page, admin needs to view and confirm orders for verification. After verification, the status will change from ‘for verification’ to ‘confirmed’ statement as shown in Figure 4.

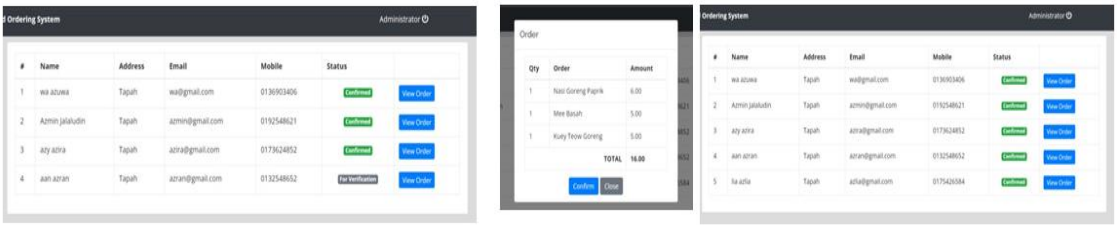

Figure 4. Order Page, Confirm Order and Verification Statement.

In the menu page, admin can insert, edit and delete the menu in menu form. On the right side, the entire menu will display including the name, description and the price of the menu. On the left side, admin can update the menu by filling in the information such as menu name, description, category, price and the image of the menu. Currently, the available categories are Nasi, Maggie, Mee and Kuey Teow. If there are any changes in category, the admin can insert, edit and delete in category form. Figure 5 shows the menu page and category list.

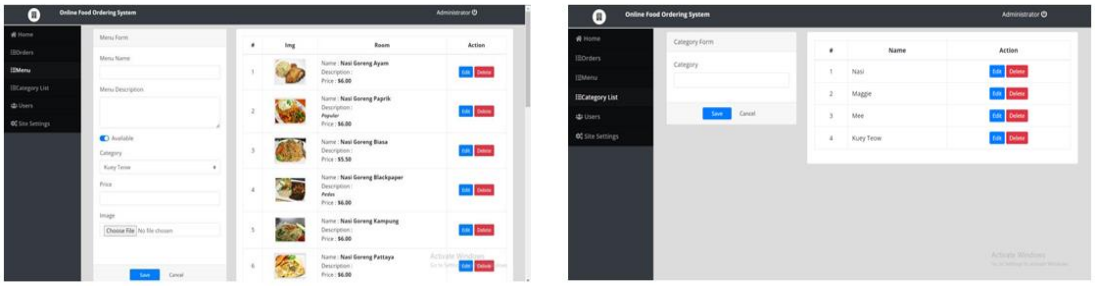

Figure 5. Menu Page and Category List Page.

3.2.2 Customer Interface

Customer homepage is the main interface that is displayed when customer open the system. The customer can directly click 'View' and click 'Add to Cart' button if they want to make an order. To place an order, customers must create an account by providing their first and last name, contact number, address, email address and password. The customer must click the 'Create' button to save their account. Figure 6 shows the customer homepage and login page.

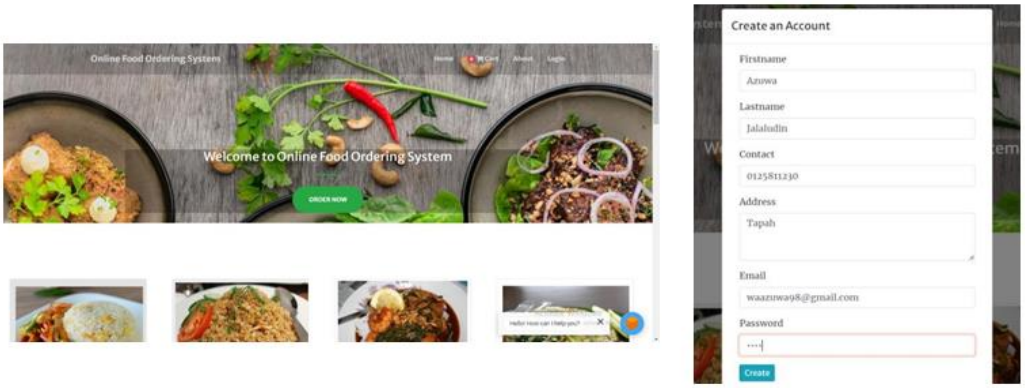

Figure 6. Customer Homepage and Login Page.

In the view menu page, customers can click directly on the 'View' button to see the description of the menu. After clicking the 'View' button, customers can simply add the quantity of food and click the "Add to Cart" button. Customers can click on the '+' or '-' button to increase or decrease the amount of food. After selecting the food to buy, the customer must click on the 'Proceed to Checkout' button for the next process. On the checkout page, the customer does not have to enter any information for confirmation, because the information has been filled in automatically. Figure 7 shows the view menu page, cart list page and checkout page for the customer.

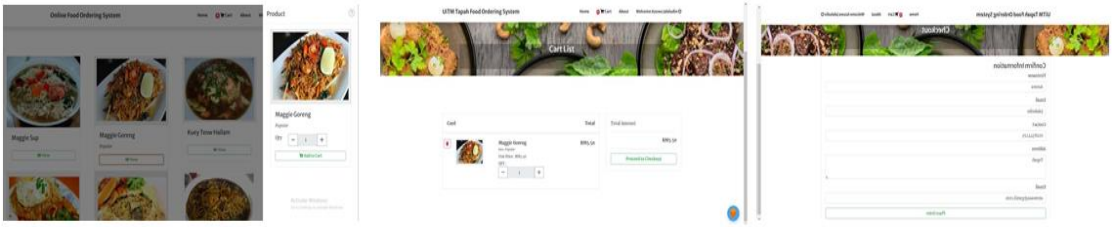

Figure 7. View Menu Page, Cart List Page and Checkout Page.

3.3 Chatbot Development

Our system features a user-friendly chatbot designed to support customer inquiries about the cafeteria and its offerings. Instead of navigating through various pages to find answers, customers can simply ask the chatbot their queries, and it will promptly provide the information they need. We used Google Dialogflow ES to create our chatbot. Dialogflow is a cloud-based conversational AI platform. It can enhance user interactions on various digital platforms, offering a user-friendly conversational experience. All the steps taken for creating the chatbot are as follows:

i. Sign Up for a Google Cloud Account - at https://cloud.google.com/
ii. Create a new Dialogflow agent (the bot) - at the Dialogflow Console (https://dialogflow.cloud.google.com/).
iii. Define Intents - which is used to group similar expression (human query) into a group that will make the chatbot understand the expressions better.
iv. Training Phrases (expression) and responses - For each intent, expressions were added and how the chatbot should respond was also defined. Unlimited expression can be included for each intent. The inclusion of more expression variations improves the agent's chances of understanding and triggering the correct intent.
v. Integration - the chatbot was set up and integrated accordingly with the website (online food ordering system).
vi. Testing - used the Dialogflow simulator to test the chatbot by entering sample customer's queries and see how the bot responds.
vii. Deploy - deploy it to the chosen platform to make it accessible to users.

Table 1 shows the type of queries and description used in the chatbot, which includes informational, transactional, support and cross-sell queries.

Table 1. Types of query and description.

Chatbot Query Type	Description	Example Query
Informational queries	These queries are intended to help customers find out more about the online ordering process for food, their menus, and delivery options.	"How can I order food online?" "Tell me about your delivery options."
Transactional queries	These queries are intended to complete a transaction, such as placing an order, following up on an order, or making a payment	"How can I make a payment?"
Support queries	These queries are designed to get help with the food ordering process, such as guidance on how to use the system, how to address issues, or how to get in touch with customer service.	"How can I talk to your customer service?"
Cross-sell queries	These inquiries aim to convince the customer to buy more products or services by recommending food items.	"What dishes do you recommend?"

Table 2 shows some samples of query being used in the chatbot testing and the responses that the chatbot generate.

Table 2. Sample customer's query and chatbot's answers.

Queries by Customer	Chatbot Answer
Are there any additional charges for online orders?	No, there are no additional charges for online orders. The price you see on our website is the price you pay.
What is the cheapest price on the menu?	Nasi Bujang. It only costs RM2.00
Do you have a customer support team I can contact with my online order?	You can contact our customer support team at 0136903406. They are available to help you with any queries or concerns you may have.
Is there any delivery for non-resident student?	Sorry, non-resident student needs to go to the cafeteria and pick-up their own food at the cafeteria's counter
What food do you recommend for me?	Nasi Goreng Paprik. Many customers choose nasi goreng paprik as their favorite food
How long does it typically take for the food to be done?	The food may be ready within 5 to 10 minutes. However, factors such as the current level of customer demand can also influence the overall preparation time.
How can I place an online food order?	Please create your own account by providing sign up your first name, last name, contact, address, email and password
How to make payment?	You need to go to the cafeteria and pay at the counter
What time does the business open?	We are available to serve you from 8am to 10pm, seven days a week
Can I track the status of my online food order?	No, unfortunately, you cannot track the status of your online food order

Figure 8 shows real conversation between customer and chatbot on our food ordering system. The customer asks about the recommended food, payment and food delivery.

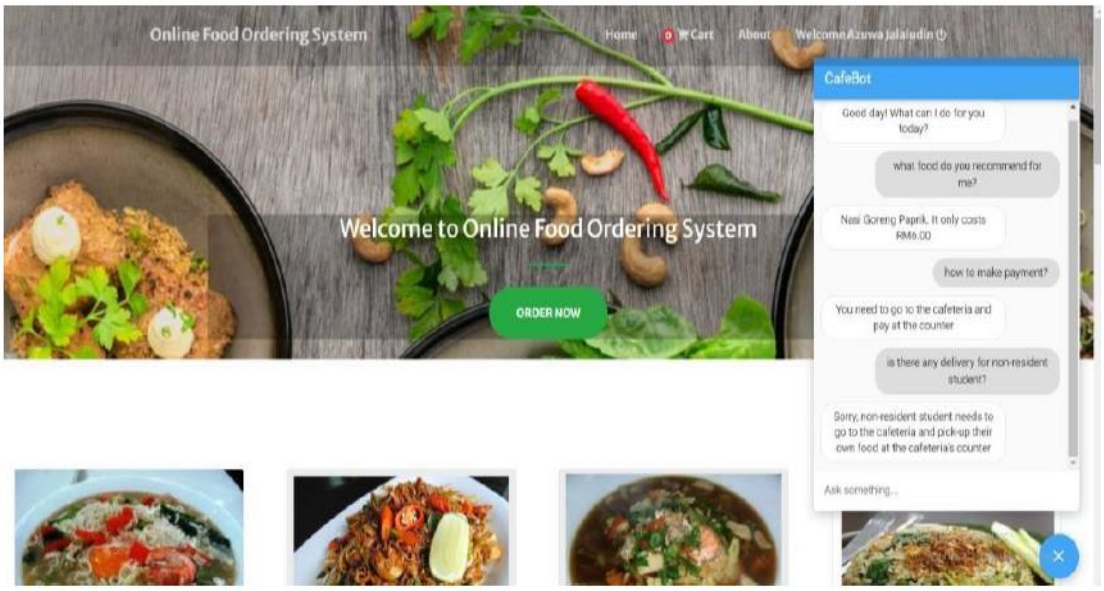

Figure 8. Chatbot Real Conversation.

4. Usability Testing and Discussion

Usability testing was conducted to evaluate the user experience and usability of a system (Andreoni, 2023). During the usability testing for the online food ordering system, a group of users (age between 21 -26) from three different faculties which are Faculty of Applied Sciences, the Faculty of Accountancy, and the Faculty of Computing, Informatics and Media were selected. All respondents are from UiTM Tapah students and non-resident students. The tasks given to participants included viewing the menu, chatting with the chatbot, and placing an order. Their actions and verbal feedback were closely observed and recorded throughout the testing sessions.

4.1 Overall Website

Overall satisfaction with the website was rated based on the responses of the 10 participants on a scale of 1 to 5, with 1 indicating that the website was difficult to use and 5 indicating that it was easy to use. The website received a score of 5 from the majority of respondents (70%) who gave it the highest possible rating. In addition, 30% of respondents gave the website a score of 4. Figure 9 shows the results of respondent's satisfaction about the overall website. These results indicate that the website received mostly positive feedback and was considered easy to access and use by most individuals.

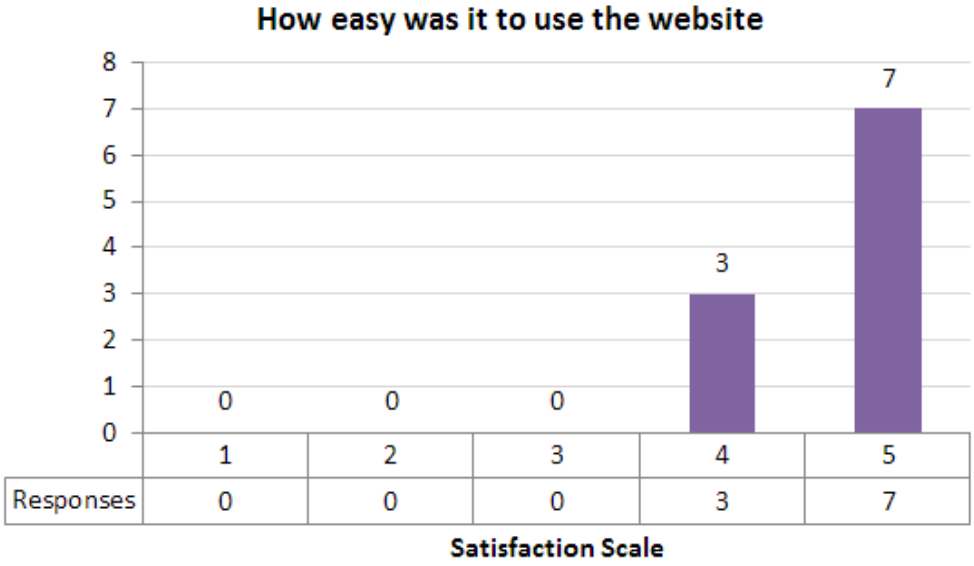

Figure 9. Results of the Respondent's Satisfaction About the Overall Website.

4.2 Chatbot Feature

Based on the feedback from respondents, the chatbot's usability received highly favorable reviews. Every participant found the chatbot easy to use, and none expressed neutral feedback or encountered any difficulties or uncertainties while using it. These results indicate that the chatbot was effectively designed, offering all respondents a simple and straightforward experience.

4.3 Order Process

Based on the feedback, 70% of those who responded gave the order process their highest rating of 5, showing their level of satisfaction. In addition, 30% of those surveyed gave the order process a score of 4. Figure 10 shows the result of the respondent's satisfaction with the order process. These results show that the order process received positive feedback, with a significant majority finding it easy to navigate and complete their orders.

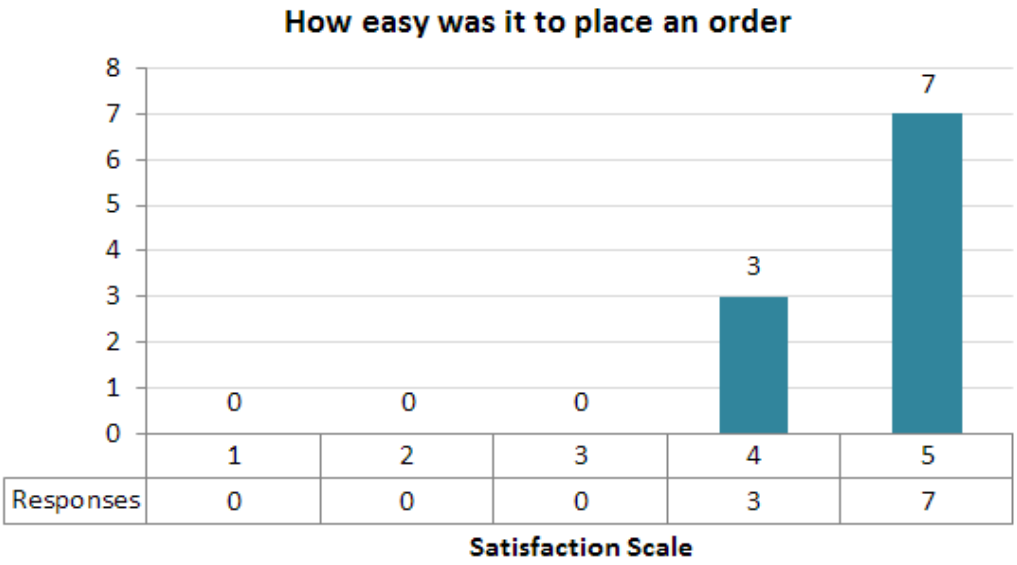

Figure 10. Result of the Respondent's Satisfaction About the Order Process.

4.4 Recommendation to others

Every respondent expressed agreement that they would recommend the online food ordering system to others. This shows how effectively the system enables the user to make effective use of the system. Without exception, their collective consensus highlights the system's ability to empower users with an effective and user-friendly experience.

5. Conclusion

In conclusion, this study addresses the limitations of conventional queuing systems by introducing an innovative online food ordering system with a chatbot feature. This advancement aligns with the goal of enhancing customer service and productivity at the UiTM Tapah cafeteria. Moving forward, the study suggests several recommendations for future implementation, including automated order status push notifications, mobile application development, and the integration of secure online payment methods.

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Author Contribution

Author1 developed the system, conducted the testing, wrote the methodology and interpreted the testing results. Author2 supervised the development of the system, wrote the abstract, introduction, related works, conclusion and oversaw the entire paper. Author3 anchored the review, made a revision of the entire paper and apply the formatting.

Conflict of Interest

The authors have no conflicts of interest to declare.

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