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TRƯỜNG ĐẠI HỌC KINH TẾ - LUẬT
KHOA HỆ THỐNG THÔNG TIN

COMPANY: JOLLIBEE

FINAL PROJECT

PROJECT NAME: CUSTOMIZED ORDER FOOD BY CUSTOMER IN JOLLIBEE VIETNAM MOBILE APP

INFORMATION SYSTEM ANALYSIS AND DESIGN COURSE

Group 7

Version 2.0

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Commitments

Jollibee is committed to upgrading and improving its mobile application to meet users' needs for convenience, personalization, and safety. We optimize based on the login experience and introduce meal portion adjustment to better bring a smooth and user-friendly experience.

In line with the policies of Jollibee on integrity and transparency, we hereby attest that the contents herein reflect original material and that all information contained in this report is plagiarism-free. We hereby ensure that the insights, strategies, and proposed improvements were worked out through internal research, analysis, and direct user feedback without unauthorized utilization of sources outside our organization.

References, benchmarks, and data used from external sources have been duly cited to respect intellectual property rights and follow industrial norms for the acknowledgment of sources. This commitment makes certain that our documentation shows the authenticity of our efforts and aligns with Jollibee standards of excellence and ethical conduct.

Executive Summary

Our project - "Ordering Food According to Customers' Requests via Jollibee Vietnam's Mobile Application" is carried out with the aim of designing an additional function to the traditional application ordering process that allows customers of the brand to adjust their food portions according to their needs, health status and preferences. Thanks to that, the brand can improve the user experience and increase customer satisfaction with the online ordering service of the Jollibee brand - a famous brand in the fast food business. Sponsored by Dr. Ho Trung Thanh and managed by Phan Thanh Giang, through understanding the trends and aspirations of consumers as well as developing an application based on that with the aim of meeting those diverse needs, this project promises to bring significant benefits to Jollibee Vietnam along with enhancing the brand image in the fast food industry which is full of competition in today's era.

The first and most important benefits of the project are the enhancement of customer loyalty, which leads to a competitive advantage for Jollibee compared to its competitors in the same industry. Secondly, with a significant number of loyal customers, Jollibee's revenue will also skyrocket, creating a solid position for the brand in the market. The entire construction and design process of the project is expected to last about six months and is estimated to be completed on March 20, 2025.

In addition to the customizing portion process mentioned above, the new system will include another process, which is the login/signup process. This process is included in the project to describe to consumers how they will approach ordering through the brand's application when they become a Jollibee customer. One unique feature that sets Jollibee apart from its competitors is that users can place orders without having to log in or create an account on the app. This is convenient when, say, their customers want to try out the service before deciding to commit to the brand.

When analyzing and designing the information system, our team collected and recorded customer requirements, and at the same time, experienced it ourselves by placing orders on the app to understand how the current system works. We then created a document that, once approved, became a contract between us and the customer, clearly defining the functions that we committed to providing. Next, the team

proceeded to build diagrams of the new system, design the interface and build a rough foundation for Jollibee to understand our ideas and avoid ambiguity and confusion among stakeholders.

With such a specific, meticulous plan and clear vision, we believe that our team's project "Ordering Food According to Customer's Requests via Jollibee Vietnam's Mobile Application" will bring significant value to Jollibee and help Jollibee dominate the fast food market in Vietnam.

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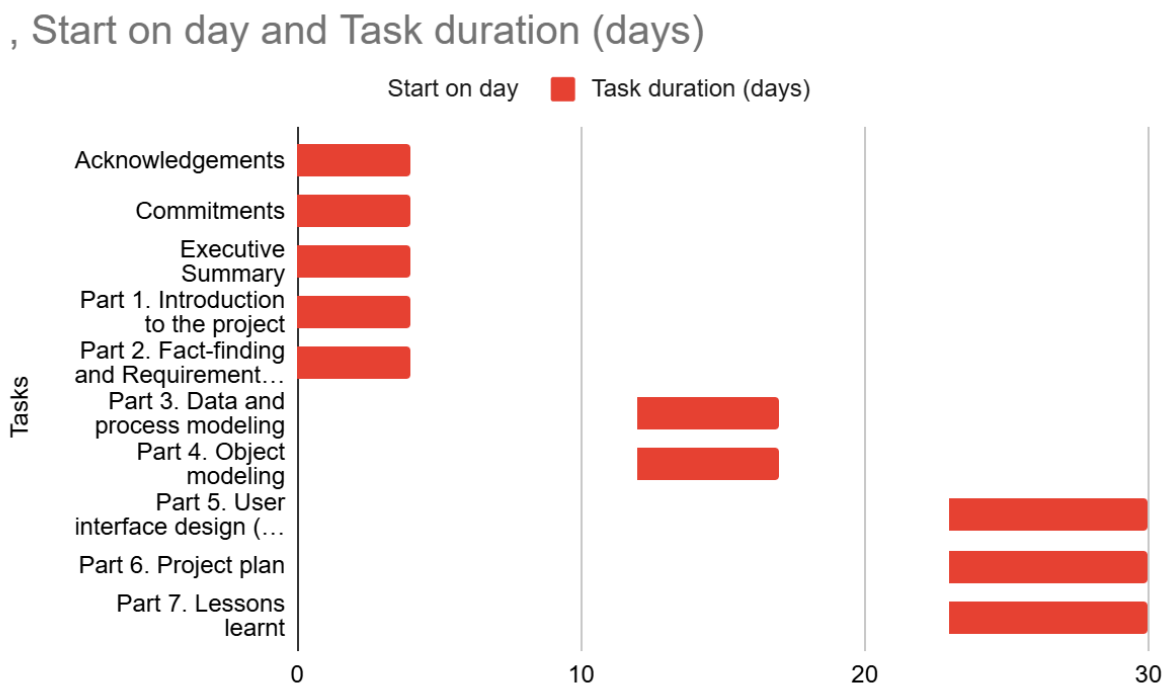
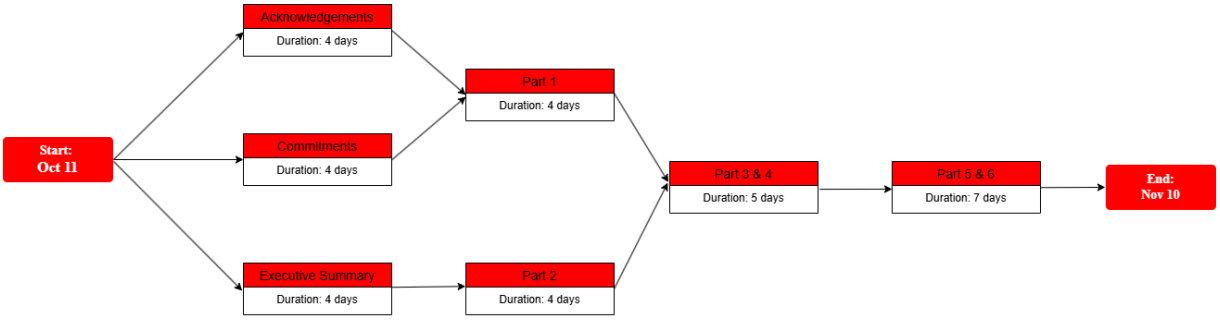
No.	Abbreviations	Meanings

GANTT and PERT Charts

GANTT CHART



PERT CHART



Part 1. Introduction to the project - General hoặc statement

1.1 Introduction to the company

1.1.1 Company Overview

Jollibee Vietnam, a subsidiary of the renowned Filipino fast-food giant Jollibee Foods Corporation, is dedicated to bringing joy through delicious cuisine to families across Vietnam. With over 100 locations nationwide, Jollibee Vietnam aims to deliver high-quality meals, exceptional service, and affordable prices to its customers. Since opening its first store in Vietnam in 2005, Jollibee has significantly expanded its presence, now boasting over 100 outlets throughout the country.

Jollibee's philosophy centers around creating a warm and inviting dining atmosphere, ensuring that customers can enjoy their meals comfortably with family and friends. The company is committed to maintaining strict quality control in its food preparation processes, further solidifying its reputation in the fast-food industry. With a vision to become a beloved fast-food brand in Vietnam, Jollibee continues to focus on delivering flavorful dishes tailored to local tastes while fostering family bonds through shared meals.

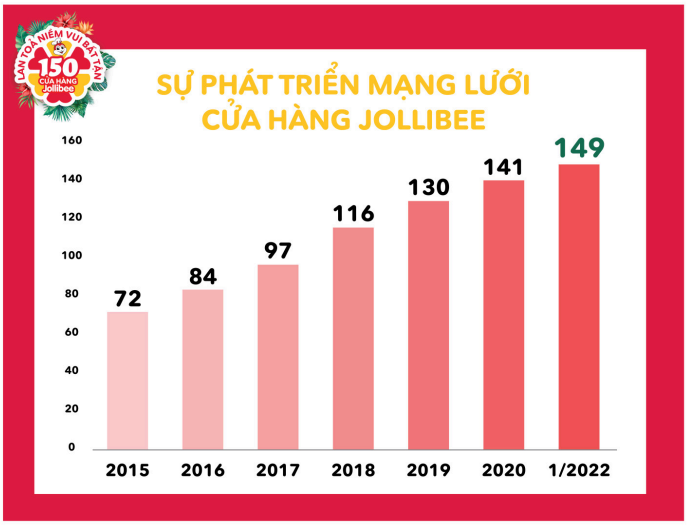


Figure: The development of the Jollibee store network with 149 stores from 2018 to January 2022 in Vietnam. *Sources:* Jollibee.

Despite the challenges posed by the COVID-19 pandemic, Jollibee Vietnam has adapted its business model, maintaining impressive sales growth and opening new stores in response to changing consumer behaviors. The company prioritizes customer satisfaction and employs market research to understand shifting preferences, which helps enhance its product offerings and service methods. Jollibee Vietnam's commitment to quality and service is reflected in its expansive network, innovative approaches, and dedication to sustainability in the fast-food sector, positioning it for long-term success in the competitive food and beverage market.

1.1.2 History of formation and development

- **1980-2009**

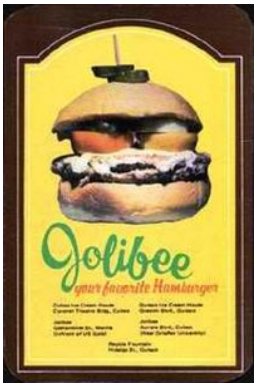


Figure: The Jollibee logo debuted in 1980.

Jollibee began operations in 1978, when a founder named Tony Tan Caktiong opened an ice cream shop in Manila, Philippines. Soon, however, he noticed customer interest in hotter dishes like hamburgers and spaghetti. In 1980, Jollibee officially launched with a menu that included Filipino-style fast food. With increasing popularity, Jollibee has expanded its store system and become one of the leading fast food brands in the Philippines.

- **1996-2011**

Figure: Logo Jollibee began revamping the brand in 1966.

This period marked Jollibee's strong expansion into the international market. In 1996, Jollibee opened its first store outside the Philippines in Hong Kong, followed by expansion into other markets such as the US, Canada and several other Asian countries. Besides expanding its store network, Jollibee also began developing menu products tailored to each market's preferences, strengthening its position in the global fast food industry.

- **2011-Present**

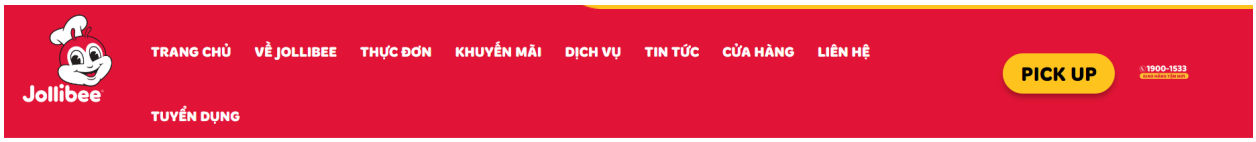
Figure: Logo Jollibee from 1999 to now.

From 2011 until now, Jollibee has continued to promote its global expansion strategy, with the opening of hundreds of additional stores around the world. In Vietnam, Jollibee has grown strongly with 149 stores from 2018 to January 2022,

affirming its position in the fast food market here. Jollibee not only provides traditional dishes but also constantly innovates menus, introduces new dishes and improves customer service, creating an enjoyable culinary experience for customers.

1.1.3 Vision and Strategy

- **Vision**



Jollibee's vision is to become the favorite restaurant of everyone by delivering exceptional dining experiences that cater to diverse tastes and preferences. With a commitment to quality, value, and customer satisfaction, Jollibee aims to be recognized not only as a leader in the fast-food industry but also as a beloved brand that brings joy and happiness to families and individuals alike.

- **Strategy**

The Marketing Mix strategy of Jollibee in Vietnam encompasses four main elements: product, price, place, and promotion. Each of these elements is designed to create optimal value for customers and maintain a competitive position in the fiercely competitive fast food market.

1. **Product**

Jollibee's flagship product is the Chickenjoy fried chicken, known for its crispy and delicious flavor, along with a secret dipping sauce. This product not only meets consumer demand but has also gained popularity globally, allowing Jollibee to easily

dominate the market in Vietnam and many other countries. Additionally, Jollibee continually improves its production process and quality management to ensure that its products consistently meet high standards, thereby enhancing customer experience.

2. **Price**

Jollibee adopts a reasonable pricing strategy to attract a wide range of customers, particularly students. The prices at Jollibee are generally lower than those of competitors like KFC and McDonald's, along with affordable combo meals and appealing promotional programs. This strategy not only increases customer accessibility but also encourages higher consumption frequency at its outlets.

3. **Place**

With over 1,500 stores worldwide and a 24/7 delivery service, Jollibee demonstrates its efforts to enhance customer experience. Jollibee's distribution strategy is flexibly adjusted for each market based on the cultural characteristics and culinary preferences of local consumers. By introducing local dishes, Jollibee has created a deeper connection with customers, thereby increasing brand preference.

4. **Promotion**

Jollibee's promotion strategy goes beyond traditional advertising to include charitable activities and creative media content. The mascot, a bee, serves as an essential symbol in the brand's image, used in advertising campaigns and the children's program, Jollitown. These activities not only foster closeness with customers but also affirm Jollibee's commitment to the community.

1.2 Deliverables

Table: Deliverables for Customization Feature in Jollibee App

Feature	**Describe**
Customized Menu Interface	Develop a user interface for the menu, where customers can easily customize dishes according to their preferences. This interface

	will display options such as cake type, meat type, and other ingredients (e.g. no chili sauce, no meat, no eggs).
Real-time Ingredient Management System	Build a real-time ingredient management system to track the availability of food ingredients. This system will automatically update and notify customers about available or unavailable ingredients on the menu
Order Customization Logic	Develop order customization logic in the backend system to handle custom requests from customers. This logic will ensure that all dish requests are delivered to the kitchen correctly, while also updating prices if there are any changes.
Feedback Mechanism	Set up a feedback mechanism so customers can rate and submit comments about their food customization experience. This mechanism can include quick survey questions and allow customers to make specific notes, thereby helping Jollibee improve service quality.
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1.3 Overview of information system

The new functional system designed to assist customers in customizing their meals according to personal preferences comprises several essential components.

Firstly, the **User Interface (UI)** serves as the primary interaction point for customers, requiring an appealing, user-friendly, and responsive design to ensure a smooth and enjoyable experience while customizing their orders.

Secondly, the **Data Management System** is crucial for real-time monitoring of ingredient availability, as well as storing historical user data and logic for meal customization. This ensures that customers can only select ingredients that are in stock, preventing confusion and enhancing the accuracy of their orders.

Additionally, the **Order Processing System** records and manages customer orders, including any customization requests, ensuring that each order is accurate and delivered in a timely manner. To enhance customer satisfaction further, the **Recommendation and Analytics System** analyzes user behavior and provides personalized suggestions based on their preferences, which not only improves the user experience but also contributes to increased revenue for Jollibee.

Finally, the **Feedback and Improvement System** collects customer feedback and evaluates the effectiveness of the customization feature, facilitating continuous enhancements to services and products based on user input. Together, these components create a comprehensive system that meets customer needs and drives business growth.

1.4 Business problems statement/Business needs

Currently, Jollibee's mobile app presents several challenges for customers placing their orders. The lack of a customizable ordering feature restricts customer choices, leading to frustration when they cannot modify their meals according to personal preferences. This limitation negatively impacts customer satisfaction, as many customers may feel that their dietary needs or taste preferences are not being addressed. Additionally, this rigidity in the ordering process can result in lost sales, as customers may opt to dine elsewhere where customization options are available.

1.4.1. Business Problems

1. **Limited Customization Options:** Customers are unable to customize their meals, which can lead to dissatisfaction when their preferences or dietary restrictions are not accommodated.

2. **Frustrating User Experience:** The current ordering process can be cumbersome and does not provide a seamless experience for customers, potentially deterring repeat business.
3. **Loss of Potential Sales:** Due to the inability to modify orders, potential customers may choose competitors that offer more flexible meal options, resulting in lost revenue for Jollibee.
4. **Lack of Customer Insight:** Without a system to capture customization preferences, Jollibee misses out on valuable data that could inform menu development and marketing strategies.

1.4.2. Business Needs

1. **Customization Feature**: Jollibee needs to implement a user-friendly system that allows customers to customize their orders easily. This feature should enable users to select or deselect ingredients, ensuring their meal meets individual tastes and dietary restrictions.
2. **Enhanced User Experience**: The company aims to improve the overall user experience of their app, making it more intuitive and engaging. The customization feature should be designed with a visually appealing interface that facilitates seamless interactions.
3. **Data Collection and Analysis**: Jollibee seeks to gather data on customer preferences and customization trends. This data will enable the company to analyze consumer behavior and make informed decisions regarding menu offerings and targeted promotions.
4. **Feedback Mechanism**: An integrated system for capturing customer feedback on the customization feature will help Jollibee continuously improve the service, adapting to customer needs and enhancing overall satisfaction.

1.5 Propose solutions

Realizing that many customers have different problems related to the menu, such as some people cannot eat tomatoes or some parents do not want to feed their children too much chili sauce, we would like to suggest solutions to improve the ordering experience in the Jollibee app. To meet these diverse needs, we will develop a feature that allows customers to customize dishes according to personal preferences. It’s includes:

- **Customizable Ordering Feature**

- Develop a feature within the app that allows customers to customize their meals easily. Users can modify their orders by selecting or deselecting specific ingredients, such as removing condiments, choosing different bread types, or omitting specific items.
- This solution directly addresses the problem of limited customization options, ensuring that customer preferences and dietary restrictions are respected. By offering flexibility, Jollibee can enhance customer satisfaction and encourage repeat business.

● **User-Friendly Interface Design**

- Revamp the app's user interface to create a more intuitive and visually appealing experience. This redesign should focus on simplifying navigation, making the customization process straightforward and engaging.
- A more intuitive interface reduces user frustration and enhances the overall ordering experience. Customers will be more likely to use the app, leading to increased sales and customer loyalty.

● **Data Analytics Integration**

- Integrate a data analytics system that captures customer preferences and ordering patterns related to the customization feature. This system should analyze trends and generate reports that inform menu adjustments and promotional strategies.
- By leveraging customer data, Jollibee can tailor its menu to better meet customer desires, ultimately boosting sales and strengthening the brand's competitive position.

● **Feedback Collection System**

- Implement a feedback mechanism within the app that allows customers to share their experiences regarding the customization feature and overall app usability. This could include rating systems, comment sections, and quick surveys.
- Actively seeking customer feedback helps Jollibee identify areas for improvement and adapt the app to better serve its users, thus fostering a customer-centric culture.

Thus, our proposal not only helps ensure that every diner can enjoy their meal the way they want, but also creates comfort and peace of mind for parents when letting their children choose dishes. This feature will contribute to improving customer satisfaction, while boosting sales for Jollibee in a competitive market.

1.6 Business case

1.6.1 Business case

Project Business Case			
Project Name	Customized Order Food by Customer in Jollibee Vietnam Mobile App		
Project Sponsor	Jollibee Vietnam	**Project Manager**	Group 7
Date of Project Approval	20th September	**Last Revision Date**	10th November
Contribution to Business Strategy	Our strategy aims to facilitate Jollibee Vietnam in enhancing customer satisfaction and loyalty by offering a personal meal. The value the project will create is well placed to meet the various demands and tastes that customers may have for foods, hence offering a better brand image and greater market share in the competitive fast-food recipe industry.		
Options Considered	Options considered included: 1. Create-Your-Own Meals. 2. Adding Customizable Meal Builder. 3. Adding Nutritional Information.		
Benefits	1. Boosted revenue by up to 40%. 2. Enhanced customer satisfaction scores to 90-95 points. 3. Increased competitive advantage, leading to a 10% market share growth.		
Timescales	Initial analysis shows that the system will take about 6 months to		

	implement.
Risks	Dietary customization for clients might be difficult. Managing inventories, incorporating new features, and guaranteeing food safety are all important considerations. Consumers can find it difficult to embrace new dietary choices.

1.6.2 Business case explanation

This project specifically focuses on the demands and preferences of customers as well as promoting brand recognition to them at each of the aforementioned stages:

1. **Customer Needs and Preferences:** Determine the individual nutritional needs and preferences of Jollibee customers. This information will allow us to better tailor the customization options.
2. **Competitive Landscape:** Examine the offers of competitors such as KFC and Lotte to identify areas where Jollibee may stand out.
3. **Technological Capabilities:** Evaluate Jollibee's present technology infrastructure and decide whether any improvements or investments are required to accommodate the new features.
4. **Regulatory Compliance**: Ensure that the new features comply with all applicable food safety and health requirements.

1.7 Project charter

1.7.1 Project charter

Project Charter	
Project Name	Jollibee Vietnam Mobile App Project

Project Sponsor	Jollibee	**Project Manager**	Group 7
Date of Project Approval	20th September	**Last Revision Date**	10th November
Project Description	To enhance the Jollibee Vietnam Mobile App		
Business Case	To enhance customer satisfaction around 90-95 points and boost revenue by 40%. To increase market share by 10%.		
Project Deliverables	1. Increase the frequency of app usage. 2. Add new personalized meal options. 3. Update comprehensive design specifications for the app's user interface, including wireframes, mockups, and style guidelines.		
Constraints	**Time**	The initial analysis shows that the system will take about 6 months to implement.	
	Budget	4 developers.	
	Scope	Whole system.	
	Quality	Prioritize efficiency and customer experience.	
Benefits	**KPI**	**Baseline**	**Goal**
	Boosted revenue	Current revenue compared to the previous year from app	Increase revenue by 40%
	Enhanced customer	Current customer	Increase customer

	experience	satisfaction level with the order process	satisfaction around 90-95 points
	Increase market share	Current market share	Increase market share by 10%
Risks	1. Technical Challenges: Integrating new functions can be difficult due to technical issues. 2. Higher Complexity: Increased complexity in the preparation process. 3. Customer Adaptability: Customers do not easily accept new features. 4. Inventory Management: Managing food inventory and ensuring food safety and hygiene can be difficult when customizing diets.		

1.7.2 Project charter explanation

To improve consumer satisfaction and loyalty, this project offers individualized meal options. Therefore, Jollibee can strengthen the brand image and market share in the competitive fast food industry by catering to consumers' various dietary needs and preferences. The initial analysis shows that there are several key factors for the success of this project:

1. **Effective User UI:** The app's UI should be simple to use and understand.
2. **Personalized Meal Options:** The customization options should be simple to use and provide a variety of alternatives to accommodate a wide range of preferences.
3. **Seamless Integration:** To avoid disruptions, the new features should integrate seamlessly with the app's existing capabilities.
4. **Efficient Backend System:** The backend system must be capable of handling more customization while maintaining rapid order processing speeds.

5. **Customer Assistance:** Providing outstanding customer assistance will be critical in resolving any issues or reservations about the new features.

1.8 Assumptions

1. **User Experience with Mobile Apps:** Users are accustomed to using mobile apps and are able to navigate the interface with ease.
2. **Device Compatibility:** The system performs on a variety of devices, including smartphones/tablets, and operating systems like iOS and Android, are assumed to be compatible with the design.
3. **Online Connectivity:** In order to use the app, the design makes the assumption that there will rely on online access.
4. **User Preferences:** Users will actively use the customized options and have preferences for meal modification.
5. **Technological Capabilities:** The system already in use will be adequate to implement the suggested features and satisfy performance standards.

1.9 System impacted

- **Mobile application:** User interface needs to be updated to allow customers to easily select and adjust food quantities.
- **Order management system:** Requires modifications to manage personalized orders and guarantee food preparation precision.
- **Order preparation system:** Employees need to be trained to understand how to fulfill customized orders and ensure quality.

1.10 Introduction to project's methodologies

This project for Jollibee Vietnam app will select the Hybrid: Agile and Waterfall approach as the primary methodology in order to guarantee a seamless project development process. This approach combines the features of both Waterfall and Agile methodologies to fit the needs of the project.

Reasons for selecting the Hybrid approach

In order to promptly address consumer input, flexibility is crucial when it comes to the meal personalization option. The project can be divided into brief development stages known as Sprints using Agile, each Sprint can last one to two weeks. In order to enhance the user experience, we can evaluate the availability of each function, pay

attention to customer input, and make timely adjustments. By combining with Waterfall, we can guarantee that certain crucial processes are completed, and the Waterfall technique will be suitable for some crucial components, such as technical requirements, system integration, and data analysis consecutively and without omitting any prerequisites. The Agile development and testing cycle will begin after completing phases like requirements collection and system design.

Advantages of the Hybrid Approach

By combining the flexibility of Agile with the structured planning of Waterfall, we can adapt to changing requirements while maintaining **organization** and **control**. One of the key benefits of Hybrid is its ability to **optimize user feedback**. By incorporating regular input from stakeholders and customers into short development **cycles**, we can quickly **enhance** the user experience and ensure that the final product meets their needs. Furthermore, the Hybrid approach can **reduce risk** and **boost control** by minimizing errors and ensuring that features are delivered effectively. This is particularly important for projects that involve **unique** features or complex requirements. In the case of this project, the Hybrid approach will enable us to develop **customization features** that are both **flexible** and **user-friendly**. By following this approach, we can ensure that the final product **fully satisfies** consumer expectations and provides a **positive** user experience.

Part 2. Fact-finding and Requirements modeling

2.1 Introduction to techniques applied for Fact-finding and Requirements modeling

Understanding the requirements from customers and modeling them is a very important and indispensable task for any information system analysis and design process. They are the foundation for a BA to clearly understand and know exactly what the new system needs to provide and how it works.

Coming to the project, the team first chose three techniques to serve the main information gathering: reviewing existing documents, observing and researching. These techniques allowed the team to understand how the current ordering system works, identify difficulties or obstacles, understand the online ordering trends of consumers, especially for fast food, thanks to which, we can propose innovative improvements for the new system.

To present the requirements clearly and visually, the team chose to use tools for the purpose of system modeling such as: Data Flow Diagram (DFD), Use Case, Unified Modeling Language (UML) diagrams and Business Process Modeling (BPM). These techniques help the team outline how information flows within the system, between functions and components. In addition, they allow for a clear and coherent capture and presentation of the answer to the question "How do the processes work together?". Through this, it is possible to identify possible bottlenecks in the system and based on those points, optimize the data flow, and at the same time, minimize potential errors that may appear during operation.

2.2 Deliverables

- Interview Notes: Take detailed notes from the customer’s requirements on what they want to improve in the new system.
- Document Analysis: Study the existing documents about the current system to come up with solutions to the customer’s requirements.
- Requirements Analysis: Analyze in detail the functional and non-functional requirements of the new system.

2.3 Current system and system architecture/diagrams (As-is business)

2.3.1. Description of the ordering process on the Jollibee app

Jollibee's online ordering application was created with the goal of providing a seamless and user-friendly experience. Users do not necessarily have to be loyal customers of the brand to order and enjoy delicious meals from Jollibee. Basically, when consumers want to order through the application, for fast food in particular and other items in general, they will first have to log in to the system and if the user does not have an account, they will register for an account first. But in Jollibee's ordering application, consumers can completely order without having to register or log in in advance. This is something that other fast food brands like KFC have not yet done. After logging in to the system, users will start ordering and can edit the ingredients if it is a combo. Finally, after completing the order, it will come to the payment step and wait for delivery for consumers to choose home delivery or go to the store to pick up if they choose to pick up. The remaining processes such as ordering, payment, delivery, Jollibee's application is not much different from its competitors.

2.3.2. Modeling the process through steps

2.3.2.1. Access the system and create an account (if any)

Step 1: Customers open the Jollibee Vietnam application to place an order.

Step 2: Choose how to access the ordering system. There will be three cases:

Step 2.1: For new customers, they will choose to register immediately to create a new account.

Step 2.2: For loyal customers of the system, they will choose to log in with a previously created account.

Step 2.3: In addition to the above two cases, the Jollibee application also allows users to place orders without logging into the system.

Step 3: Access the ordering system and corresponding to step 2, here will also be divided into 3 small steps:

Step 3.1: For new users

Step 3.1.1: After choosing to register, the new user will be asked by the system to enter a phone number. After the system confirms a valid authentication code, the customer will continue to fill in basic customer information.

Step 3.1.2: When creating a password for a new account, the customer must set it up to meet the conditions. If the conditions are not met, the application will ask for re-entry. Once the password has been confirmed by the system as correct, the customer must check the box agreeing to the general policy, regulations and personal security notice. In addition, the customer can also choose whether to receive promotional programs via email or not?

Step 3.1.3: The customer checks the information again and when sure the information is correct, starts creating an account.

Step 3.1.4: The system will take a while to create an account, when successfully created, the user will be able to access the application's ordering interface.

Step 3.2: For users who have previously created an account. In this case, it will continue to be divided into 2 more small steps. That is the user logs in normally and the user logs in but forgets the password.

Step 3.2.1: When logging in normally, users only need to enter the phone number and password registered with the system into the login interface to be able to directly access the ordering interface.

Step 3.2.2: For customers who want to log in but do not remember their password, they can select Forgot password? so that the system can help them reset their password.

Step 3.2.2.1: After the system confirms that the user has forgotten their password, the system will ask them to enter the phone number used to register. The system will then send a verification code via text message and the customer will enter the code as required by the application.

Step 3.2.2.2: At this point, the customer will be given a new password and will obviously still comply with the password conditions as when registering. Next, the user selects save so that the system can record the new password.

Step 3.2.2.3: After saving the password, the system will return the customer to the login interface so that the customer can log in again with the reissued password.

Step 3.2.2.4: After successfully logging in, the system allows the user to access the ordering interface.

Step 3.3: For users who want to order without logging in, the system will take the user directly to the ordering interface without having to perform any additional steps.

2.3.2.2. Ordering process

Step 4: In the ordering interface, before starting to choose the dish, the customer will choose the form of receiving the food. There are two options: home delivery and pick up at the store.

Step 5: After the customer chooses the form of receiving the food, they will continue to choose the store that will deliver the food or the store where they will pick it up. At this point, there will be 2 cases:

Step 5.1: If the user previously chose home delivery and now the user's home location is not within the <5km delivery radius of any store, the system will not be able to continue the ordering process.

Step 5.2: And vice versa, when choosing to receive at the store, the customer will not be limited in this.

Step 6: After choosing the form of receiving food and the store, the customer will proceed to select dishes from the Menu section in the ordering interface.

Step 7: After the order is completed as desired, the customer will choose to pay for his order.

Step 8: In this step, the customer will check the order information.

Step 9: Regarding the use of coupons, the user will enter the coupon code in the correct place. The system will check whether the coupon code is correct or not? If the coupon code is correct, it will be applied and if not, it will notify that the coupon code is

incorrect. When the customer enters the wrong coupon code and wants to use another code, they can still re-enter it.

Step 10: When the coupon entry step is completed, the customer will continue to choose the payment method between cash and online payment. In addition, for customers who order without logging in, before choosing the payment method, the customer will have to check the box to confirm their agreement with Jollibee VN's operating policy and information security policy.

Step 11: After checking, the user will click Order.

2.3.2.3. Cooking process

Step 12: After the customer places an order, the system will send a request to the store and the store will receive that request.

Step 13: With the order sent by the system, the store will proceed to prepare the dish. At the same time, the system will display the order status so that the customer can track it.

Step 14: When the dish is completed according to the order, the store will send a notification to the system that the dish is completed. At this time, the user will also know that their order has been completed.

2.3.2.4. Delivery and pick up

Step 15: If the customer initially chooses to pick up the goods, they will come to pick up the goods according to the appointment schedule and if it is home delivery, the store will send an employee to deliver the food to the customer.

Step 16: The customer will come to pick up the goods and pay in cash if available.

2.3.2.5. Complete order

Step 17: After the successful delivery, the employee will notify the system so that the system can confirm the completion of the order. Similarly, when the customer has come to pick up the goods at the store.

2.3.3. BPMN of process

Here is a BPMN visual representation of the ordering process on Jollibee Vietnam's app. Through this BPMN, it provides a standard method to document processes, making them easy to understand, analyze, and improve.

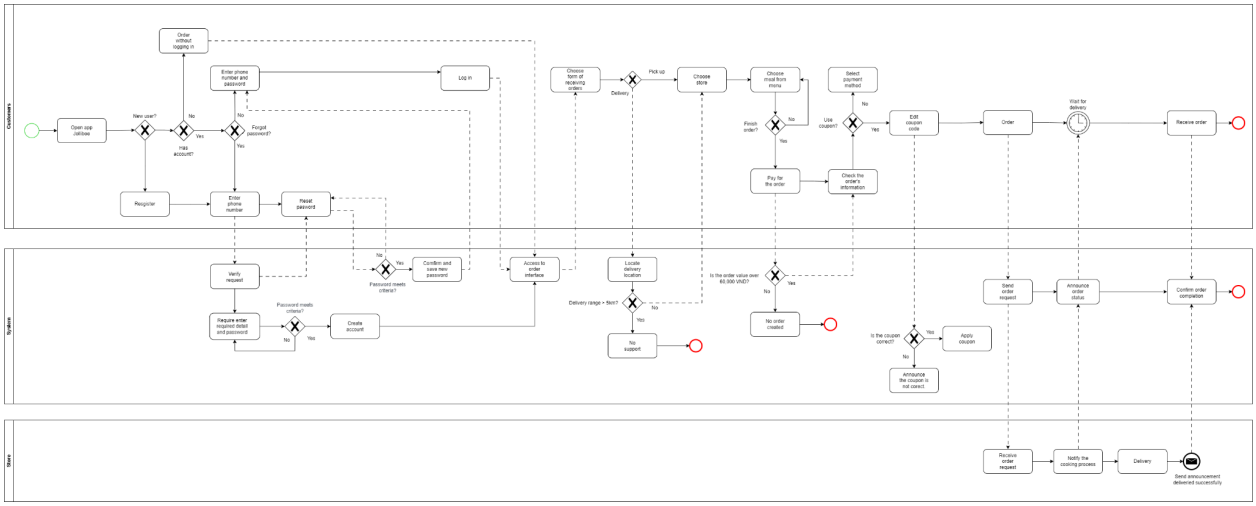

Figure 2.1 .Current system of the ordering process on Jollibee Vietnam's app (Source: authors)

2.4 Business Requirement Documents

User Authentication and Authorization:

- Users should be able to create accounts with basic information (name, email, phone number, password).
- Users should be able to log in to their accounts using their credentials.
- The system should implement strong password policies to ensure account security.

Product Catalog and Customization:

- The app should display a comprehensive menu of food items, including images, descriptions, and prices.
- Users should be able to customize their orders by selecting options like toppings, sauces, and drink sizes.
- Real-time pricing adjustments should be made based on customization choices.
- The system should provide clear allergen information for each product.

Order Placement and Checkout:

- Users should be able to add items to their cart and review their order before checkout.
- Multiple payment options (credit card, mobile payment, cash on delivery) should be supported.
- The system should generate order confirmation and receipt for the user.
- Users should be able to track their order status in real-time.

Payment Processing:

- The system should integrate with a secure payment gateway to process payments.
- Payment information should be encrypted to protect user privacy.
- The system should handle payment failures and retries.

Order Tracking and Delivery:

- The system should transmit order details to the kitchen for preparation.
- The system should integrate with delivery partner APIs to schedule and track deliveries.
- Push notifications should be sent to customers regarding order status updates and delivery notifications.

Non-Functional Requirements

- Performance: The app should be responsive and have minimal load times.
- Security: The system should implement robust security measures to protect user data and prevent unauthorized access.
- Scalability: The system should be able to handle increasing user loads and transaction volumes.
- Usability: The user interface should be intuitive and easy to navigate.
- Accessibility: The app should be accessible to users with disabilities.

2.5 Systems Requirements Documents

2.5.1 Functional Requirements

Using the information from the scenario, think about the different functions the system needs to provide. Each of your bullets should start with "The system shall . . ." For example, one functional requirement might be, "The system shall validate user credentials when logging in."

User Authentication and Authorization

Code	Function	Description
A01	User Registration	The system shall allow users to create new accounts by providing necessary personal information.
A02	User Login	The system shall authenticate users based on their credentials (username/email and password).
A03	Role-Based Access Control	The system shall differentiate between customer and admin roles, granting appropriate access to features.

Product Catalog and Customization

Code	Function	Description

C01	Product Display	The system shall display a comprehensive catalog of food items, including images, descriptions, and prices.
C02	Customization Options	The system shall allow users to customize their meals by selecting base items, toppings, and sauces.
C03	Real-time Pricing	The system shall dynamically calculate the price of a customized meal based on the selected options.
C04	Allergen Information	The system shall provide clear information about allergens present in each food item and customization option.

Order Placement and Checkout

Code	**Function**	**Description**
P01	Cart Functionality	The system shall allow users to add items to their cart and review their order before checkout.
P02	Payment Options	The system shall support multiple payment methods, including credit/debit cards, mobile payments, and cash on delivery.

P03	Order Confirmation	The system shall generate order confirmation and receipt for the user.
P04	Order Tracking	The system shall provide real-time order tracking information, including order status and estimated delivery time.

Order Tracking and Delivery

Code	**Function**	**Description**
D01	Kitchen Order Management	The system shall transmit order details to the kitchen for preparation.
D02	Delivery Partner Integration	The system shall integrate with delivery partner APIs to schedule and track deliveries.
D03	Push Notifications	The system shall send push notifications to customers regarding order status updates and delivery notifications.

Customer Support

Code	Function	Description
S01	In-app Chat	The system shall provide a live chat feature for customers to communicate with customer support agents.
S02	Email Support	The system shall allow customers to contact support via email for non-urgent inquiries.
S03	FAQ and Help Center	The system shall provide a comprehensive FAQ section to address common customer queries.

Data Privacy and Security

Code	Function	Description
R01	Data Encryption	The system shall encrypt sensitive user data, such as personal information and payment details.
R02	Secure Authentication	The system shall implement strong authentication mechanisms to protect user accounts.
R03	Data Privacy Compliance	The system shall comply with relevant data privacy regulations.

Additional Requirements

Code	Function	Description
B01	Platform Compatibility	The system shall be compatible with a wide range of mobile devices and operating systems (iOS, Android) to ensure maximum accessibility.
B02	Performance Optimization	The system shall be optimized for speed and responsiveness, minimizing load times and ensuring smooth user interactions.
B03	Regular Updates	The system shall be regularly updated with new features, bug fixes, and security patches to enhance user experience and address evolving needs.
B04	Maintenance	The system shall be maintained to ensure ongoing reliability, security, and performance.

2.5.2 Non-Functional Requirements

In this section, you will detail the different nonfunctional requirements for the system. You will need to think about the different things that the system needs to function properly.

Performance

- **Response Time:** The system shall respond to user input within 2 seconds.
- **Load Handling:** The system shall handle a high volume of concurrent users without significant performance degradation.
- **Scalability:** The system shall be able to scale horizontally to accommodate future growth.

Security

- **Data Privacy:** The system shall comply with relevant data privacy regulations.
- **Data Security:** The system shall implement strong security measures to protect user data, including encryption and secure authentication.
- **Access Control:** The system shall restrict access to authorized personnel.

Usability

- **User-Friendly Interface:** The system shall have an intuitive and user-friendly interface.
- **Clear Navigation:** The system shall provide clear navigation and information hierarchy.
- **Error Handling:** The system shall provide informative error messages and recovery options.

Reliability

- **System Availability:** The system shall be available 24/7.
- **Fault Tolerance:** The system shall be able to recover from failures and minimize downtime.
- **Data Integrity:** The system shall maintain data integrity and consistency.

Maintainability

- **Code Quality:** The system shall be well-structured, modular, and maintainable.
- **Documentation:** The system shall be well-documented, including technical documentation and user manuals.
- **Testability:** The system shall be easily testable, with unit, integration, and system tests.

Portability

- **Platform Independence:** The system shall be compatible with different mobile platforms (iOS, Android).
- **Device Compatibility:** The system shall be compatible with various devices and screen sizes.

Performance Requirements

What environments (web-based, application, etc.) does this system need to run in? How fast should the system run? How often should the system be updated?

Environment

- **Mobile Platforms:** iOS and Android
- **Web Platform:** A responsive web application for desktop and tablet devices

Performance Metrics

- **Response Time:**
  - Initial app load: < 5 seconds
  - Page load time for product catalog and customization: < 2 seconds
  - Order processing time: < 5 seconds
- **Throughput:** The system should be able to handle a peak load of [X] orders per minute.
- **Scalability:** The system should be able to scale horizontally to accommodate increased user load and data volume.

Performance Testing

- **Load Testing:** Simulate a high number of concurrent users to identify performance bottlenecks and optimize system resources.
- **Stress Testing:** Push the system to its limits to identify breaking points and improve system resilience.

- **Performance Monitoring:** Continuously monitor system performance metrics to identify and address issues proactively.

Update Frequency

- **Regular Updates:** The app should be updated regularly with new features, bug fixes, and security patches.
- **Major Updates:** Major updates, such as significant feature additions or design overhauls, should be released at least twice a year.
- **Security Updates:** Security patches should be released as soon as vulnerabilities are identified.

Platform Constraints

What platforms (Windows, Unix, etc.) should the system run on? Does the back end require any tools, such as a database, to support this application?

Server-Side:

- **Operating System:** Linux-based systems for optimal performance and security.
- **Database:** A NoSQL database for flexible data storage and scalability.
- **Cloud Platform:** Consider using cloud platforms for scalability, reliability, and cost-effectiveness.

Client-Side:

- **Mobile Platforms:** iOS and Android
- **Web Platform:** Modern web browsers (Chrome, Firefox, Safari, Edge)

Considerations for Platform Selection

- **Scalability:** The platform should be able to handle increasing user load and data volume.
- **Performance:** The platform should ensure fast response times and efficient resource utilization.
- **Security:** Robust security measures should be implemented to protect user data.
- **Cost-Effectiveness:** The platform should be cost-effective, considering both initial investment and ongoing maintenance costs.

- **Flexibility:** The platform should be flexible to accommodate future changes and enhancements.

Accuracy and Precision

How will you distinguish between different users? Is the input case-sensitive? When should the system inform the admin of a problem?

User Authentication and Identification

- **Unique User Identifiers:** Each user should be assigned a unique identifier to differentiate them from others.
- **Secure Authentication:** Implement strong authentication mechanisms, such as password hashing and multi-factor authentication, to protect user accounts.
- **Session Management:** Manage user sessions effectively to prevent unauthorized access and maintain data privacy.

Input Validation and Error Handling

- **Input Validation:** Validate user input to ensure it adheres to specific formats and constraints.
- **Error Handling:** Provide clear and informative error messages to guide users in correcting input errors.
- **Input Sanitization:** Sanitize user input to prevent security vulnerabilities like SQL injection and cross-site scripting.

Data Accuracy and Consistency

- **Data Validation:** Implement data validation rules to ensure data accuracy and consistency.
- **Data Normalization:** Normalize data to eliminate redundancy and improve data integrity.
- **Data Consistency Checks:** Regularly perform data consistency checks to identify and correct errors.

System Alerts and Notifications

- **Real-time Alerts:** Send real-time alerts to administrators for critical system issues, such as database errors, server failures, or security breaches.
- **Scheduled Reports:** Generate regular reports on system performance, user behavior, and sales trends.
- **User-Specific Notifications:** Send notifications to users about order status, promotions, and personalized recommendations.

Testing and Quality Assurance

- **Unit Testing:** Test individual components of the system to ensure they function correctly.
- **Integration Testing:** Test the integration between different components of the system.
- **System Testing:** Test the entire system to ensure it meets functional and non-functional requirements.
- **User Acceptance Testing:** Involve real users to test the system and provide feedback.

Adaptability

Can you make changes to the user (add/remove/modify) without changing code? How will the system adapt to platform updates? What type of access does the IT admin need?

User Management and Access Control

- **Flexible User Roles:** Implement a role-based access control system to define different user roles and assign appropriate permissions.
- **User Management Portal:** Provide an intuitive admin portal to manage user accounts, roles, and permissions without requiring code changes.
- **Dynamic User Provisioning:** Automate user provisioning and de-provisioning processes to streamline user management.

Platform Adaptability

- **Responsive Design:** Ensure the app's user interface adapts to different screen sizes and devices.

- **Platform-Specific Features:** Utilize platform-specific features to enhance the user experience.
- **Regular Updates:** Stay up-to-date with the latest platform updates and security patches.

System Configuration and Customization

- **Configuration Files:** Use configuration files to manage system settings.
- **Plugin Architecture:** Design the system to be modular, allowing for the addition of new features or functionalities through plugins.
- **Customization Options:** Provide options to customize the app's appearance, branding, and language settings.

IT Admin Access and Control

- **Centralized Administration:** Use a centralized administration console to manage system settings, user accounts, and security policies.
- **Role-Based Access Control:** Grant different levels of access to different administrators based on their roles and responsibilities.
- **Logging and Monitoring:** Implement robust logging and monitoring tools to track system activity, identify issues, and analyze user behavior.
- **Backup and Recovery:** Regularly back up system data and implement disaster recovery procedures to minimize downtime in case of failures.

Security

What is required for the user to log in? How can you secure the connection or the data exchange between the client and the server? What should happen to the account if there is a "brute force" hacking attempt? What happens if the user forgets their password?

Data Protection and Privacy

Data Encryption:

- Encrypt sensitive data (e.g., credit card information, personal details) both at rest and in transit using strong encryption algorithms.
- Regularly update encryption keys and protocols.

Secure Data Transmission:

- Use HTTPS to encrypt data transmitted between the client and server.
- Implement a firewall to protect the server from unauthorized access.
- Regularly update security patches for the web server and application server.

Data Privacy Compliance:

- Adhere to relevant data privacy regulations (e.g., GDPR, CCPA) to protect user data.
- Obtain explicit user consent for data collection and usage.
- Implement data minimization practices to collect only necessary data.

Account Security and Recovery

Account Lockout:

- Temporarily lock accounts after multiple failed login attempts to prevent brute-force attacks.
- Implement IP blocking to prevent attacks from specific IP addresses.

Password Reset:

- Provide a secure password reset process, such as email verification or SMS authentication.
- Avoid sending plain text passwords via email.

Regular Security Audits:

- Conduct regular security audits to identify vulnerabilities and potential threats.
- Stay updated on the latest security best practices and implement them.

Part 3. Data and process modeling (reference Chapter 5)

3.1 Overview and purposes

The new system for Jollibee Vietnam's mobile app introduces a meal customization feature, designed to enhance customer satisfaction by allowing personalized orders based on individual preferences. This addition addresses the limitations of the current ordering system, which restricts customization options and does not adequately accommodate dietary preferences. Through this feature, customers can select specific ingredients or adjust portions within their meal, resulting in a more tailored dining experience that meets their unique dietary needs and tastes.

The system streamlines the process for customers to choose, customize, and confirm their orders, while ensuring ingredient availability through real-time inventory checks. By automating ingredient validation, customization options, and order tracking, the new system optimizes operational efficiency for both customers and staff. It also enables the collection of valuable customer preference data, supporting Jollibee in developing targeted offerings and marketing strategies. Overall, the system promotes a user-centric experience that strengthens customer loyalty and differentiates Jollibee in the competitive fast-food market.

3.2 Deliverables

Functional Grouping	Deliverable	Description
Order Selection and Customization	Choose Meal from Order (Customer)	Allows customers to browse and select items (e.g., Hamburger, Chicken) and view available customization options.
	Customize Meal Options (Customer)	Customers personalize meal elements (e.g., add or remove ingredients, adjust sizes) and confirm their customization choices.
System Validation and Inventory Check	Validate Customization (System)	Ensures selected options are valid (e.g., flags

		invalid selections like removing all ingredients).
	Check Food Availability? (Store)	Verifies ingredient stock in real-time at the chosen branch; prompts customers to modify orders if stock is insufficient.
	Send Notification to Customer (Store)	If ingredients are missing for customization options, the system notifies the customer, allowing them to revise their order or choose another item.
	Notify to Restock (Store)	When detecting that ingredients are out of stock, the system will send a notification to the store so that staff can prepare additional ingredients if needed.
	Wait until Ingredients Restocked (Store)	The process waits until materials are replenished to continue processing the order.
Order Processing and Cart Management	Add Customized Meal to Cart (Customer)	Adds confirmed customized items to the customer's cart and displays the updated cart with the selected meal(s).
Payment Processing	Confirm Order (Customer)	Allows customers to review and finalize their cart contents before moving to payment.
	Proceed to Payment (Customer)	Presents various payment methods (e.g., card,

		e-wallet, cash on delivery) for customers to complete their transaction.
Order Confirmation and Preparation	Order Confirmation & Notification (System)	Sends order confirmation to the customer and alerts the store to start preparing the customized meal.
	Prepare Customized Meal (Store)	Store staff prepare the meal as per the confirmed customization instructions.
Delivery or Pick-Up Notification	Delivery or Pick-Up Notification (System)	Notifies the customer once the meal is ready, detailing pick-up or delivery instructions.

3.3 Business process Modeling BPMN For New System

3.3.1. Overview of New System

This section provides an overview of the new food ordering process on the Jollibee Vietnam app. It introduces the new system's streamlined approach to improve user experience, including simplified navigation, enhanced customization options, and seamless checkout.

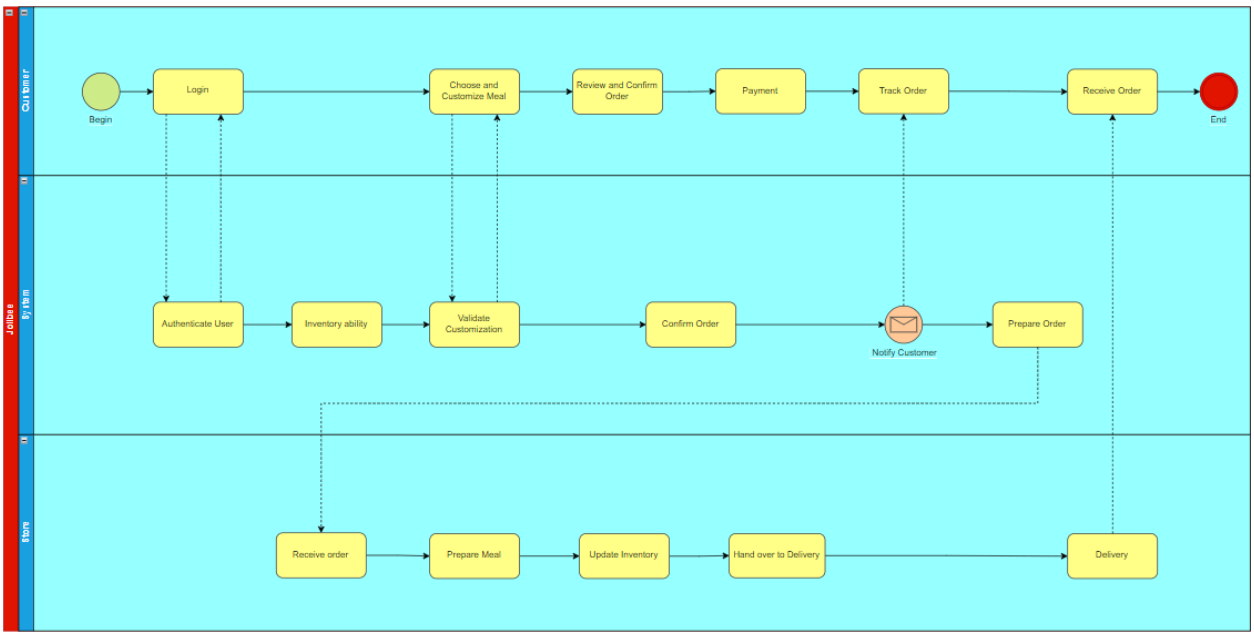

Figure: *Overview of the ordering process in Jollibee Vietnam's app.*

Key features:

1. **User Authentication**: Simplifies the login/signup process, ensuring quick and secure access for both new and returning users.
2. **Meal Customization**: Provides dynamic options for users to tailor their orders based on preferences such as toppings, sizes, and extras.
3. **Real-Time Price Updates**: Reflects customization changes dynamically to maintain pricing transparency.
4. **Order Review and Checkout**: Ensures users can review their orders in detail and proceed to payment without confusion.
5. **Order Tracking**: Includes real-time updates on order status, from preparation to delivery.

3.3.2. Login/Signup Functionality BPMN

This section presents the BPMN for the login and registration process in the new Jollibee Vietnam application system. Since the details of this process have been mentioned in Part 2: Current Process. In this section, we just repeat it to create a stepping stone for the new feature.

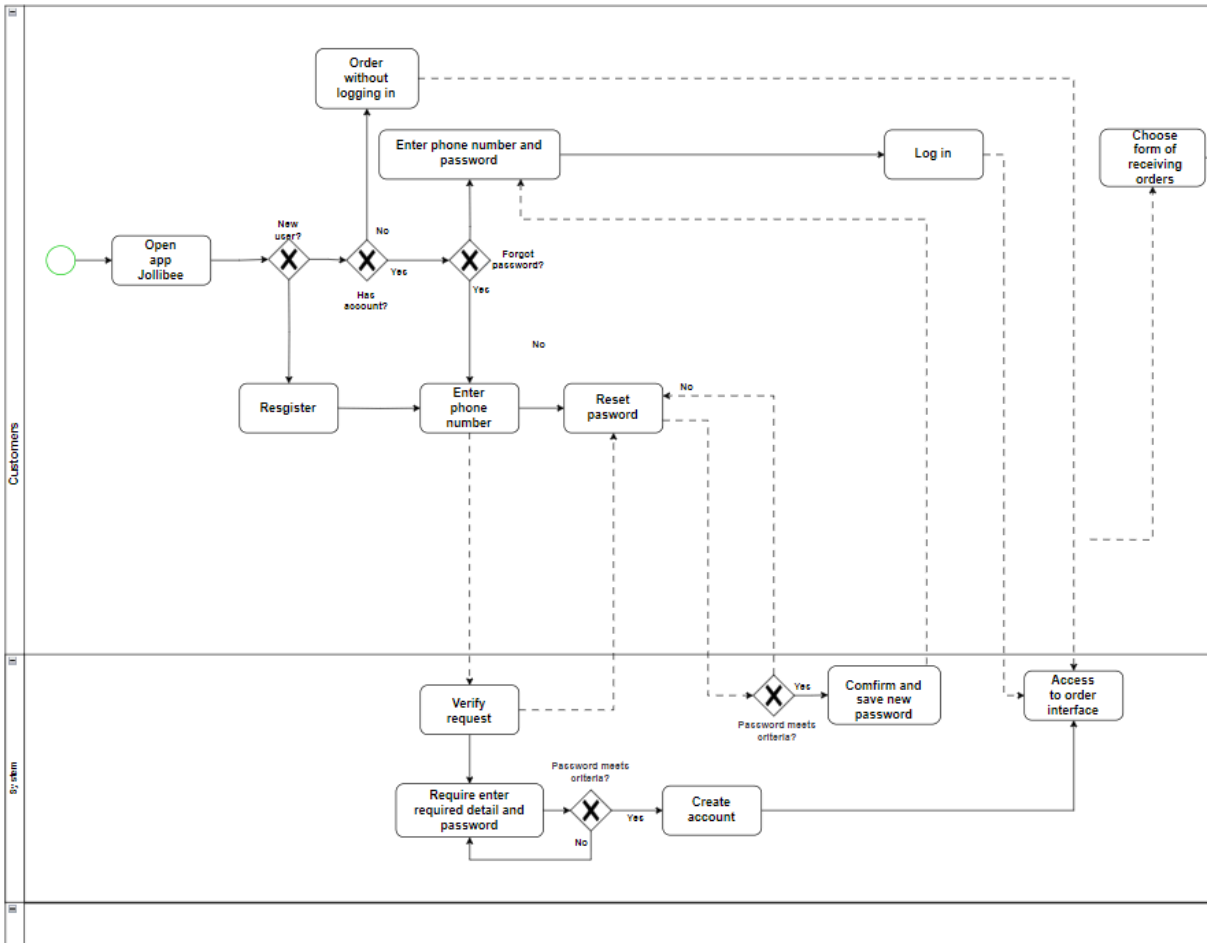

Figure. Overview of new system of the ordering process on Jollibee Vietnam's app (Source: authors)

3.3.3. Detail Customize Order food of New System

The new Customize Order Food functionality is the highlight of Jollibee Vietnam's app redesign, offering users a seamless and interactive experience tailored to their preferences. This feature addresses the diverse needs of customers by providing flexible options and real-time updates, ensuring transparency and satisfaction throughout the ordering process.

The customization process begins when users select a meal or combo from the home page. Upon selection, they are directed to the Customization Interface, where they can personalize their order using an intuitive design.

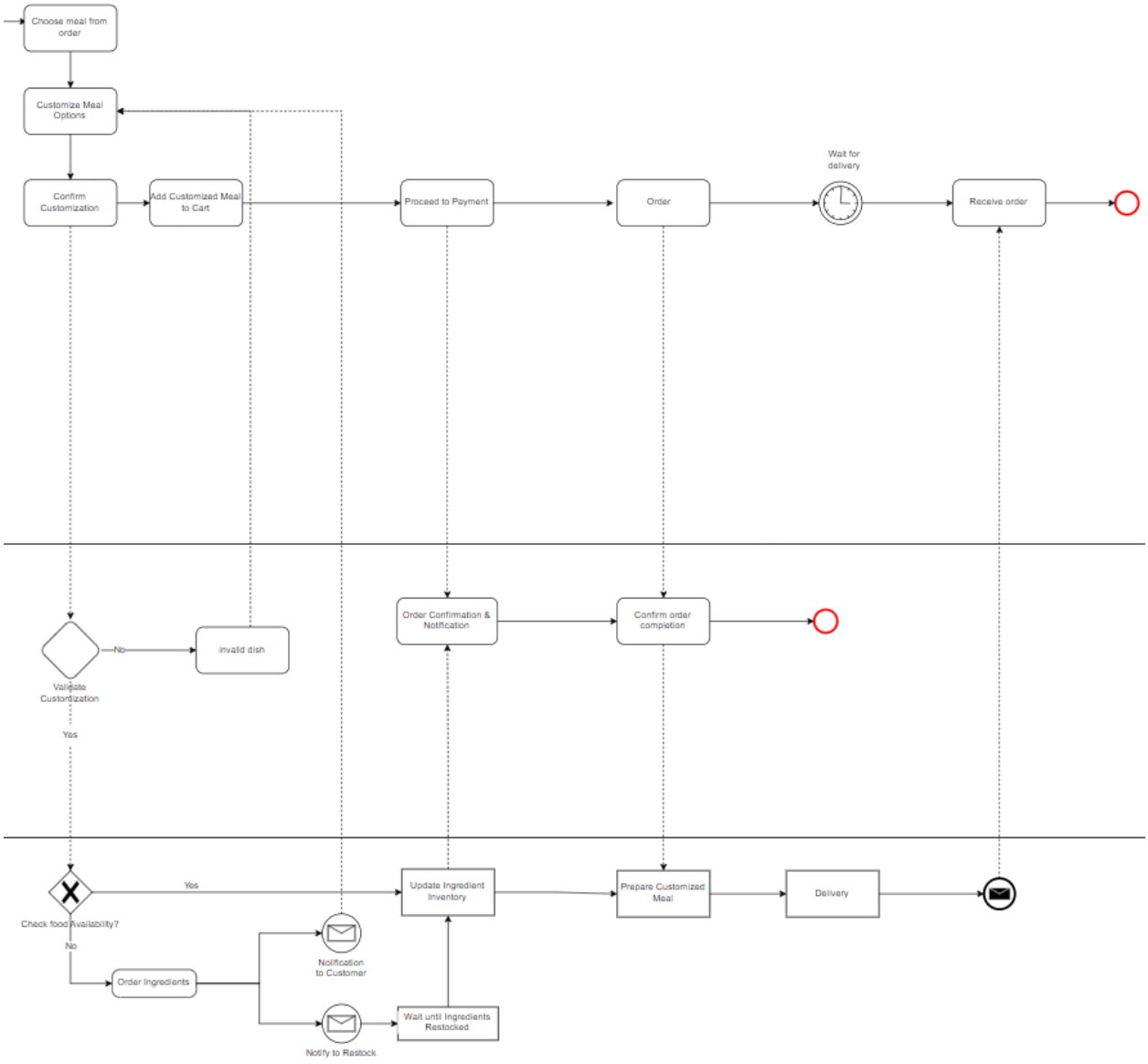

Figure. Detail about customize food ordering on Jollibee Vietnam's app (Source: authors)

The process will following steps:

1. **Choose Meal**

Users start by selecting a meal or combo from the home page. This step serves as the entry point to the customization process.

2. **Customize Meal Options**

Users can choose from various main dish options, such as noodles or chicken. This flexibility ensures meals match their personal preferences.

Interactive controls like "+" and "-" buttons allow users to add or adjust toppings such as cheese, sauces, or sides. This feature provides users control over portion sizes.

Users select beverages, such as soft drinks, juice, or water, to complement their meals.

3. **Validate Customization**

After meal customization, the system verifies the inputs. If invalid choices are detected (e.g., unavailable items), the system alerts users to make corrections.

4. **Check Food Availability**

Once customization is validated, the system checks inventory to confirm availability. If any item is unavailable, a notification is sent to the user for adjustments.

5. **Confirm Customization**

A summary of the customized meal, including selected items, extras, and the total price, is displayed. This ensures transparency, allowing users to confirm or make further changes.

6. **Add to Cart**

After confirmation, the customized order is added to the cart. A success message reassures users that the process is complete and offers options to continue shopping or proceed to checkout.

7. **Proceed to Payment**

Users finalize their order by proceeding to the payment interface.

8. **Order Confirmation and Preparation**

Once payment is successful, the system notifies the user and begins preparing the customized meal.

9. **Delivery and Completion**

After preparation, the meal is delivered to the customer. Upon successful delivery, a notification confirms the completion of the order.

3.4. Requirement modeling by DFD (Data Flow Diagram)

3.4.1 Data sources, data flows, data store, data destinations, and process

Data Sources

- **Customer Data:** User information, preferences, and order history.
- **Product Catalog:** Information about food items, prices, and customization options.
- **Inventory Data:** Real-time information about product availability.
- **Payment Gateway Data:** Information about payment transactions and authorization.
- **Delivery Partner Data:** Information about delivery partners, delivery status, and estimated delivery time.

Data Flows

- **Customer Registration:** User information flows from the user input to the user database.
- **Product Catalog:** Product information flows from the product database to the app's display.
- **Order Placement:** Customer's selected items and customizations flow from the app to the order processing system.
- **Payment Processing:** Payment information flows from the app to the payment gateway and back to the app with transaction status.
- **Order Fulfillment:** Order details flow from the app to the kitchen and delivery partner systems.
- **Order Tracking:** Order status updates flow from the delivery partner to the app and then to the customer.

Data Stores

- **User Database:** Stores user information, login credentials, order history, and preferences.
- **Product Catalog Database:** Stores information about products, prices, and customization options.
- **Inventory Database:** Stores information about product availability and stock levels.

- **Order Database:** Stores order details, including customer information, items ordered, payment information, and delivery status.

Data Destinations

- **Customer Devices:** Order confirmations, tracking updates, and promotional offers.
- **Jollibee Kitchen:** Order details for preparation and fulfillment.
- **Delivery Partner:** Order details for delivery.
- **Payment Gateway:** Payment information for processing transactions.
- **Analytics Platform:** Data for analyzing user behavior, sales trends, and operational insights.

Processes

1. **User Registration and Login:**
    - Capture user information (name, email, password)
    - Validate user input
    - Store user information in the database
    - Authenticate user credentials upon login
2. **Product Catalog:**
    - Retrieve product information from the database
    - Display product information and customization options on the app
3. **Order Placement and Customization:**
    - Allow users to browse product catalog
    - Add items to cart
    - Allow users to customize items
    - Calculate order total
4. **Payment Processing:**
    - Collect payment information from the user
    - Send payment information to the payment gateway
    - Receive payment confirmation or rejection
    - Update order status based on payment outcome
5. **Order Fulfillment:**
    - Transmit order details to the kitchen
    - Coordinate with delivery partner for order pickup and delivery
    - Update order status and provide tracking information to the customer
6. **Order Tracking:**

- Retrieve order status from the delivery partner
- Update the app with real-time tracking information
- Send notifications to the customer about order status

3.4.2 Context diagram

3.4.3 Level 0 of DFD

3.4.4 Level 1 of DFD

3.5 Data Dictionary

Entity: User

Field Name	Data Type	Description
user_id	INT	Unique identifier for the user
user_name	VARCHAR(50)	User's name
email	VARCHAR(100)	User's email address
password	VARCHAR(255)	User's hashed password
phone_number	VARCHAR(20)	User's phone number
address	VARCHAR(255)	User's address

Entity: Product

Field Name	Data Type	Description
product_id	INT	Unique identifier for the product

product_name	VARCHAR(100)	Product name
product_description	TEXT	Product description
price	DECIMAL(10,2)	Product price
category_id	INT	Foreign key to the Category table
is_customizable	BOOLEAN	Indicates if the product is customizable

Entity: Category

Field Name	Data Type	Description
category_id	INT	Unique identifier for the category
category_name	VARCHAR(50)	Category name (Burger, Chicken, Rice)

Entity: Order

Field Name	Data Type	Description
order_id	INT	Unique identifier for the order
user_id	INT	Foreign key to the User table
order_date	DATETIME	Date and time the order was placed
total_amount	DECIMAL(10,2)	Total order amount

status	VARCHAR(20)	Order status (pending, processing, delivered)

Entity: Order Item

Field Name	Data Type	Description
order_item_id	INT	Unique identifier for the order item
order_id	INT	Foreign key to the Order table
product_id	INT	Foreign key to the Product table
quantity	INT	Quantity of the product ordered
price	DECIMAL(10,2)	Price of the item
customizations	TEXT	Containing customization details (toppings, sauces)

Entity: Payment

Field Name	Data Type	Description
payment_id	INT	Unique identifier for the payment
order_id	INT	Foreign key to the Order table
payment_method	VARCHAR(50)	Payment method (credit card, cash on delivery)

payment_status	VARCHAR(20)	Payment status (pending, successful, failed)
payment_amount	DECIMAL(10,2)	Amount paid

Part 4. Object modeling

4.1 Overview and purposes

Overview

In systems analysis and design, object modeling is a technique which is useful for locating and defining objects, their relations, and requisite attributes for the application. In this project, object modeling will be applied to form a visual construction of the application in use.

The object modeling shall incorporate primary entities which include the customer, food, dose and order respectively. Each of the entities will have properties and methods of its own which will enable users to manage relevant parameters on selecting a dish and its corresponding dosage.

Purposes

- **Determine the primary items:**

It is helpful in clearly highlighting the key players in the application, including users, food items, and orders. Each of these organizations will be responsible for a certain facet of its own feed control and management.

- **Explain how the objects relate to one another:**

It explains how the entities are interdependent; for instance, a single user may place multiple orders, each of which may include a variety of food items presented at various levels. This makes it possible to understand how application objects react to interdependencies.

- **Specifying attributes and procedures:**

The model will help define methods like Add Dish, Adjust Dish Quantity, and Confirm Order for each object, as well as characteristics like dish name, price, and quantity. Verifying that the application has all the necessary features is much easier with this.

4.2a Deliverables (List and Describe)

4.2.1. Object Model Diagram.

- **Description:** This entails the graphical layout of the identified groups, what they consist of and how they fit together.
- **Deliverable:** Such UML (Unified Modelling Language). The works include Class Diagram which show:
- **Entities**: User, Food_Item, Portion_Size, Order.
- **Attributes:**

User: userID, username, preferences, history of orders.

Food_Item: itemID, foodname, details, pricing, nutrition.

Portion_Size: sizeID, sizeDescription, multiplicationFactor.
Order: orderID, userID, date, total price, order info.

- **Relationships:**

- User places Orders.
- Orders contain different Food Items in certain Portion Sizes.

4.2.2. Use Case Diagram.

Description: Diagram that explains how users will interact with the system.
Deliverable: Identification of use case with diagram that show:
Actors: User, Store.
Use Cases:

- Adjust portion size.
- Make order.
- Check the history of orders.
- Food item management by Store.

4.2.3. Data Dictionary.

Description: Data dictionaries provide detailed information in regard to each entity, and its characteristics.
Deliverable: Documentation that details:
Names and types of objects together with any restrictions and, and default values for each of the attributes.

4.2.4. Functional Specifications Document.

Description: Enumerating general specifications as well as detailed ones bulking out each feature available in the application.
Deliverable: This document contains other documents as:

- Feature specifications.
- User Models based off of the object models.
- Feature acceptance test cases.

4.2.5. Prototype or Wireframes.

Description: These are visual presentations of the expected user interface for the app.
Deliverable: Wireframes for the most important screens, including:

- Login/sign up for users.
- Screen to select food with adjustable portions.
- Screen for order summary and cancellation.

4.2.6. Sequence Diagram.

Description: The illustration displaying the interaction of objects with respect to time.
Deliverable: Sequence diagram for the use case of special importance such as:

- Ordering.
- Modifying portion sizes.
- Getting to know the order records.

4.2.7. Test Case Scenarios

Description: The term refers to a test case that is prepared on the basis of functional requirements and has to be verified at a later phase.

Deliverable: Document including:

For each business feature there should be defined at least a single test case with input data, output data and the criteria to validate them.

4.2b Scenarios, Models and Functionality

4.2b.1 Use Case of Login

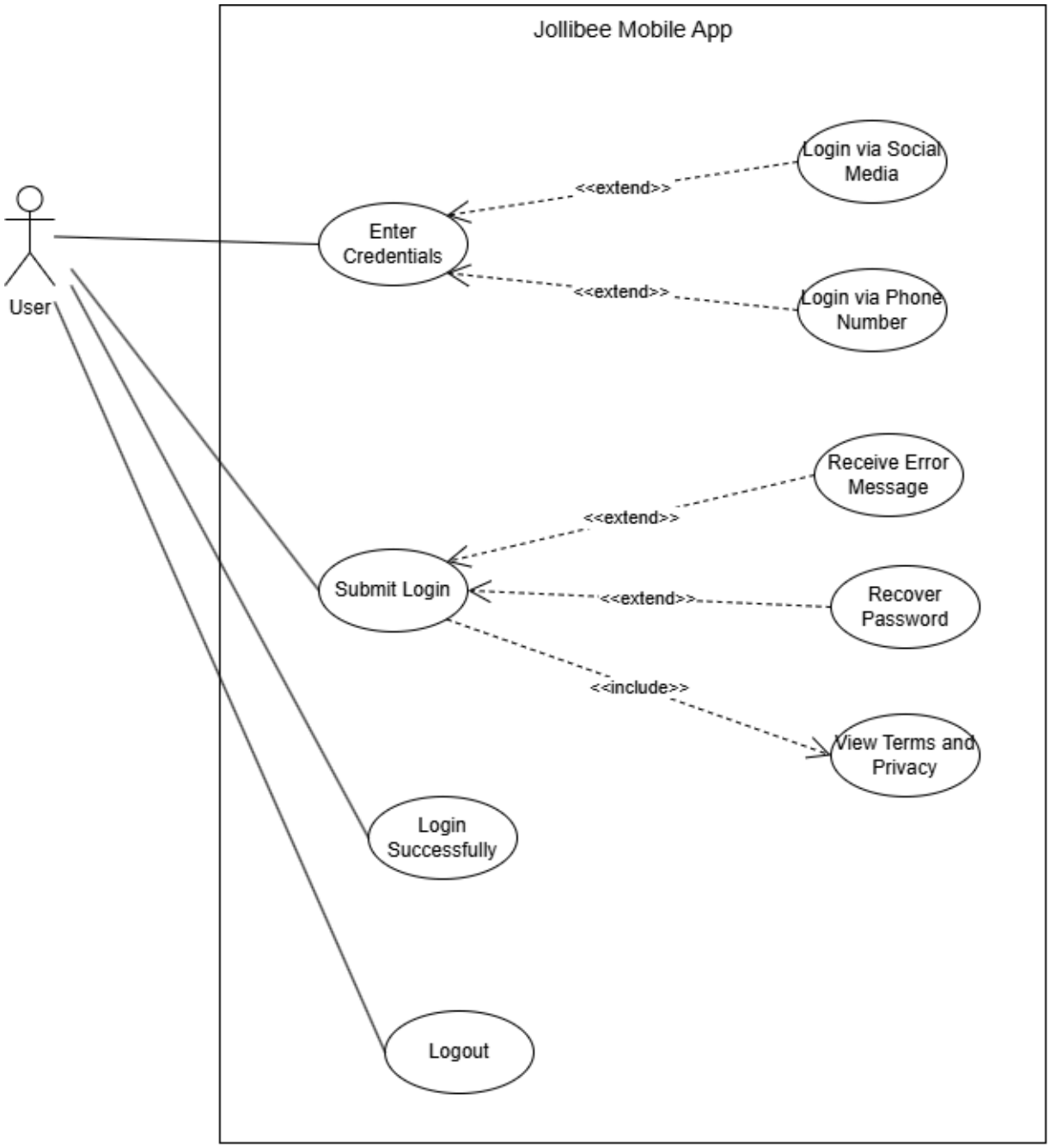

Figure: Use Case Diagram for new process of login function of Jollibee (Source: authors)

User login	
As a	customer of Jollibee
I want	to login into Jollibee mobile app using my credentials.

So that	I can access my account and use the app's features.
Acceptance Criteria	1. The user should be able to enter credentials (username and password). 2. The user should have the option to log in via social media or phone number. 3. The user should be able to submit the login form. 4. The system should validate the credentials and either log the user in successfully or display an error message. 5. The user should be able to recover their password if forgotten. 6. The user should be able to view terms and privacy policies. 7. The user should be able to log out successfully.

UC Name	User login	**Use case description**
UC Number	01	The User Login use case describes the process by which a user logs into the Jollibee Mobile App.
Primary Actor	Online Registered User	
Use Case Story	The user wants to log in to the Jollibee Mobile App to access their account and use the app's features.	
Trigger	The user opens the Jollibee Mobile App and chooses to log in.	
Pre-Condition	The user has the Jollibee Mobile App installed on their device.	

Post-Condition	The user is either logged in successfully or receives an error message. If logged in, the user can access their account and app features.	
Primary Flow (PF)	**Title:** User is able to login without any errors	
	Actor Action	**System Response**
		1) System displays the login screen.
	2) User selects the option to login.	3) System prompts the user to enter their credentials.
	4) User enters their credentials (username and password).	5) System displays the entered credentials.
	6) User submits the login form.	7) System sends the credentials to the server for validation. If valid, go to the next step. If invalid, go to AF1 or EF1.
		8) System displays the user's account and features.
Alternate Flow 1 (AF1)	**Title:** Invalid User Credentials	
	Actor Action	**System Response**
	1) User chooses to log in via social media.	2) System redirects the user to the social media login page.

	3) User enters their social media credentials.	4) System sends the credentials to the server for validation. If valid, go to step 8 of PF. If invalid, go to EF1.
Exception Flow 1 (EF1)	**Title:** Recover Password	
	Actor Action	**System Response**
		1) System displays an error message.
	2) User chooses to recover their password.	3) System guides the user through the password recovery process.
	4) User enters new credentials and submits the login form again.	5) System updates the user's credentials.
		6) System sends the new credentials to the server for validation. If valid, go to step 8 of PF. If invalid, go back to step 4 of EF1.

4.2b.2 Use Case of Order Customization

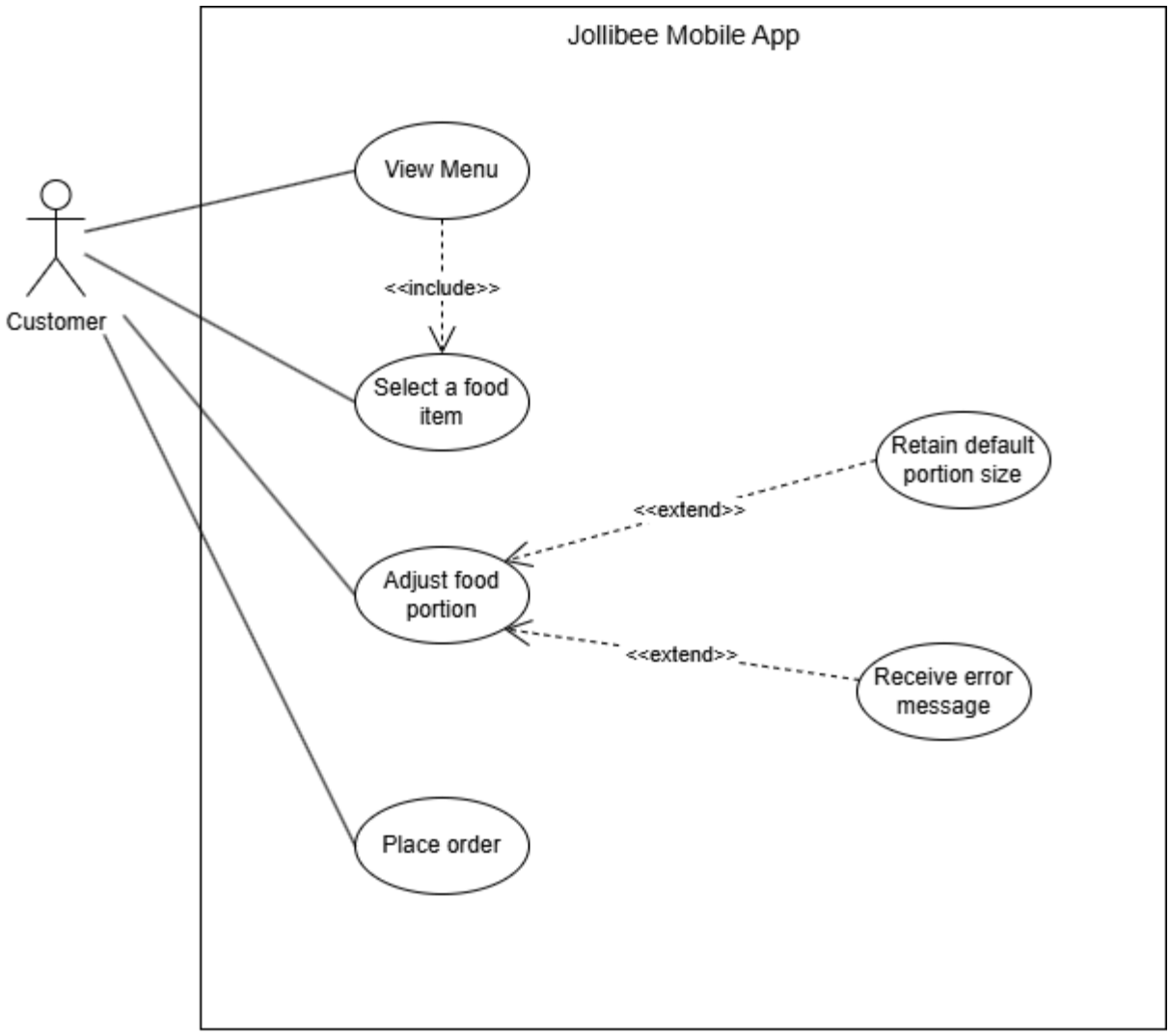

Figure: Use Case Diagram for new process of food ordering system of Jollibee (Source: authors)

User customizes order	
As a	customer of Jollibee
I want	to adjust the portion size of my food order.
So that	I can customize my meal according to my preference.

Acceptance Criteria	1. The user can view the menu and select a food item. 2. The user can adjust the portion size of the selected food item. 3. The system updates the portion size and displays the new price. 4. The user can confirm the adjustment and proceed with the order. 5. The system reflects adjusted portion size in the final order summary. 6. The system displays an error message if the adjustment fails and prompts the customer to try again or contact support.

UC Name	Adjust Food Portion	**Use case description**
UC Number	02	This use case allows the customer to adjust the portion size of a selected food item from the menu before placing the order.
Primary Actor	Online Registered User	
Use Case Story	The user wants to log in to the Jollibee Mobile App to access their account and use the app's features.	
Trigger	The customer selects a food item from the menu.	
Pre-Condition	The customer is logged into the Jollibee mobile app and has accessed the menu.	
Post-Condition	The adjusted portion size is updated in the customer's order.	

Primary Flow (PF)	**Title:** User is able to adjust the food portion without errors.	
	Actor Action	**System Response**
	1) User navigates to the menu.	
		2) System displays the menu.
	3) User selects a food item.	
		4) System displays the food item details.
	5) User adjusts the portion size.	
		6) System updates the portion size and displays the new price.
	7) User confirms the adjustment.	
		8) System updates the order with the adjusted portion size.
Alternate Flow 1 (AF1)	**Title:** Retain Default Portion Size	
	Actor Action	**System Response**
	1) User decides not to adjust the portion size.	

		2) System retains the default portion size and proceeds with the order.
Exception Flow 1 (EF1)	**Title:** Error in Adjusting Portion Size	
	Actor Action	**System Response**
	1) User tries to adjust the portion size but encounters an error.	
		2) System displays an error message and prompts the customer back to step 5 of PF or contact support.

4.3 Class Diagram

Class Diagram is one of the essential tools in software design and development. It helps the developer understand the structure of the system, identify the main components and how they interact with each other, thereby facilitating the realization of specific functions of the software. Below is the Class Diagram for two processes, Login and Customized Order, for the new system of Jollibee application. Through this Class Diagram, we can clearly see how the components of the system are linked and interact to perform functions effectively.

4.3.1. Class diagram of Login

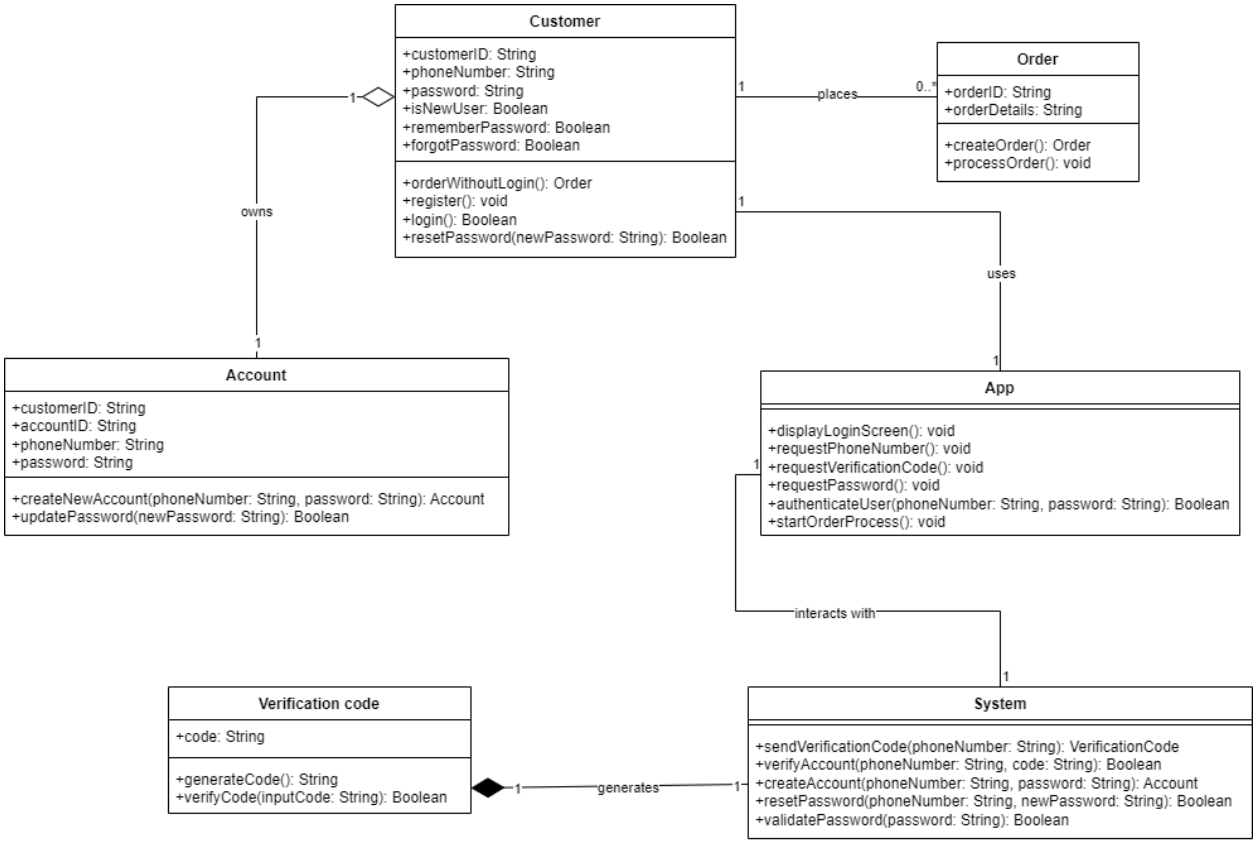

Figure 4.. Class diagram of for new process of food ordering system of Jollibee

(Source: authors)

4.3.2. Class diagram of Customize Order

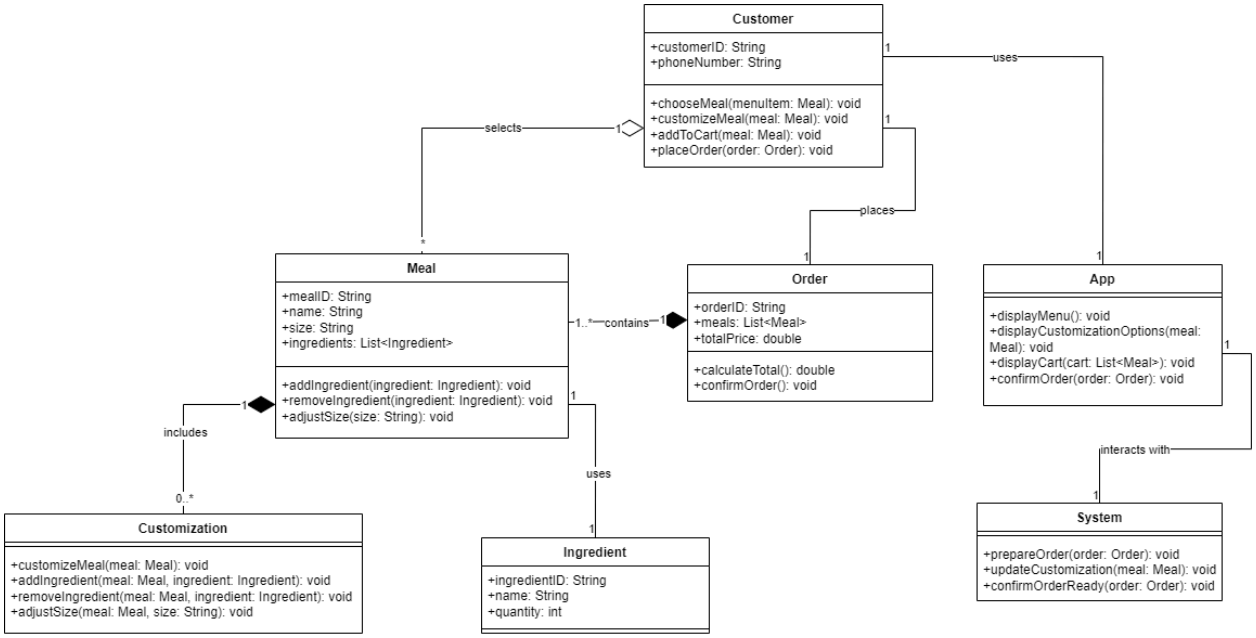

Figure 4.. Class diagram for new process of food ordering system of Jollibee

(Source: authors)

4.4 Sequence diagram

Sequence diagrams are one of the basic tools in designing and developing software. They illustrate how objects interact in a certain sequence of events, focusing on the order in which messages are exchanged between different components in the system. Below is a Sequence Diagram for two processes, Login and Customized Order, for the new system of Jollibee application. These diagrams are important to ensure that all stakeholders have a clear understanding of the system's behavior and can identify potential improvements or issues in the workflow.

4.4.1. Sequence diagram of Login

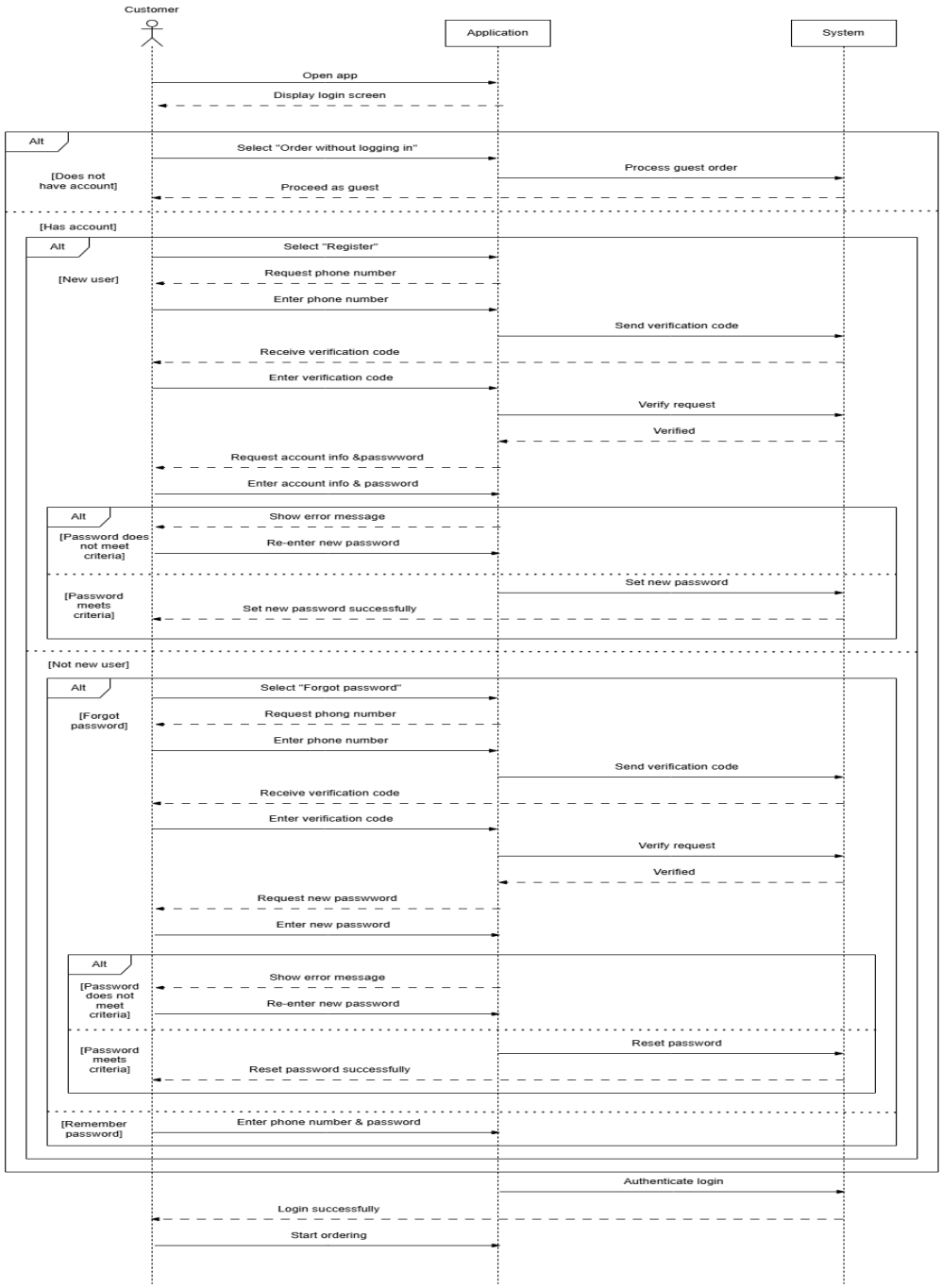

Figure 4.. Sequence diagram of login for new process of food ordering system of Jollibee

(Source: authors)

4.4.2. Sequence diagram of Customize Order

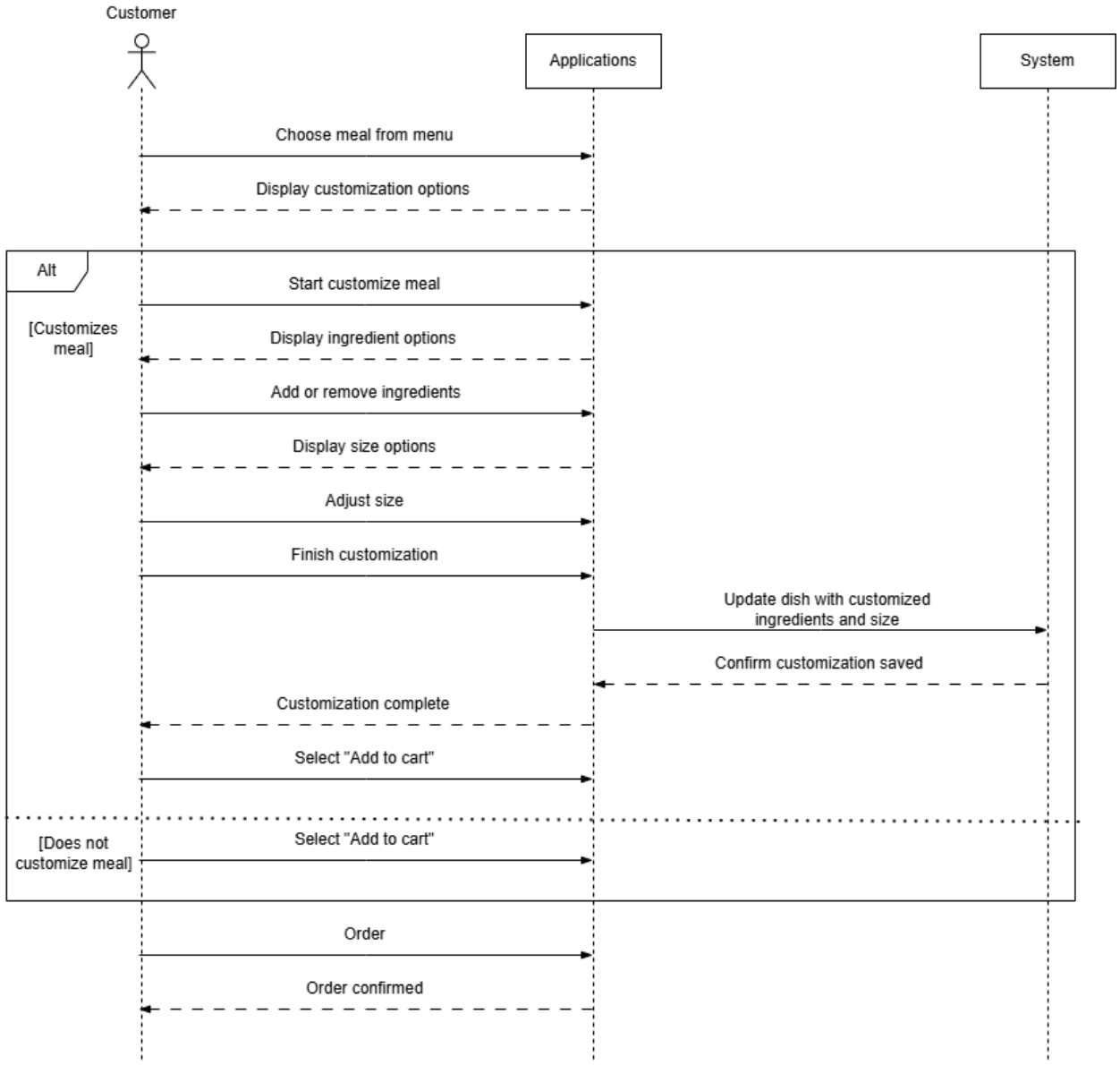

Figure 4.. Sequence diagram for new process of food ordering system of Jollibee

(Source: authors)

4.5 Activity Diagram

Activity diagrams are an integral part of modeling the workflow of a system. They are particularly useful when visualizing the dynamic aspects of a system, thereby showing how activities work together to achieve a set goal. Below is an Activity Diagram for two processes, Login and Customized Order, for the new system of Jollibee application. By providing a clear description of the workflow of these two processes, the Activity Diagram has helped investors understand how the system works, ensuring the continuity of the processes and the efficiency of management.

4.5.1. Activity diagram of Login

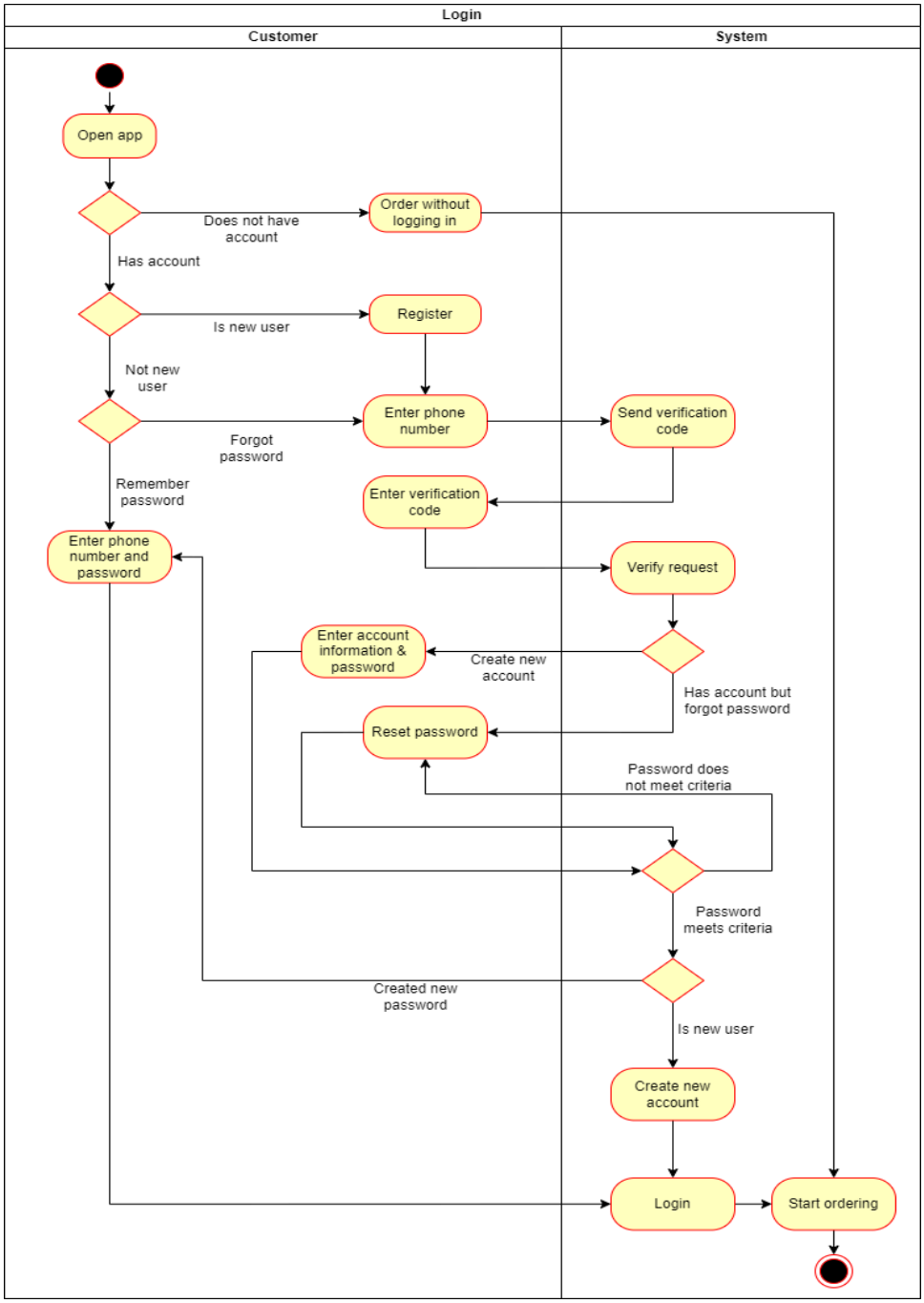

Figure 4..Activity diagram of login for new process of food ordering system of Jollibee

(Source: authors)

4.5.2. Activity diagram of Customize Order

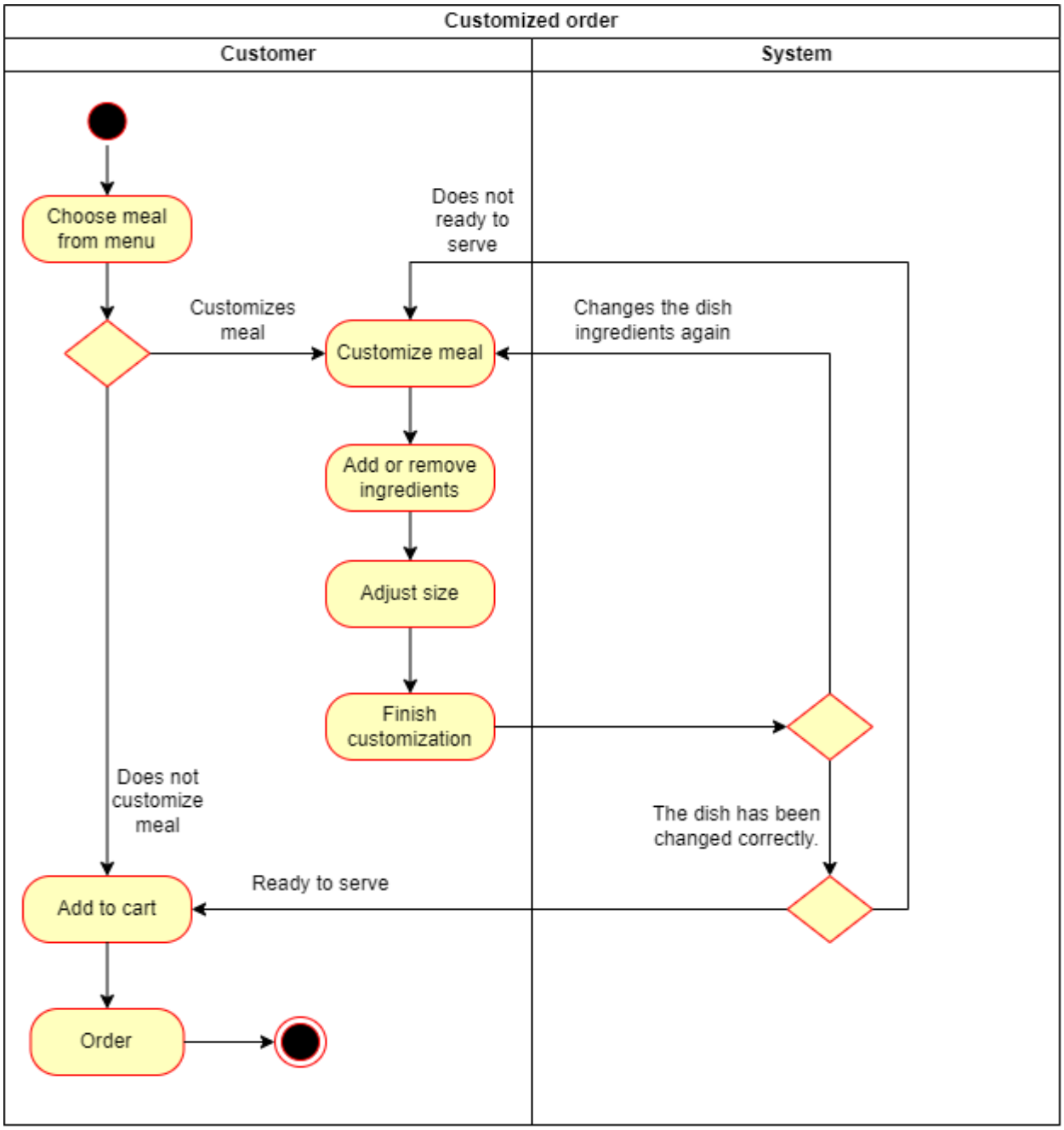

Figure 4..Activity diagram for new process of food ordering system of Jollibee

(Source: authors)

Part 5. User interface design and Data design

5.1 User interface design

5.1.1 Overview and purpose

Overview

The goal of the Jollibee mobile app is to give its customers a smooth and enjoyable online dining experience. To do this, a well-designed user interface (UI) is essential. Customers should be able to quickly and simply traverse the menu, personalize their orders, and finish the checkout process thanks to an intuitive, aesthetically pleasing, and efficient user interface. The app can increase customer loyalty and boost sales by emphasizing the user experience and integrating Jollibee's brand identity.

Purpose

1. **Enhance User Experience:** create a positive and memorable user experience that encourages customer loyalty and repeat usage.
2. **Simplify the Ordering Process:** streamline the ordering process, making it quick and easy for customers to place their orders.
3. **Boost Sales:** drive sales by offering personalized recommendations, promotions, and a seamless checkout experience.
4. **Strengthen Brand Identity:** reinforce Jollibee's brand identity through a consistent and visually appealing design.
5. **Increase Customer Satisfaction:** meet customer expectations and build trust by providing a reliable and efficient app.

5.1.1.1. Home Page

Overview

When a user logs in and starts accessing the Jollibee application, the user will first see the Homepage interface. This page plays a central role, helping users easily search and access key features such as ordering food, viewing promotions, and managing personal accounts.

The interface has been improved so that customers can easily search for promotional combo dishes. The Home Page interface is designed to be intuitive,

minimizing unused tasks so it is easy to use and focuses on displaying promotional information, featured products, and popular food options. .

Purpose

1. **Get user attention**
- Display attractive promotions right at the top of the page to stimulate shopping needs.
- The "Today's specials" section is designed to stand out, helping users quickly recognize the daily promotions.
2. **User navigation**
- The clear navigation bar at the top allows quick access to main sections: Home, store, contact.
- The search bar and filters help users easily find the dishes they like.
3. **Increase personalization**
- The personalized welcome section (e.g. "Hi Dat, are you hungry?") creates a sense of friendliness and connection.
4. **Increase conversion rate**
- Combos are clearly listed with promotional prices and estimated delivery times, helping users easily make purchasing decisions.
- The icons for rating dishes (stars), delivery (motorbike), and estimated time increase trust.
5. **Create a consistent brand experience**
- Use Jollibee's signature colors (red and yellow), along with the logo and brand imagery to maintain recognition.

5.1.1.2. Meal Customization

Overview

The **Meal Customization** interface is designed to allow users to personalize their meals according to their preferences while ensuring clarity and convenience during the ordering process. This interface enables customers to select meal components, adjust the quantity of toppings, and add optional extras like herbs or cheese.

The customization steps are presented in a clear sequence, with real-time price updates and a live display of the total cost of the meal.

Purpose

1. **Catering to personalized meal preferences**

- The customization interface is tailored for customers to easily select meal components, such as sauce, meat, or preferred toppings. For example, customers can adjust the quantity of minced beef sauce (less, medium, or extra) or add cheese with clearly displayed additional fees.

2. **Enhancing a seamless and intuitive experience**

- Customization components like sliders, quantity increment/decrement buttons, and dropdown menus make the interface easy and quick to use. The dish image is prominently displayed at the top center, providing users with a friendly and visual experience.

3. **Ensuring price transparency**

- Prices dynamically update as customers customize their toppings or upgrade meal portions. The total price is prominently displayed at the bottom, enabling customers to track costs and make informed decisions.

4. **Maintaining brand consistency and optimization**

- The interface incorporates Jollibee's signature red and yellow colors along with its iconic branding throughout, ensuring a cohesive and recognizable user experience.

5. **Driving conversion rates**

- Clear action buttons such as "Add to Cart" or "Cancel," along with a simple yet effective layout, ensure customers can quickly complete their orders with minimal friction.

5.1.1.3. Add Meal to cart

Overview

The Add Meal to Cart interface serves as a confirmation step after users have successfully customized their meal. This screen provides users with feedback that their selected meal has been added to their cart while giving them clear options to continue shopping or proceed to the cart for checkout.

The interface is designed to be simple and visually distinct, ensuring that the user feels reassured about their action and is guided smoothly to the next step in their journey.

Purpose

1. **Reassuring the user**
- The confirmation message (e.g., *"Successfully added to cart"*) provides instant feedback to users, assuring them that their action has been completed successfully.
2. **Facilitating navigation**
- Users are given two clear options:
    - *"Continue Shopping"* allows them to browse more items.
    - *"Go to Cart"* directs them to review their selections and proceed with checkout.
3. **Improving user experience**
- A bright, visually appealing overlay with clear buttons minimizes confusion and helps users feel in control of their journey.
- The use of Jollibee's red and yellow branding reinforces consistency across the application.
4. **Encouraging additional purchases**
- By offering the option to return to shopping, the interface subtly encourages users to explore and add more items to their cart.
5. **Streamlining the checkout process**
- For users ready to finalize their purchase, the “Go to Cart” button provides a seamless transition to the checkout phase.

5.1.1.4. Custom carts

Overview

The Custom Carts interface is a critical component of the ordering process, designed to provide users with a detailed overview of the items they have selected. It serves as a centralized space for reviewing meal selections, adjusting quantities, applying vouchers, and verifying order details before proceeding to checkout.

This screen ensures a seamless and user-friendly experience by offering interactive elements for customization while maintaining transparency in pricing and discounts.

Purpose

1. **Providing transparency and control**
    - The cart displays a summary of all selected items, including their names, quantities, individual prices, and any applied discounts, allowing users to review and confirm their orders with ease.
2. **Enabling quick adjustments**
    - Users can modify their selections directly within the cart by adjusting quantities, removing items, or adding special notes to individual meals. For instance, a user can increase the quantity of a combo meal or add a note requesting "no ice" for their drink.
3. **Facilitating promotional benefits**
    - A dedicated section for voucher application encourages users to take advantage of promotions and discounts, further enhancing the shopping experience.
4. **Reassuring pricing clarity**
    - The interface clearly outlines the breakdown of costs, including the total price, discounts, and any delivery charges, helping users understand the value they are receiving.
5. **Streamlining checkout navigation**
    - A prominent "Checkout" button at the bottom of the screen ensures a smooth transition to the payment process while maintaining accessibility for further cart adjustments.
6. **Strengthening trust and convenience**
    - The ability to update delivery details (e.g., address, phone number) directly from the cart page adds a layer of convenience, minimizing errors and enhancing trust in the ordering process.

5.1.2 Deliverables

Table: Detailed Deliverables and Designed Interfaces with Key Features

Deliverable	Detailed Description	Designed Interface Reference	Key Features
Home Page	This interface shows some promotional combos, a search bar, and categorization of meals	Home Page Interface	Flash deal display, Search box, Greetings with

	in order for users to easily navigate and choose whatever they want. It also includes discounts and personalized greetings right there on the homepage.		names, Navigation, Cuisines
Meal Customization	Meal customization enables the user to personalize selected meals by setting toppings, sauces, and quantity. A user can also add notes in the case of special requests, and it automatically updates the prices dynamically with selections.	Meal Customization Interface (Single Meal)	Toppings selector - with multiple selected items, Quantity chooser, Special instructions, Price changing, Sliding selectors
Add Meal to Cart	When adding a meal to the cart, the Add Meal to Cart interface shows successfully adding a meal to the cart, and gives the option to either continue shopping or go to the cart for checkout. Clarity provides assurance.	Add Meal to Cart Confirmation Interface	Confirm message, Continue shopping option, Proceed to cart button, Visual response
Custom Carts	The Custom Carts interface enumerates all the selected items, showing their names and details of quantity and prices. It allows you to add features like applying vouchers, updating delivery details, editing item quantities, or viewing the total breakdown for price transparency.	Shopping Cart Interface	Item overview, Quantity adjustments, Voucher application, Delivery info update, Price transparency

5.1.3 Creating Wireframes

5.1.3.1. Home Page

The wireframe of the Home Page was designed in such a way that each and every important element was underlined in order to help the user with ease in using this application. It contains an upper section with a navigation bar, greeting personalized and a quick search bar. It will also contain a promotional banner pointing out some special offers in the application, a list of product categories in a vertical position, and places where images, prices, and ratings are supposed to go under each category. This structure ensures a smooth user experience, as navigation is easy and promotions are highly visible.

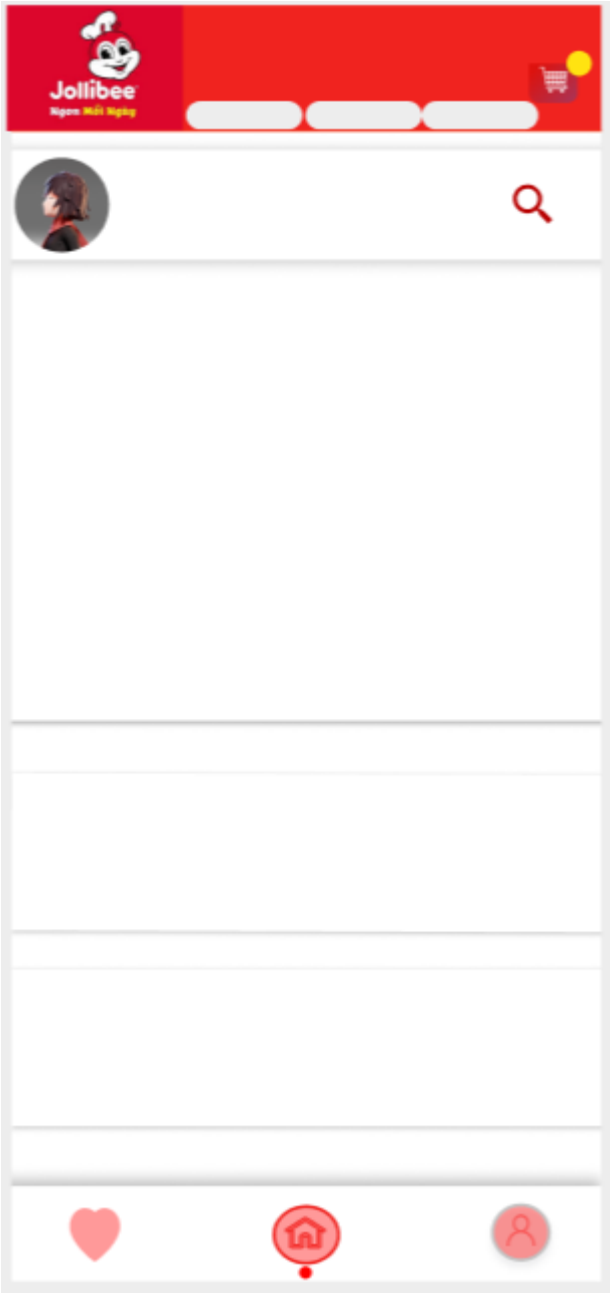

***Figure**: Homepage Wireframe. (Sources: Author)*

5.1.3.2. Meal Customization

The Meal Customization wireframe enables users to easily personalize their orders. The layout consists of a placeholder image of the selected meal at the top; below it are options for toppings and extras that can be added to or removed from the order, with "+/-" buttons for clearly controlling the quantity. A text field at the bottom

allows special notes to be added. The design is minimalistic in order to focus on functionality and provide dynamic price updates for a transparent shopping experience.

***Figure**:Meal Customization Wireframe. (Sources: Author)*

5.1.3.3. Add Meal to Cart

Above is a wireframe that indicates after a user has added a meal to her cart, a confirmation message overlay appears. There is a large check mark symbol that gives good confirmation to the user and two very noticeable buttons saying "Continue Shopping" and "Go to Cart." This layout should clearly support the user and guide her further, either to continue browsing or to proceed with checkout.

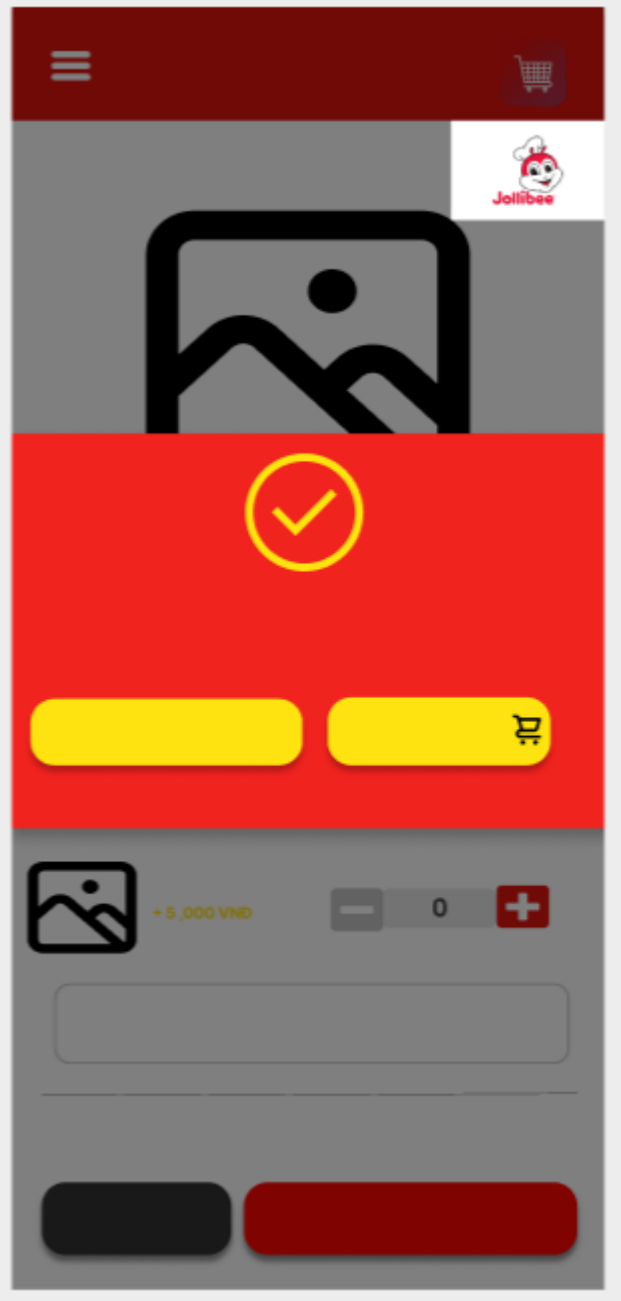

***Figure**: Add Meal to Cart Confirmation Wireframe. (Sources: Author)*

5.1.3.4. Custom Carts

Custom Carts wire provides a detailed overview of the selected items in the user's cart: product names, prices, quantity, and an editable notes section per item. This wire also contains a voucher input field for discount handling, with the total price of

the order shown dynamically at the bottom. This would make it easy for users to review and adjust their orders before they checkout.

***Figure**: Shopping Cart Wireframe. (Sources: Author)*

5.1.4 Screen Mockups

5.1.4.1. Home Page

Below is the proposed home page interface of the Jollibee application, designed to be user-friendly. It would ensure that the signature red and yellow colors of Jollibee's branding are featured in the layout for consistency while navigating the user fast and conveniently in making decisions.

At the top, it displays the Jollibee logo, a language selector, navigation menu, and a personalized greeting ("Hi Dat, are you hungry?").

The central section highlights promotional banners with special offers, enticing users with discounts and e-voucher deals.

The Combo meals categorized and listed below outline pricing in detail, ratings, and estimated delivery times.

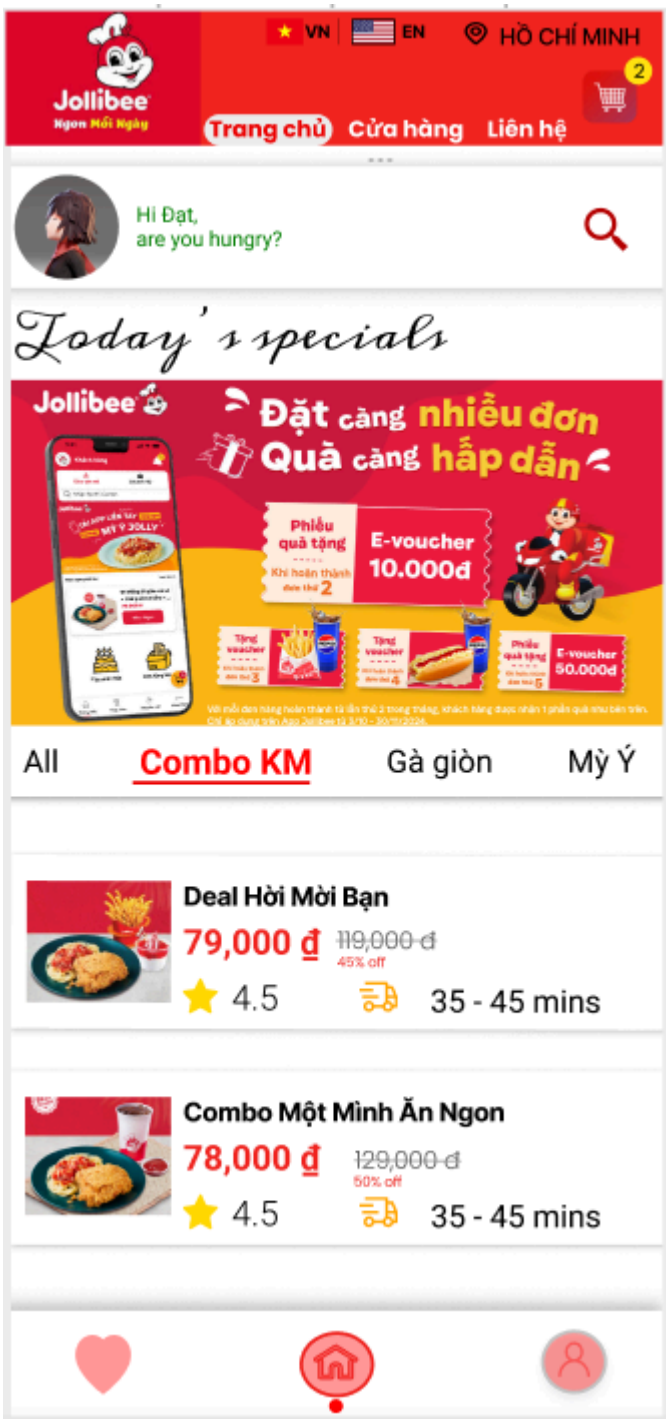

Figure: *Home Page Interface. (Sources: Author)*

5.4.4.2. Meal Customization

- **Customize dishes**

Meal Customization allows a user to customize a single meal by choosing the quantity of toppings, for example, noodles or minced beef sauce, using sliders and quantity selectors. Extra options, such as cheese, can optionally be selected with a clear display of additional costs, while free toppings like herbs are selected via checkboxes. The interface dynamically refreshes the total price depending on a user's choices. Besides, it includes a text field for special notes. That's a smooth and interactive design; call-to-action buttons "Cancel" and "Add to Cart" are all highly visible.

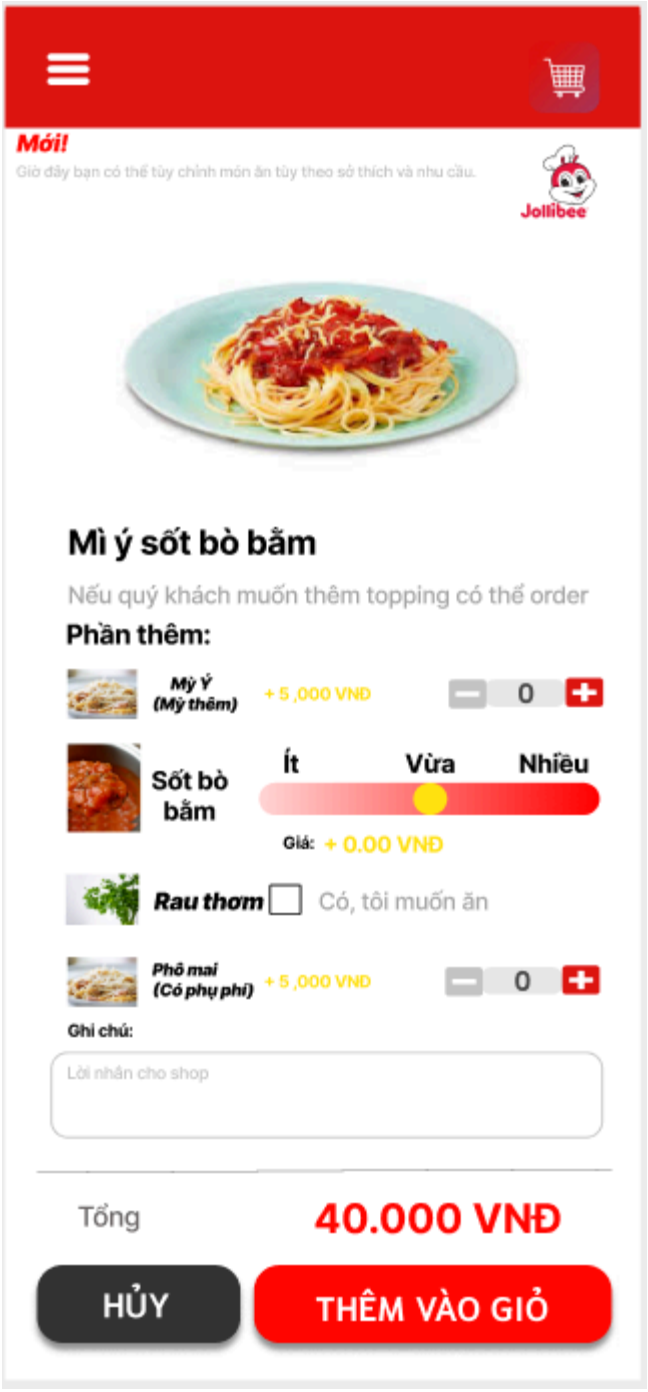

Figure: *Meal Customization Interface (Single Meal). (Sources: Author)*

- **Customize Combo**

Another example is a screen combo customization process in meals that combines 1 Medium Jolly Spaghetti, 2 Boneless Chicken, 1 Medium Fries, and 1 Soft

Drink. Users can start customizing from selecting the main course down to the replacement of side dishes like fries and soft drinks.

It allows for easy handling of quantity changes with transparent "+/-" buttons, while the total price is dynamically shown at the bottom. The action buttons Cancel and Add to Cart are placed in very strategic positions to help users navigate through them.

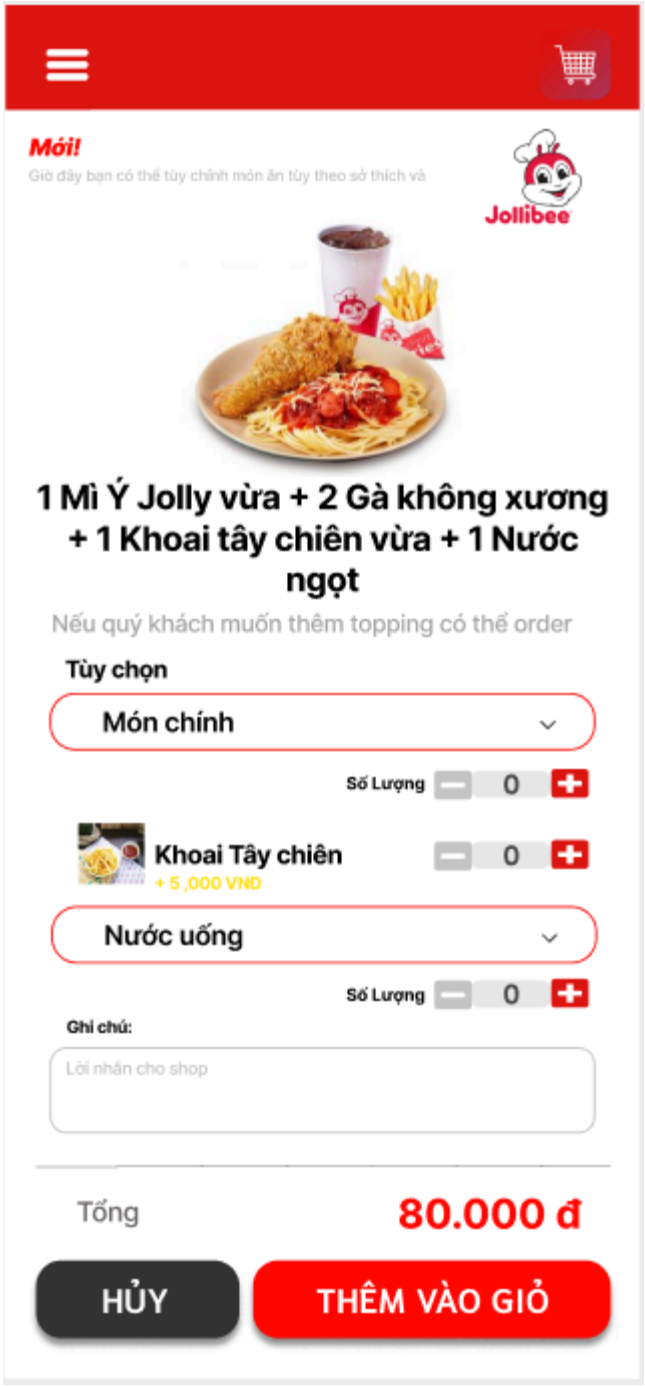

Figure: *Combo Customization Interface - Default View. (Sources: Author)*

On the selection page for main dishes, the user goes ahead and selects the main dish from a dropdown list. A selection menu shows items such as Crispy Chicken Delight and Large Jolly Spaghetti, along with their prices. The customers can enhance

their meal sets with the help of premium items provided. That dropdown is gonna keep things nice and intuitive, and auto-bump the updated price righto.

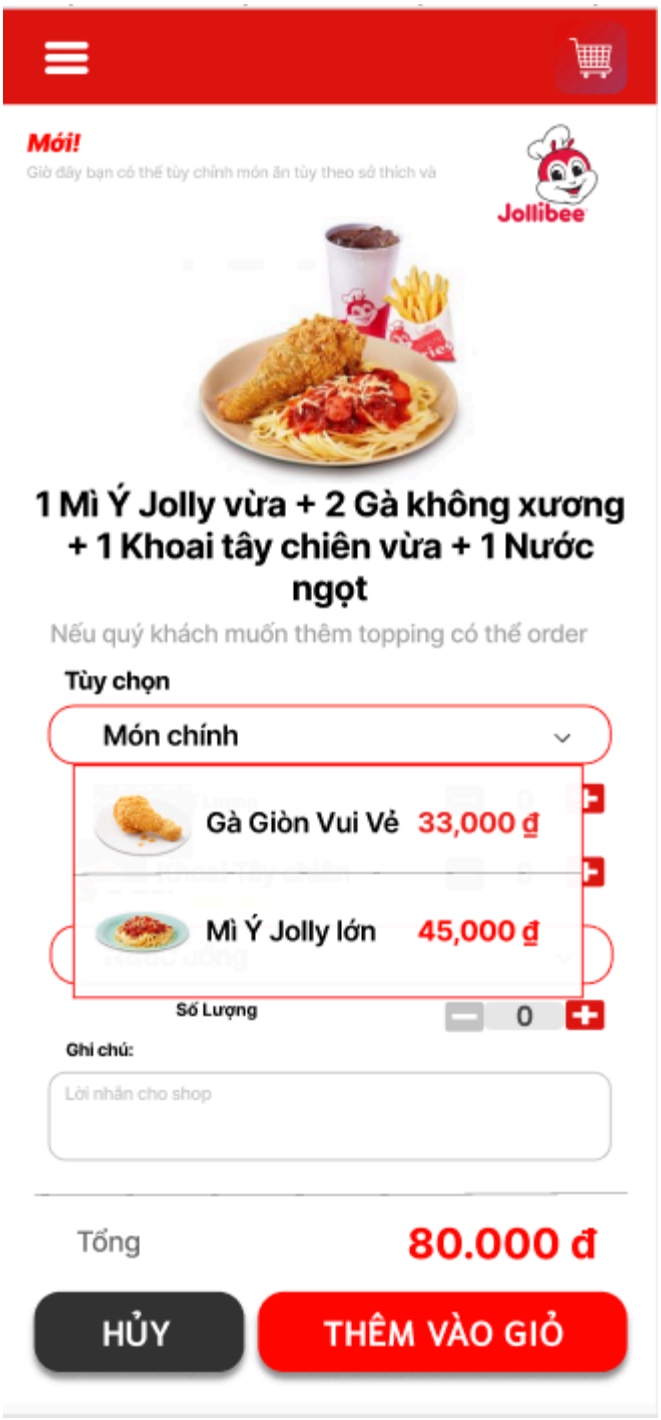

Figure: *Example Customization: Main Dish Selection. (Sources: Author)*

Finally, users can view and adjust the quantity for each item, such as increasing the number of Crispy Chicken Delight or Fries. There is also an extra box, Notes,

where users can add special instructions about their order. The dynamically updated total price will keep things clear, while the action buttons (Cancel and Add to Cart) will guide the user toward the final selection with ease.

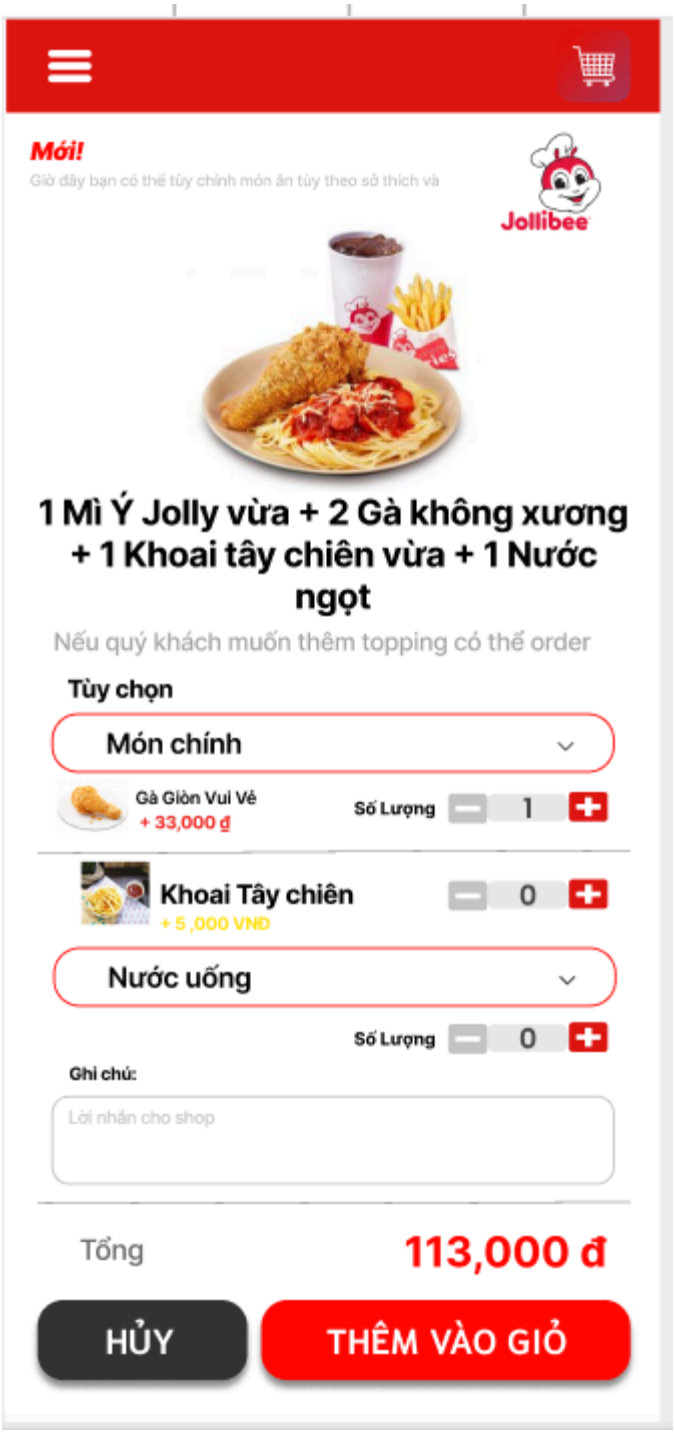

Figure: *Combo Customization Interface - Quantity Adjustment. (Sources: Author)*

5.4.4.3. Add Meal to cart

After setting the setting for their meal, the customer clicks the "Add to Cart" button. This initiates an Add Meal to Cart Confirmation interface, which instantly pops up with a message to confirm to them their action taken.

With two action buttons then help the user’s next steps:

- The "Continue Shopping" button allows the customer to return to the menu for further browsing of meal options.
- "Go to Cart" button redirects them to the preview of selected items, adjustment of quantities, or directly to checkout.

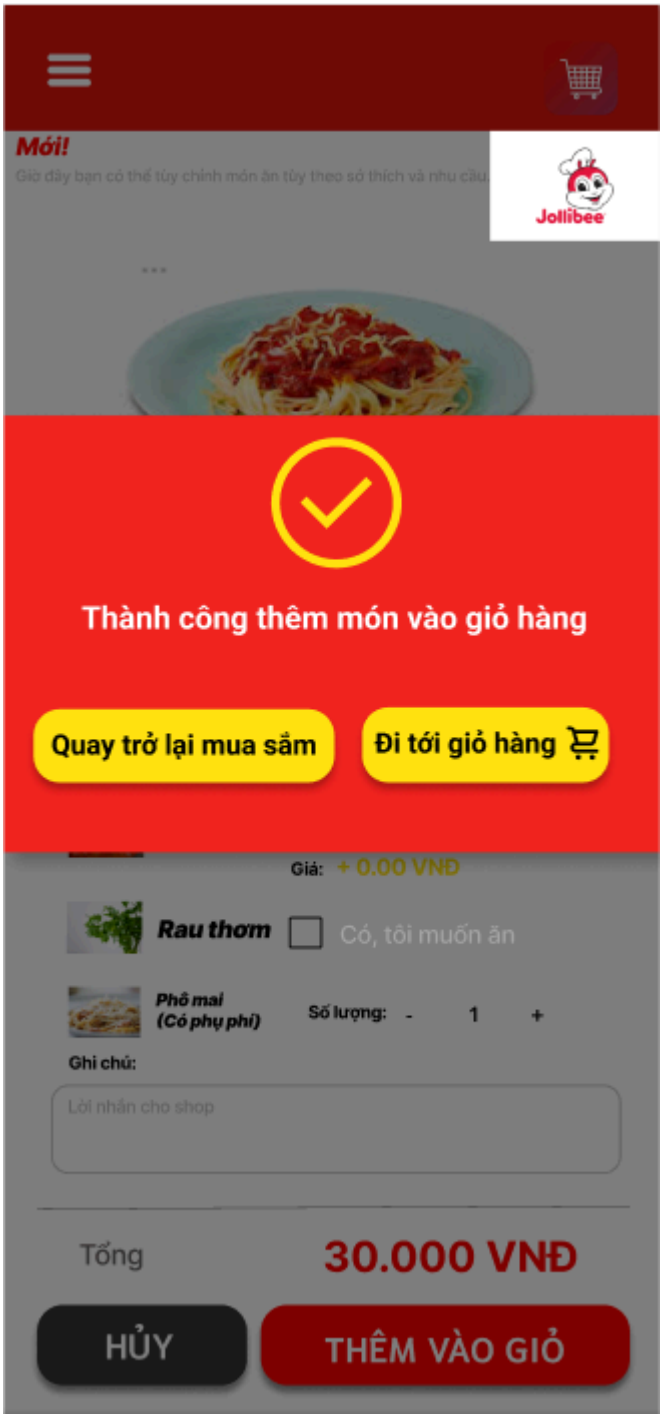

Figure: *Add Meal to Cart Confirmation. (Sources: Author)*

5.4.4.4. Custom carts

The Shopping Cart Interface lists a summary of all meals selected in great detail before proceeding to checkout. It comes after adding items into the cart or by clicking "Go to Cart" from the confirmation screen or through a cart from the main menu.

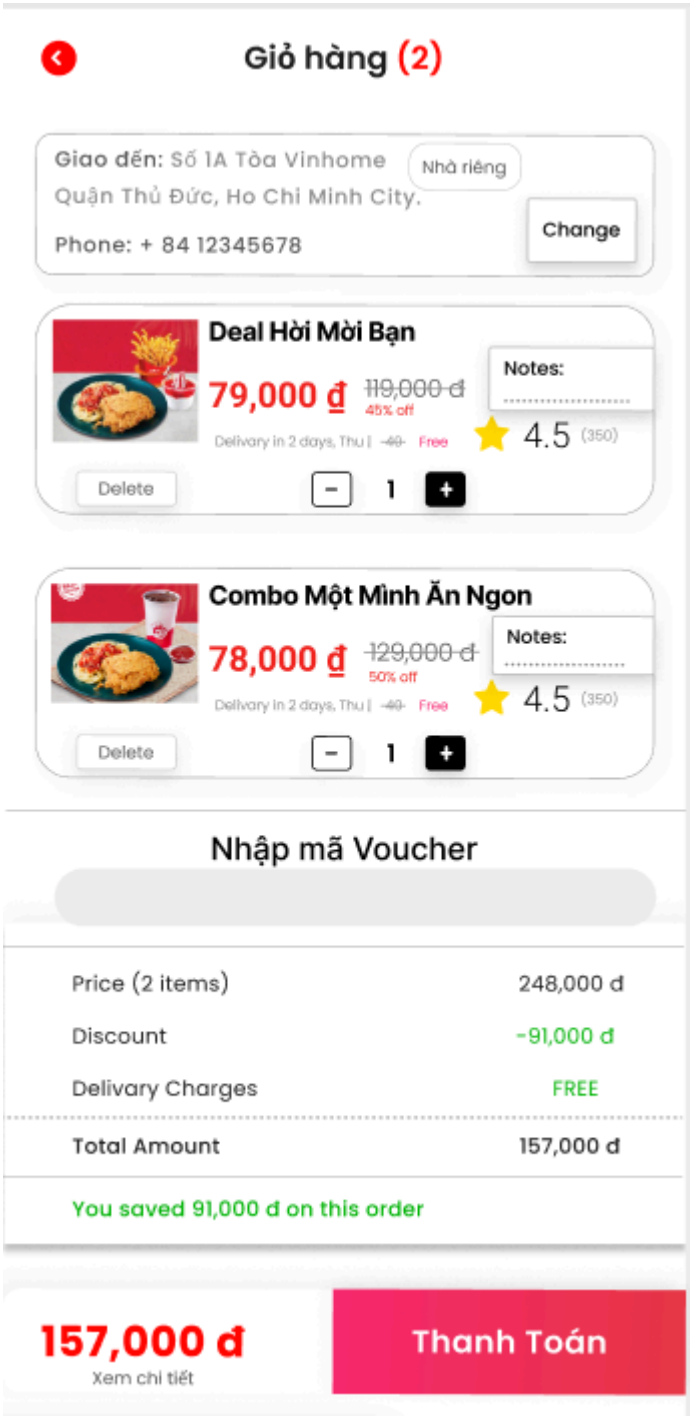

Figure: *Shopping Cart Interface. (Sources: Author)*

5.1.5 Prototype

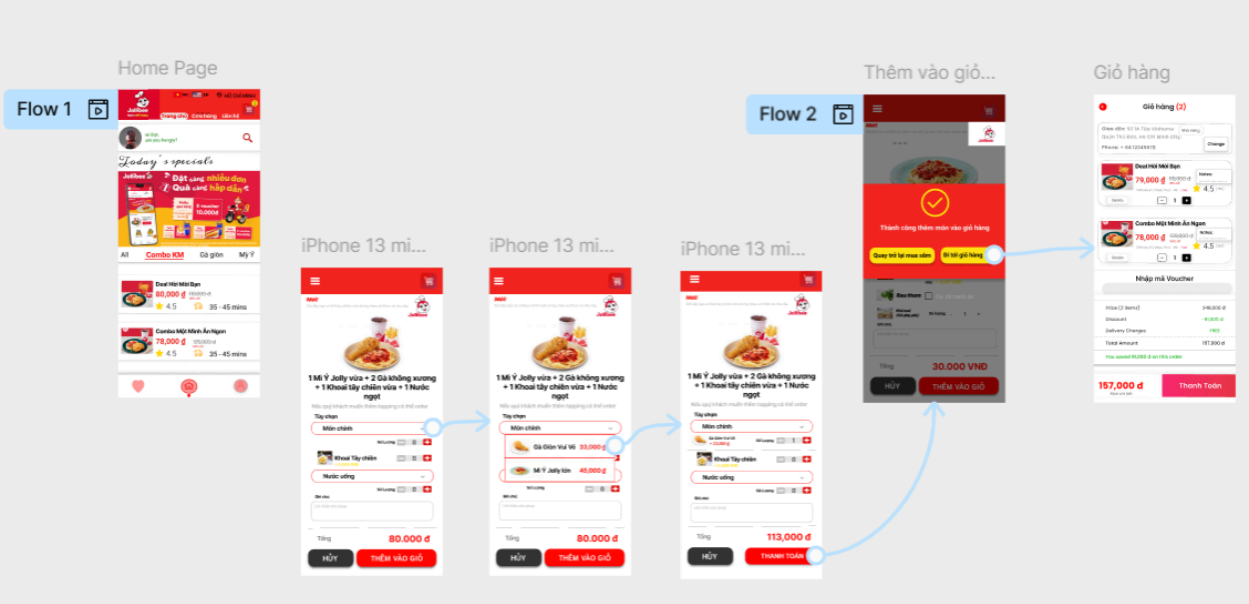

Figure: *Prototype Flow for Jollibee App Ordering Process. (Sources: Author)*

Flow 1: Browsing and Customization

1. **Home Page**
    - The customer is redirected to the Main interface, which displays promotional combos, a greeting personalized for him, and categorized menu options.
    - The customer decides to order a combo, such as "Combo Một Mình Ăn Ngon".
2. **Combo Customization (Step 1)**
    - The user is taken further to the interface for Combo Personalisation to select the main course (Main Dish), side dishes (Fries), and a beverage (Soft Drink).
3. **Combo Customization (Step 2)**
    - The customer can choose from dropdown menus of available options for the main course, like Crispy Chicken Delight or Jolly Spaghetti.
4. **Combo Customization (Final Step)**
    - The customer, after making the selections, can modify the quantities or add optional items they want, such as extra fries. The bottom shows the

dynamically updated total price of the order. They click "Add to Cart" to continue.

Flow 2: Confirmation and Cart Review

1. **Add Meal to Cart Confirmation**
    - A success message is displayed, including text such as "Your customized meal was added to your cart". The customer has two options:
        - *"Continue Shopping"* to go back to the menu.
        - *"Go to Cart"* to view the order.
2. **Shopping Cart Interface**
    - The cart summarizes in detail the items selected, prices, quantities, and discounts applied.
    - The customer can apply their voucher, if available, for extra savings, make quantity adjustments, or add special notes.
    - The last step of "Check out" finishes the order.

5.2 Validation

Table: Key Metrics for Validation of User Interface and Flow

Validation	Key Metric	Description
User Interface	**Page Load Time**	Measure the time it takes for each interface (e.g., Home Page, Meal Customization) to load.
	Click-to-Action Conversion Rate	Percentage of users who proceed from selecting a meal to adding it to the cart.
	Error Rate	Number of errors encountered during user actions (e.g., invalid inputs, broken links).
	Task Completion Time	Time taken for users to complete specific tasks (e.g., customizing a combo, checkout).
	Bounce Rate	Percentage of users who leave the interface without completing any action.
Flow Validation	**Navigation**	Percentage of users successfully

	Accuracy	navigating between flows (Home → Customization → Cart).
	Drop-Off Rate	Percentage of users who abandon the process at specific stages (e.g., Meal Customization).

5.3 Database design

5.3.1 Overview and purpose

Overview

Database design is critical to making a program useful, secure, and scalable. This database design will support the main functionalities of the Jollibee application: handling user login management, product information, order processing, and payment; it also enhances the login features and adds customizable food portions to let users have flexible and convenient experiences. The system is designed to enhance the login features of the application. Furthermore, it allows users to edit portion sizes, show nutrition facts, and change the prices according to their preference, which satisfies the demand for a personalized customer experience.

Purposes

- **Data Storage and Retrieval:** To store and retrieve efficiently the important data necessary for customers' information, product catalogs, order details, payment information, and loyalty program data.
- **Data Integrity and Consistency:** The solution must be capable of maintaining the accuracy and consistency of the data, using techniques for validation and normalization.
- **Scalability:** The design of the database should be done in such a way that the solutions are capable of accommodating growth in the future, supporting increasing numbers of users.
- **Security:** Security is an important concern; hence, strong security measures will have to be provided within the system to protect sensitive customer information against any unauthorized access.
- **Performance Optimization:** Performance can be added with optimized queries and indexes to deliver fast data retrieval.

5.3.2 Deliverables

- **Database Schema:** Using the system to create tables and data structures.

- **Entity-Relationship Diagram (ERD):** A diagram which is used to represent the relationships between entities.
- **Normalized Database:** The optimization of the database is performed based on the normalization rules.
- **Physical Database:** The database will be implemented on SQL Server.
- **SQL Script:** This script contains SQL statements used to create the tables and set up the data.

5.3.1. Identify entities, relationship, attributes, data types, and constraints

5.3.1.1. User.

Attribute	Data Type	Constraints
user_id	INT	PRIMARY KEY
user_name	VARCHAR(100)	NOT NULL
email	VARCHAR(255)	UNIQUE, NOT NULL
password	VARCHAR(255)	NOT NULL
phone_number	VARCHAR(20)	NULLABLE
address	TEXT	NULLABLE

5.3.1.2. Product.

Attribute	Data Type	Constraints
product_id	INT	PRIMARY KEY
category_id	INT	FOREIGN KEY
product_name	VARCHAR(100)	NOT NULL
product_description	TEXT	NULLABLE
price	DECIMAL(10,2)	NOT NULL
is_customizable	BOOLEAN	DEFAULT FALSE

5.3.1.3. Category.

Attribute	Data Type	Constraints
category_id	INT	PRIMARY KEY
category_name	NVARCHAR(50)	NOT NULL, UNIQUE

5.3.1.4. Order.

Attribute	Data Type	Constraints
order_id	INT	PRIMARY KEY
user_id	INT	FOREIGN KEY REFERENCES User(user_id)
order_date	DATETIME	DEFAULT GETDATE()
total_amount	DECIMAL(10,2)	NOT NULL
status	NVARCHAR(20)	CHECK (status IN ('pending', 'processing', 'delivered')), DEFAULT 'pending'

5.3.1.5. Order Item.

Attribute	Data Type	Constraints
order_item_id	INT	PRIMARY KEY
order_id	INT	FOREIGN KEY REFERENCES Order(order_id)
product_id	INT	FOREIGN KEY REFERENCES Product(product_id)
quantity	INT	NOT NULL, CHECK

		(quantity > 0)
price	DECIMAL(10, 2)	NOT NULL
customizations	TEXT	NULL

5.3.1.6. Payment.

Attribute	Data Type	Constraints
payment_id	INT	PRIMARY KEY
order_id	INT	FOREIGN KEY REFERENCES Order(order_id)
customer_id	INT	FOREIGN KEY REFERENCES Customer(customer_id)
payment_method	NVARCHAR(50)	NOT NULL
payment_status	NVARCHAR(20)	CHECK (payment_status IN ('pending', 'successful', 'failed')), DEFAULT 'pending'
payment_amount	DECIMAL(10, 2)	NOT NULL

5.3.2 Entity Relationship Diagram

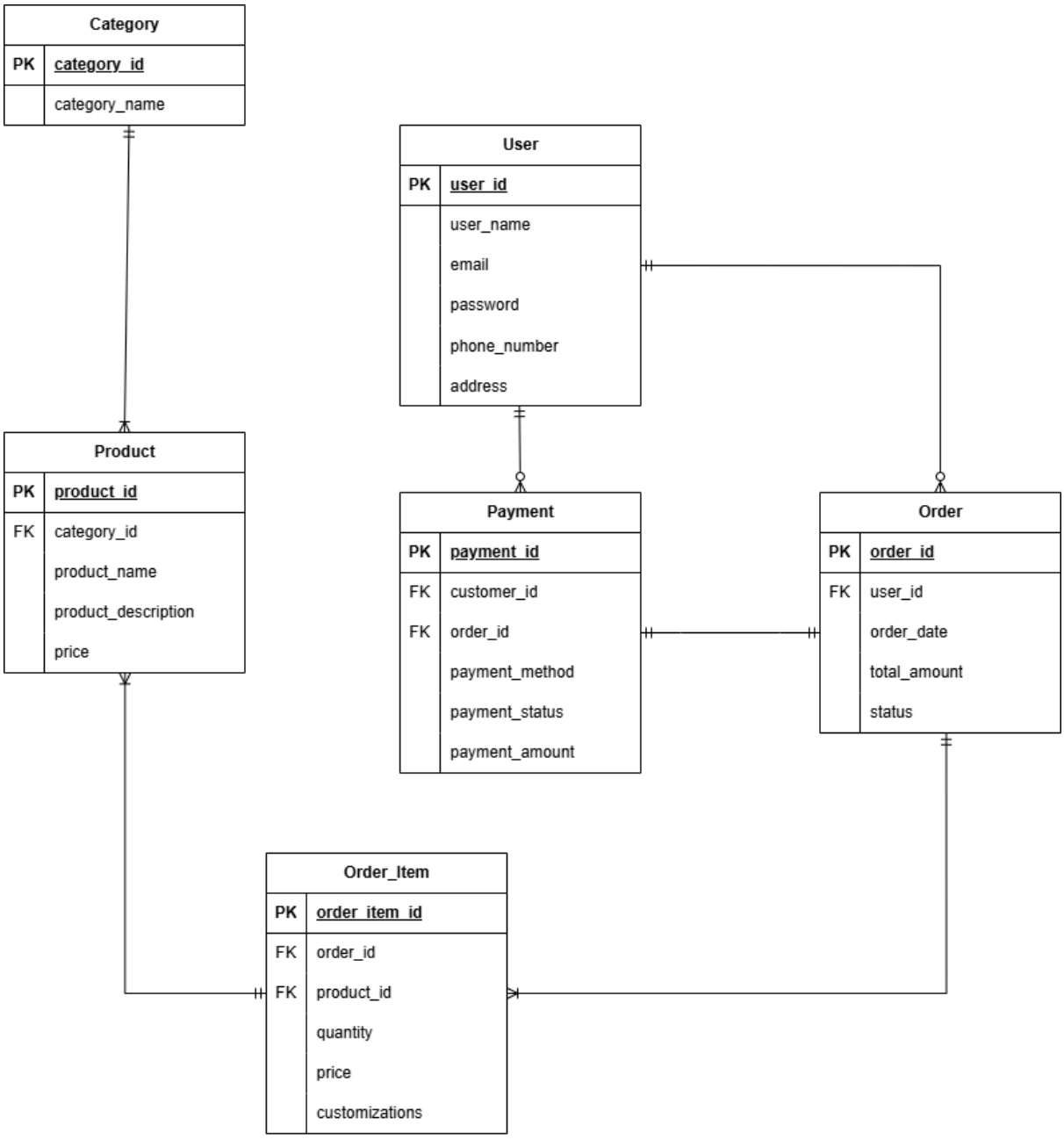

Figure: Entity Relationship Diagram of the Jollibee Project
(source: authors)

5.3.3 Data Normalization

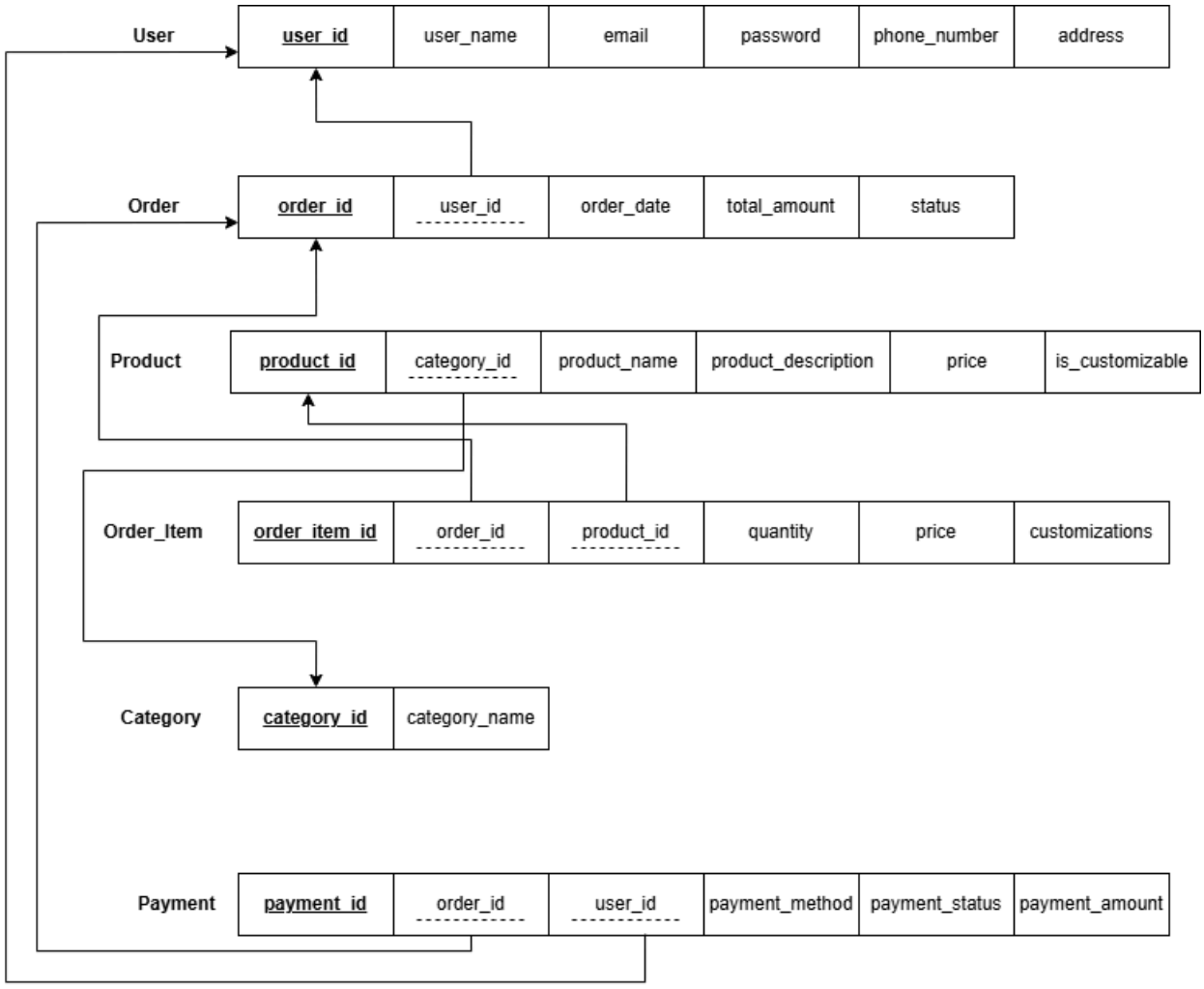

Figure: Data Normalization of the project
(Source: authors)

5.3.4 Physical database in SQL server

CREATE DATABASE JollibeeApp;
USE JollibeeApp;

User

```
CREATE TABLE User (
    user_id INT PRIMARY KEY,
    user_name VARCHAR(100) NOT NULL,
    email VARCHAR(255) UNIQUE NOT NULL,
    password VARCHAR(255) NOT NULL,
    phone_number VARCHAR(20),
    address TEXT
```

)

Category

```
CREATE TABLE Category (
   category_id INT PRIMARY KEY,
   category_name VARCHAR(50) NOT NULL
)
```

Product

```
CREATE TABLE Product (
   product_id INT PRIMARY KEY,
   product_name VARCHAR(100) NOT NULL,
   product_description TEXT,
   price DECIMAL(10, 2) NOT NULL,
   category_id INT,
   is_customizable BIT DEFAULT 0,
   FOREIGN KEY (category_id) REFERENCES Category(category_id)
)
```

Order

```
CREATE TABLE [Order] (
   order_id INT PRIMARY KEY,
   user_id INT,
   order_date DATETIME DEFAULT CURRENT_TIMESTAMP,
   total_amount DECIMAL(10, 2) NOT NULL,
   status VARCHAR(20) DEFAULT 'pending',
   FOREIGN KEY (user_id) REFERENCES User(user_id)
)
```

Order Item

```
CREATE TABLE OrderItem (
   order_item_id INT PRIMARY KEY,
   order_id INT,
   product_id INT,
   quantity INT NOT NULL,
   price DECIMAL(10, 2) NOT NULL,
   customizations TEXT,
   serving_size VARCHAR(50) DEFAULT 'regular',
   calories INT,
   FOREIGN KEY (order_id) REFERENCES [Order](order_id),
```

```
    FOREIGN KEY (product_id) REFERENCES Product(product_id)
)
```

Payment

```
CREATE TABLE Payment (
    payment_id INT PRIMARY KEY IDENTITY,
    order_id INT,
    payment_method VARCHAR(50) NOT NULL,
    payment_status VARCHAR(20) DEFAULT 'pending',
    payment_amount DECIMAL(10, 2) NOT NULL,
    FOREIGN KEY (order_id) REFERENCES [Order](order_id)
)
```

Part 6. Project Plan

6.1 Work Breakdown Structure

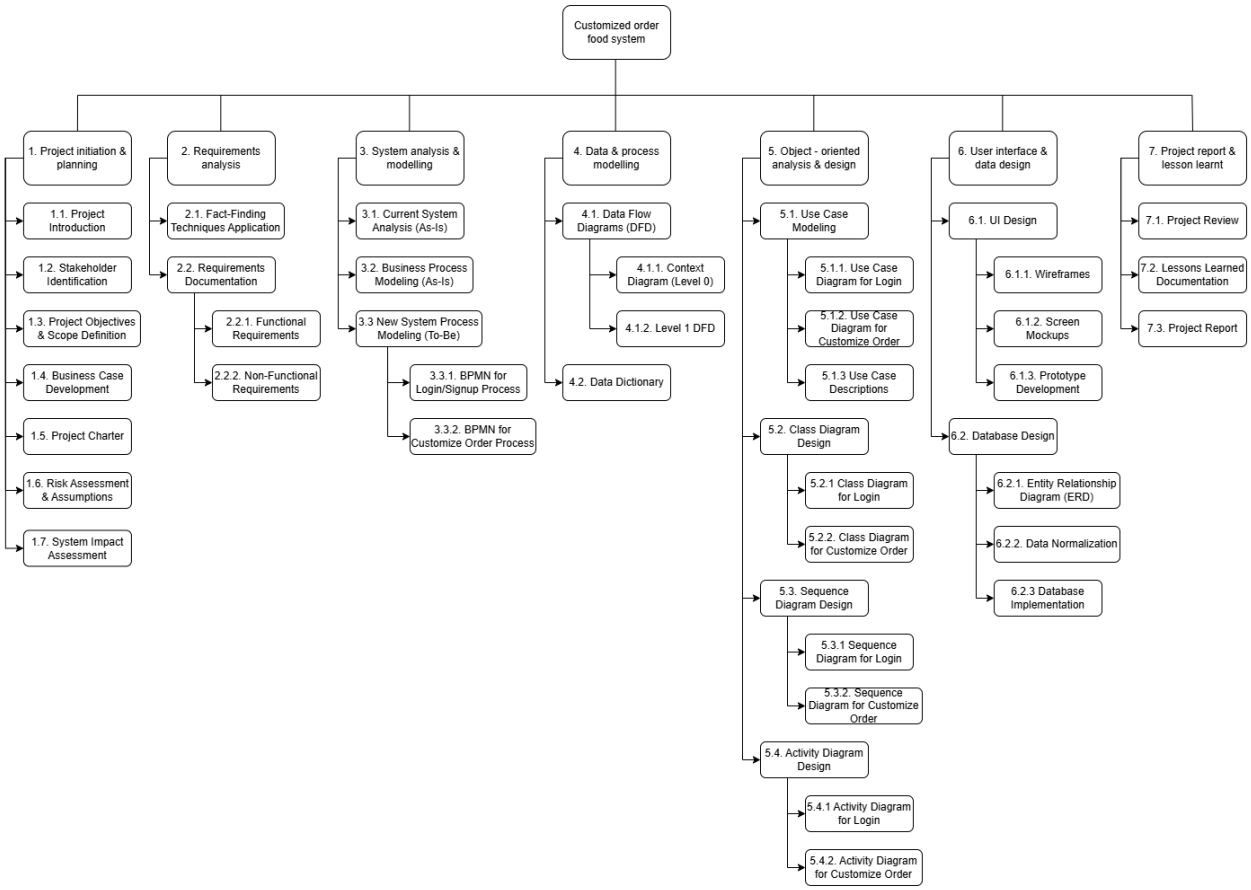

Figure 6.1. Work breakdown structure of project

(Source: authors)

6.2 Project Milestones

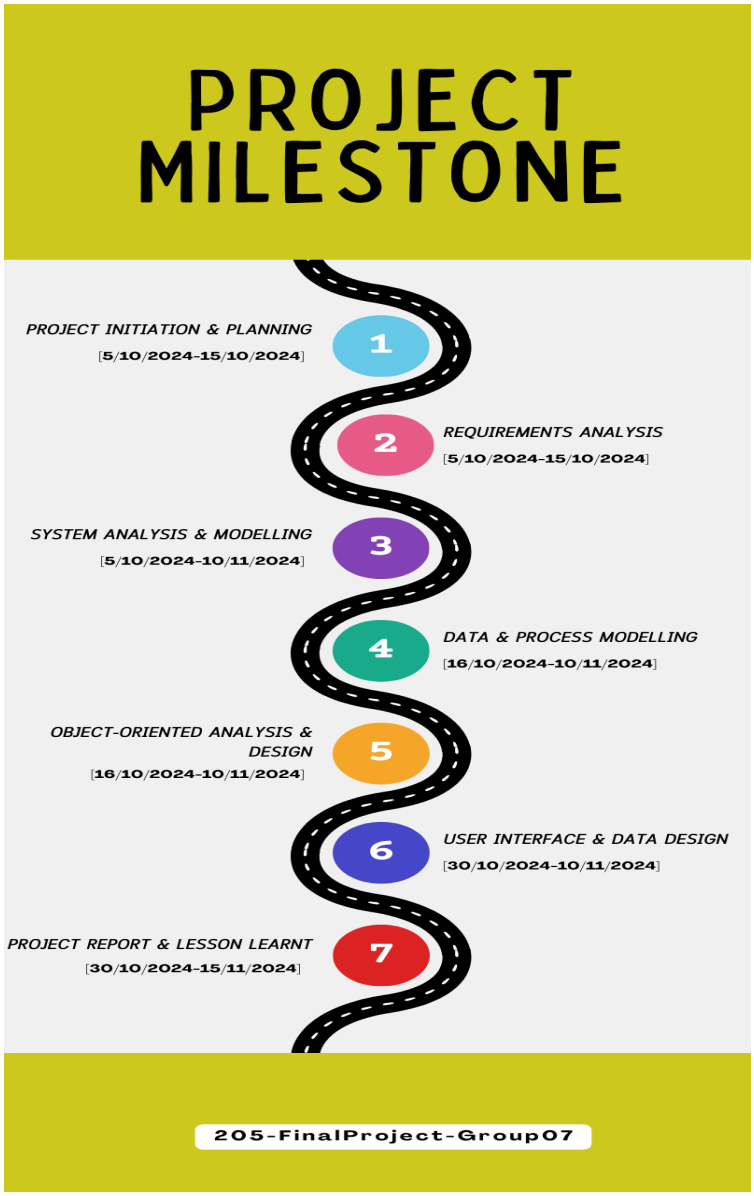

Figure 6.2. Project milestone

(Source: authors)

Part 7. Lessons learnt

No.	Issue / what did not work well	What should the team have done instead?	Lessons Learned
1	When drawing a diagram, not sure where to start and not sure if we have drawn it correctly?	+ Have a solid understanding of the usage, structure and meaning of the symbols for each diagram. + Reviewing or referring to sample diagrams or documents related to the topic. + Seek help and advice from a mentor or seniors who have studied and have experience in drawing diagrams.	+ Having a proper knowledge base of diagram types is crucial. + Feedback from experienced people throughout the drawing process is valuable. + Available resources greatly simplify the drawing process, improve the quality of diagrams, and save drawing time.
	[Description]	[Description]	[Description]
	[Description]	[Description]	[Description]
	[Description]	[Description]	[Description]
	[Description]	[Description]	[Description]

No.	What worked Well	Lesson Learned (Best Practice)
1	Deep understanding of how Jollibee's app ordering system works	When we understand how the system works, combined with the requirements from customers, we will know where to develop new functions in the old process so that it is reasonable, not causing conflicts between the newly developed functions and the existing functions.
	[Description]	[Description]
	[Description]	[Description]
	[Description]	[Description]
	[Description]	[Description]
	[Description]	[Description]
	[Description]	[Description]

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Outline

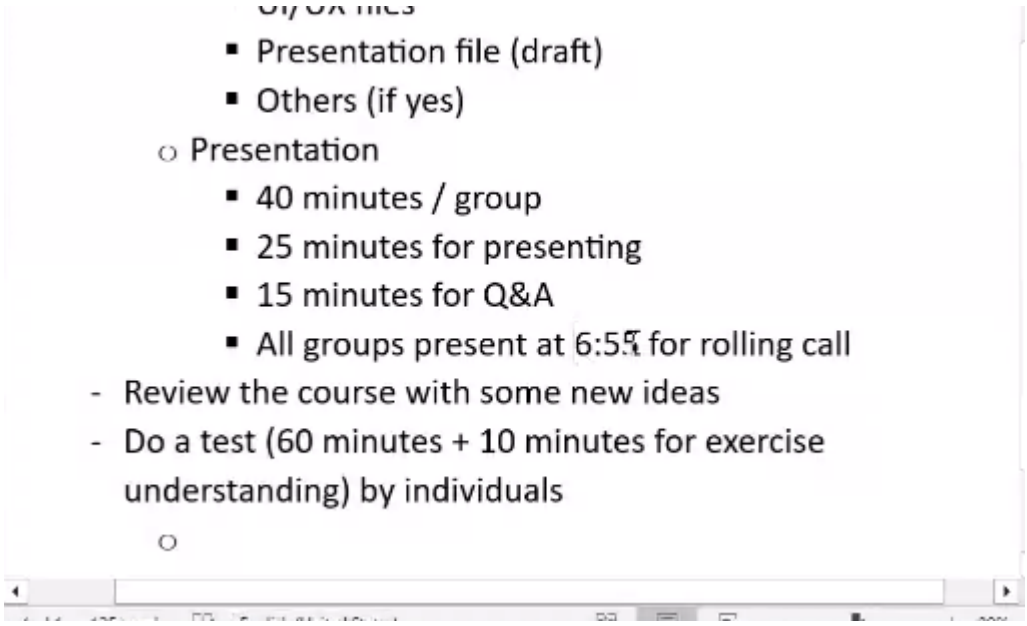
- Final project
  - Submission folder: 205_FinalProject_Group##
    - Report (word, pdf, and Turnitin file < 30% of similarity)
    - Diagram files
    - Database file
    - UI/UX files
    - Presentation file (draft)
    - Others (if yes)
  -
- Review the course with some new ideas
- Do a test (60 minutes + 10 minutes for exercise understanding) by individuals

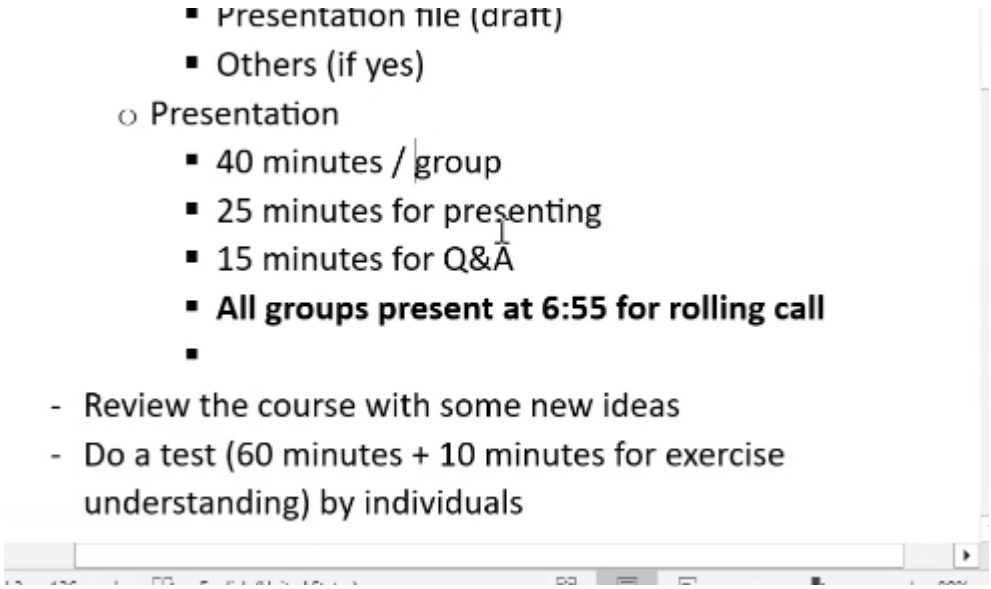
1 59 words English (United States) 90%

Outline

- Final project
  - Submission folder: 205_FinalProject_Group## → it must be compressed. If the size of the folder is over the limited size on the LMS, you should create Google drive and then you copy the Google drive link and past it in the word file namely 205_FinalProject_Group##
    - Report (word, pdf, and Turnitin file < 30% of similarity)
    - Diagram files
    - Database file
    - UI/UX files
    - Presentation file (draft)

1 100 words English (United States)





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