Project Proposal

Wait Management System

z5315885	Ho Wan Hou	z5315885@ad.unsw.edu.au	Scrum Master
z5405329	Puquan Chen	z5405329@ad.unsw.edu.au	Developer
z5275224	Wei Chen	z5275224@ad.unsw.edu.au	Developer
z5338023	Weizhe Pan	z5338023@ad.unsw.edu.au	Developer
z5387750	Qifan Zhao	z5387750@ad.unsw.edu.au	Developer

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Team: Gogogo

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1 Background

1.1 Problem Statement

The traditional process of ordering food at cafes and restaurants involves customers sitting down, browsing the menu, and either waiting for a waiter to take their order or queuing up at a counter. However, this method has some drawbacks. Firstly, it can be time-consuming and frustrating for customers, especially when there are long queues. According to recent data, 55% of American diners and 57% of Canadian diners stated that a waiting time exceeding 30 minutes would discourage them from visiting a restaurant (TouchBistro, 2023). Secondly, the more popular the cafe or restaurant becomes, additional staff must be hired to maintain acceptable wait times, leading to higher operating cost for restaurants.

To overcome these challenges, a Wait Management System has been proposed, enabling customers to place their orders immediately without relying on staff assistance. Additionally, it reduces the chances of miscommunication between customers and waiters, leading to a smoother dining experience. This system should achieve the following objectives:

1. Customer Menu Browsing
2. Customer Ordering
3. Customer Request
4. Kitchen Staff System
5. Wait Staff System
6. Notification System
7. Manager System
8. Rating and Recommendation System (Novel)
9. Analytics (Novel)

1.2 Existing System Analysis

Currently, many restaurant management systems and wait management systems on the market are in the form of an online ordering system or a POS (Point of Sale) system. Mr Yum (Mr Yum, 2023), Tayble (Tayble, 2023) and Square POS (Block Inc, 2023) are three existing systems in the same problem domain. In this analysis, we will compare and evaluate these systems to gain insights into their functionalities and effectiveness in addressing the challenges faced by the industry.

Mr Yum and Tayble are online order platforms that provide similar functionalities. They allow customers to browse menus and place orders. Square's Restaurant POS system offers a restaurant POS solution with features such as floor and table management, stock control, menu management, clock-ins, and roster management. To provide a comprehensive comparison, the following table outlines the pros and cons of each system.

System	Pros	Cons
Mr Yum	1. User-friendly interface for customers to browse menus and place orders. 2. Efficient payment process from customers' own devices.	1. Limited features beyond online ordering, requiring integration with existing POS systems to provide comprehensive functionality for kitchen staff and wait staff.

	3. Customizable menu and easy management of menu items. 4. Loyalty program available, ability to apply vouchers and promo codes to keep customers coming back. 5. Web-based menu URL, no app download. 6. Reporting and Analytics available 7. Delivery and pick-up option available	2. Commissions per order for the ordering and payments functions, potentially increasing the overall cost for the restaurant. 3. Reliance on customer-owned devices and stable internet connectivity. 4. Does not have a rating or review system for customers.
Tayble	1. User-friendly interface for customers to browse menus and place orders. 2. Customizable menu and easy management of menu items. 3. Web-based menu URL, no app download.	1. No online payment available 2. Limited features beyond online ordering. 3. Table ordering only 4. Does not provide integration with other POS systems, require staff to manually enter orders into POS system. 5. Reliance on customer-owned devices and stable internet connectivity. 6. Annual/Monthly Subscription fee, although no commissions per order. 7. Does not have a rating or review system for customers.
Square POS	1. Comprehensive restaurant POS features including: a. Kitchen display system b. Staff Ordering and Menu Management system c. Payment System d. Floor and table management e. Stock control f. Roster management g. Analytics and reporting 2. Overall, users have provided positive reviews especially for the ease of use of the system. (GetApp, 2023)	1. Most expensive, include ongoing subscription fees and transaction fees (depending on pricing plans). 2. Require integration with Square Online or other online order platforms such as Mr Yum to provide front-of-house operations and functions. 3. Limited hardware compatibility and potential higher upfront costs. 4. Limited customizability in loyalty programs and discount set-ups, leading to less flexibility. (GetApp, 2023)

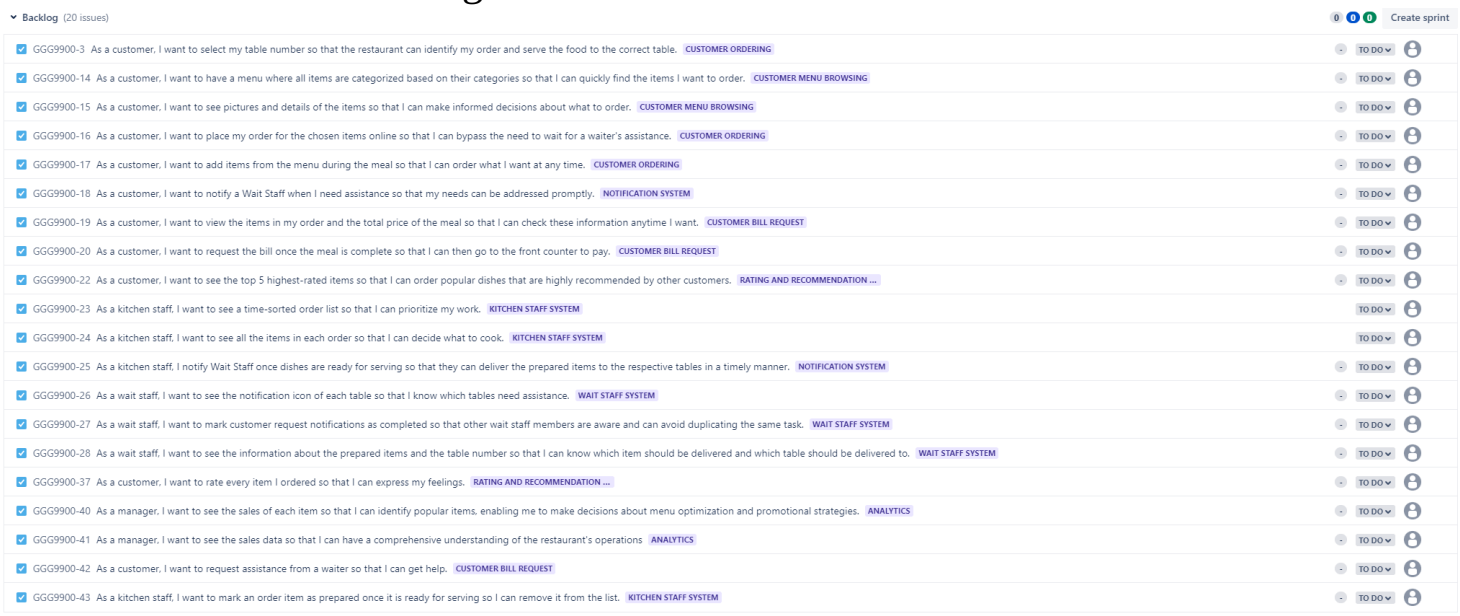
In conclusion, while online ordering platforms like Mr Yum and Tayble offer convenient ways for customers to place orders, they lack direct communication between front-of-house operations and back-of-house operations. This requires integration with POS systems or manual entry of information, leading to potential increases in operating costs for subscribing

to a POS system (ex. Square POS). Furthermore, both platforms lack integrated customer rating and review systems. This can be inconvenient for customers who rely on such feedback to assess the quality and popularity of dishes. As a result, customers may have to use external platforms like Google to find top-rated dishes, which can disrupt the ordering experience.

Therefore, the proposed wait management system aims to connect customer ordering with kitchen staff, wait staff and managers without the need for integration with external systems. It also includes an integrated customer rating and review function to enhance the overall ordering experience, and analytics capabilities for managers to gain insights into their operations.

2 User stories and Sprints

2.1 Product Backlog

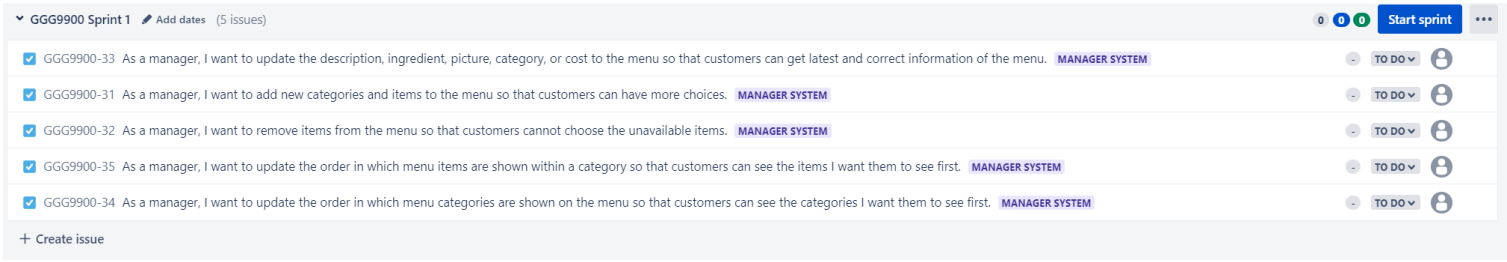


2.2 Sprints

There are 3 sprints in total. Each sprint is about 2 weeks long. These sprints help us to demonstrate the progress in week 5, week 8 and the final week 10. The end date of each sprint is the lab date.

Sprint	Start Date	End Date	Sprint Scope
1	14/6/2023	28/6/2023	The manager system should be implemented. The manager should be able to add, remove categories or items. And the manager should be able to modify the order of categories and items.
2	29/6/2023	19/7/2023	Most of the features should be implemented. Wait staff, kitchen staff and customers should be able to use their end and use the system.
3	20/7/2023	2/8/2023	Novel functionalities should be implemented. The improvement of interface or the correction of data should be implemented.

2.2.1 First Sprint



2.3 Objectives and User Stories

2.3.1 Objective 1: Customer Menu Browsing

Customers can navigate the menu interface, where items are organized into different categories. A clear and user-friendly digital menu enhances customer's ordering experience.

User Stories	Acceptance Criteria
As a customer, I want to have a menu where all items are categorized based on their categories so that I can quickly find the items I want to order.	- Customer should be able to view all items available in the menu. - Each item should be properly classified and grouped.
As a customer, I want to see pictures and details of the items so that I can make informed decisions about what to order.	- Picture of each item should be clearly displayed. - A description and ingredients of each item should be provided. - Price of each item should be clearly displayed.

2.3.2 Objective 2: Customer Ordering

Customers can order items from the menu, providing them with the flexibility to choose and order their desired items at any time during their dining experience. This bypass the need to wait for a waiter's assistance, reducing the waiting time for customers.

User Stories	Acceptance Criteria
As a customer, I want to select my table number so that the restaurant can identify my order and serve the food to the correct table.	- The customer can enter their table number before navigating the menu interface. - Only the available table numbers are visible for selection.
As a customer, I want to place my order for the chosen items online so that I can bypass the need to wait for a waiter's assistance.	- Customer can place an order for items whenever they are ready to do so in the menu browsing interface.
As a customer, I want to add items from the menu during the meal so that I can order what I want at any time.	- Customer can add items to their order at any time during the meal.

2.3.3 Objective 3: Customer Request

Customers can view the items they ordered, along with their prices, and the total amount on the bill. They can also request their bill once the meal is complete.

User Stories	Acceptance Criteria

As a customer, I want to view the items in my order and the total price of the meal so that I can check these information anytime I want.	- Customers can view the details of their order, including:
	  o Item names
	  o Price for each item
	  o Quantity of each item

	○ Total Price
As a customer, I want to request the bill once the meal is complete so that I can then go to the front counter to pay.	- The checkout button is easily accessible and visible to the customer.
As a customer, I want to request assistance from a waiter so that I can get help.	- Customer can request service through the notification button on the menu.

2.3.4 Objective 4: Kitchen Staff System

The kitchen staff will have access to a time-sorted order list displayed on the screen. This allows the kitchen staff to have a clear overview of the items that need to be prepared and prioritize orders accordingly. As a result, efficiency is improved and the waiting time for customers is reduced.

User Stories	Acceptance Criteria
As a kitchen staff, I want to see a time-sorted order list so that I can prioritize my work.	- A time-sorted order list is displayed on the Kitchen Staff interface. - The list is updated when there are new orders.
As a kitchen staff, I want to see all the items in each order so that I can decide what to cook.	- Items in each order are displayed clearly. This includes: ○ Item Name ○ Quantity
As a kitchen staff, I want to mark an order item as prepared once it is ready for serving so I can remove it from the list.	- There is a button next to each item. - Kitchen staff can press the button and mark the item as completed. - Once all items in the order is completed, the order should be removed from the Kitchen Staff Interface.

2.3.5 Objective 5: Wait Staff System

The wait staff system aims to let wait staff serve customers in time. Wait staff should be able to see the information of customers' orders and deliver it to the customers. They can mark the notification once it is completed. This system makes convenience for wait staff to serve customers.

User Stories	Acceptance Criteria
As a wait staff, I want to see the notification icon of each table so that I know which tables need assistance.	- Wait Staff can view a notification icon next to each table on the Wait Staff interface.
As a wait staff, I want to mark customer request notifications as completed so that other wait staff members are aware and can avoid duplicating the same task.	- Wait Staff can mark customer request notifications as complete. - Wait staff interface is updated after a request is marked as complete.
As a wait staff, I want to see the information about the prepared items and the table	- Wait staff can view the detail of item-serve notifications. This includes:

number so that I can know which item should be delivered and which table should be delivered to.	○ Table number ○ Item name

2.3.6 Objective 6: Notification System

The notification system aims to improve communication among customers, wait staff and kitchen staff. Customers can use this system to request assistance and the wait staff will see the notifications on the wait staff system. Kitchen staff can use this system to send the notification to wait staff to remind them the order is ready. This system improves the efficiency of communication.

User Stories	Acceptance Criteria
As a customer, I want to notify a Wait Staff when I need assistance so that my needs can be addressed promptly.	- When the customer press the request assistance notification button, this information should be transmitted to the Wait Staff Interface.
As a kitchen staff, I notify Wait Staff once items are ready for serving so that they can deliver the prepared items to the respective tables in a timely manner.	- When the Kitchen staff marks a prepared item as completed, this information should be transmitted to the Wait Staff Interface.

2.3.7 Objective 7: Manager System

The manager system aims to let manager manage and customize the menu. The manager can use this system to add or remove categories and items. And the manager also can put categories and items in self-defined order. This system enables managers to manage the menu whenever he wants.

User Stories	Acceptance Criteria
As a manager, I want to add new categories and items to the menu so that customers can have more choices.	- Manager can add a new category to the menu with a self-defined name - Manager can add a new items to a category with a self-defined name, description, picture, ingredient and price.
As a manager, I want to remove items from the menu so that customers cannot choose the unavailable items.	- Manager can remove a specified item from the menu.
As a manager, I want to update the description, ingredient, picture, category, or cost to the menu so that customers can get latest and correct information of the menu.	- Manager can update the description, ingredient, picture, category, or price of an item - The updated information should be shown after the customer refresh the page
As a manager, I want to update the order in which menu items are shown within a category so that customers can see the items I want them to see first.	- Manager should be able to modify the order of items within a category - The order of items can be modified by clicking arrows
As a manager, I want to update the order in which menu categories are shown on the	- Manager should be able to modify the order of categories

menu so that customers can see the categories I want them to see first.	- The order of categories can be modified by clicking arrows

2.3.8 Objective 8: Rating and Recommendation System (Novel)

Customers can rate every item they ordered after they requested the bill. An average rating for each item will be calculated. To assist in decision-making, the menu also highlights the top five highest-rated items.

User Stories	Acceptance Criteria
As a customer, I want to see the top 5 highest-rated items so that I can order popular items that are highly recommended by other customers.	- The menu interface includes an option for customers to view the top 5 highest-rated items.
As a customer, I want to rate every item I ordered so that I can express my feelings.	- Customer can rate the items they ordered after checkout by clicking the stars.

2.3.9 Objective 9: Analytics (Novel)

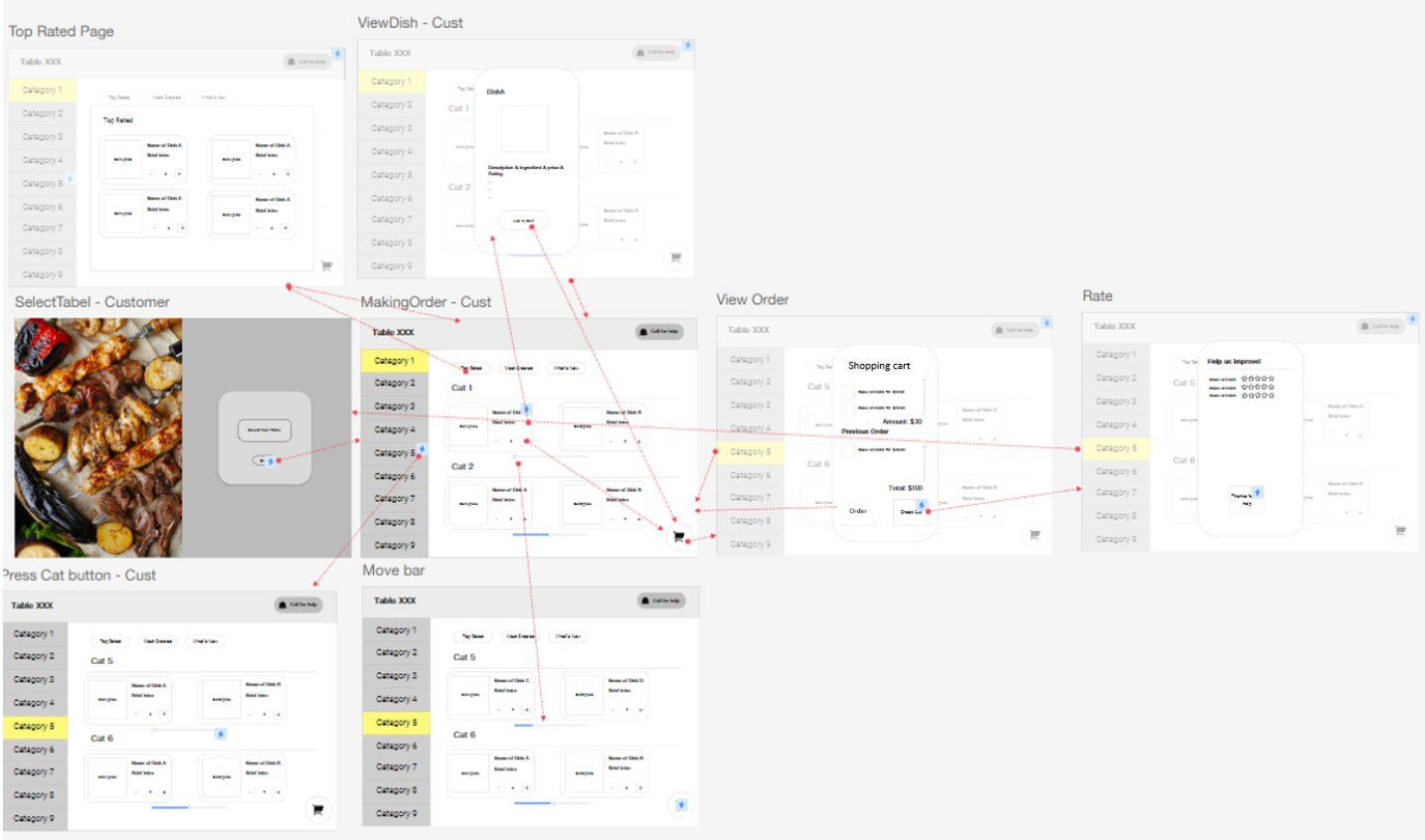
Managers can view the sales situation and turnover of all items within a specific period. This feature allows managers to gain a comprehensive understanding of the restaurant's sales performance, enabling them to plan more effectively for the future.

User Stories	Acceptance Criteria
As a manager, I want to see the sales of each item so that I can identify popular items, enabling me to make decisions about menu optimization and promotional strategies.	- Manager should be able to see the sales of each item within a given time slot.
As a manager, I want to see the sales data so that I can have a comprehensive understanding of the restaurant's operations.	- The sales data should be presented in a clear and easily understandable format, such as charts, graphs, or tables.

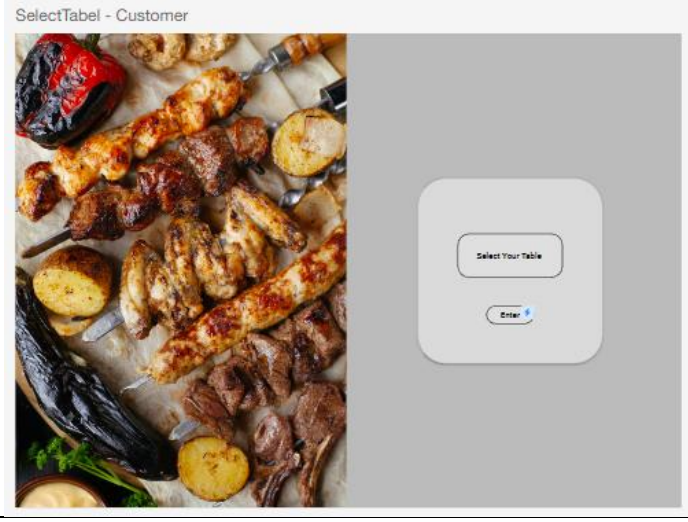
3 Flow Diagram and Interface

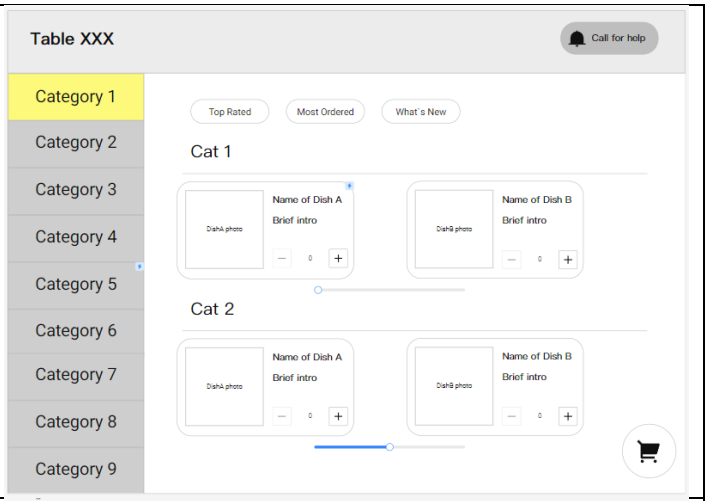
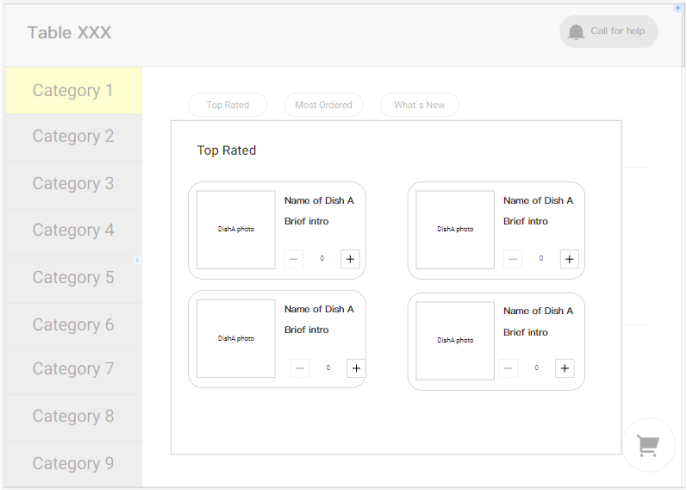
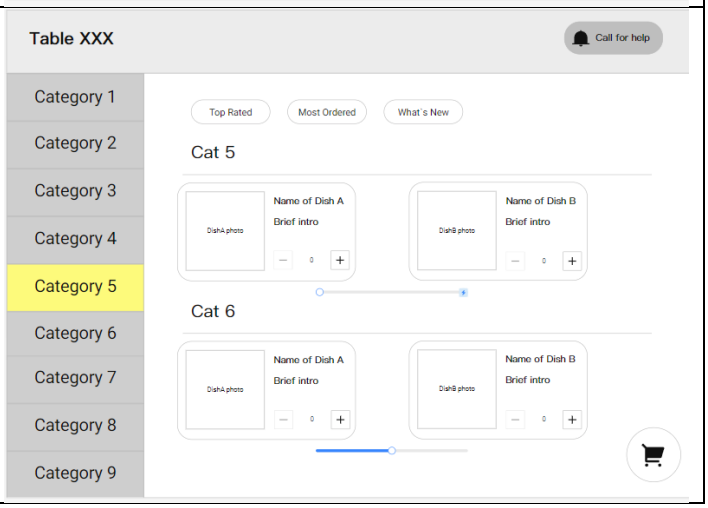
3.1 Customer

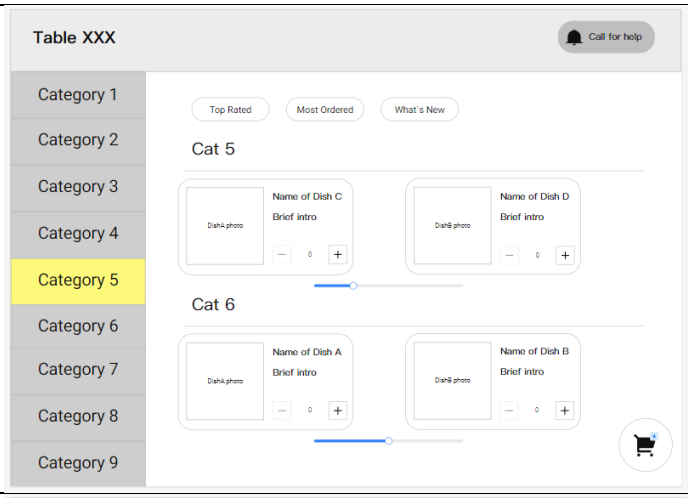
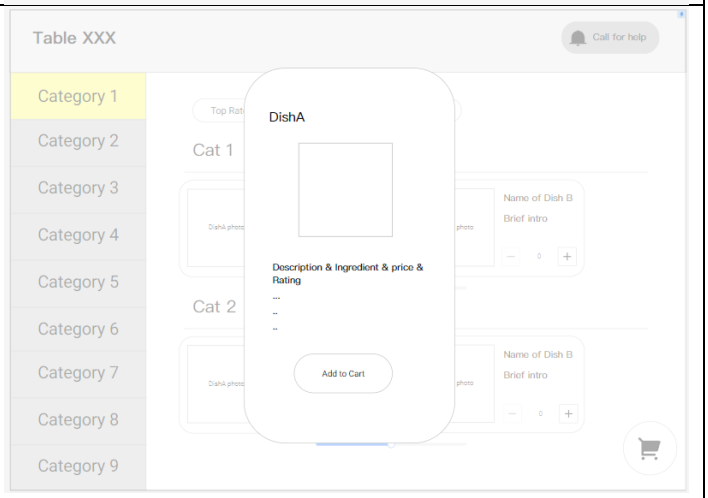
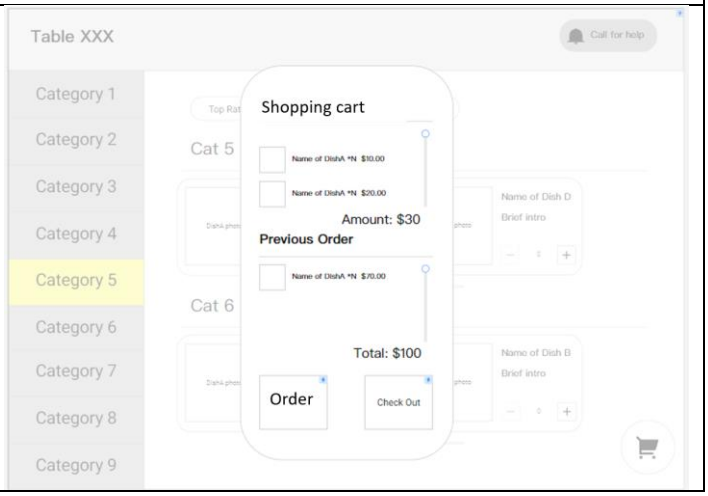
3.1.1 Customer Flow Diagram

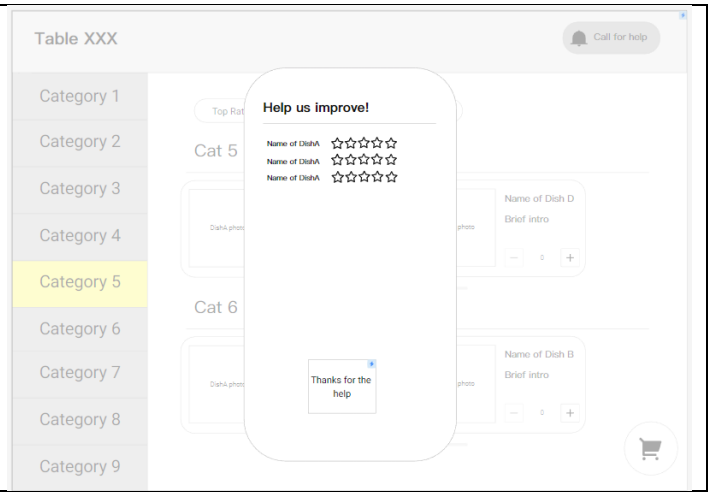


3.1.2 Customer Interface

- The first thing a customer does is to select their table number, which will be recognized as the identification for the later order processing.	

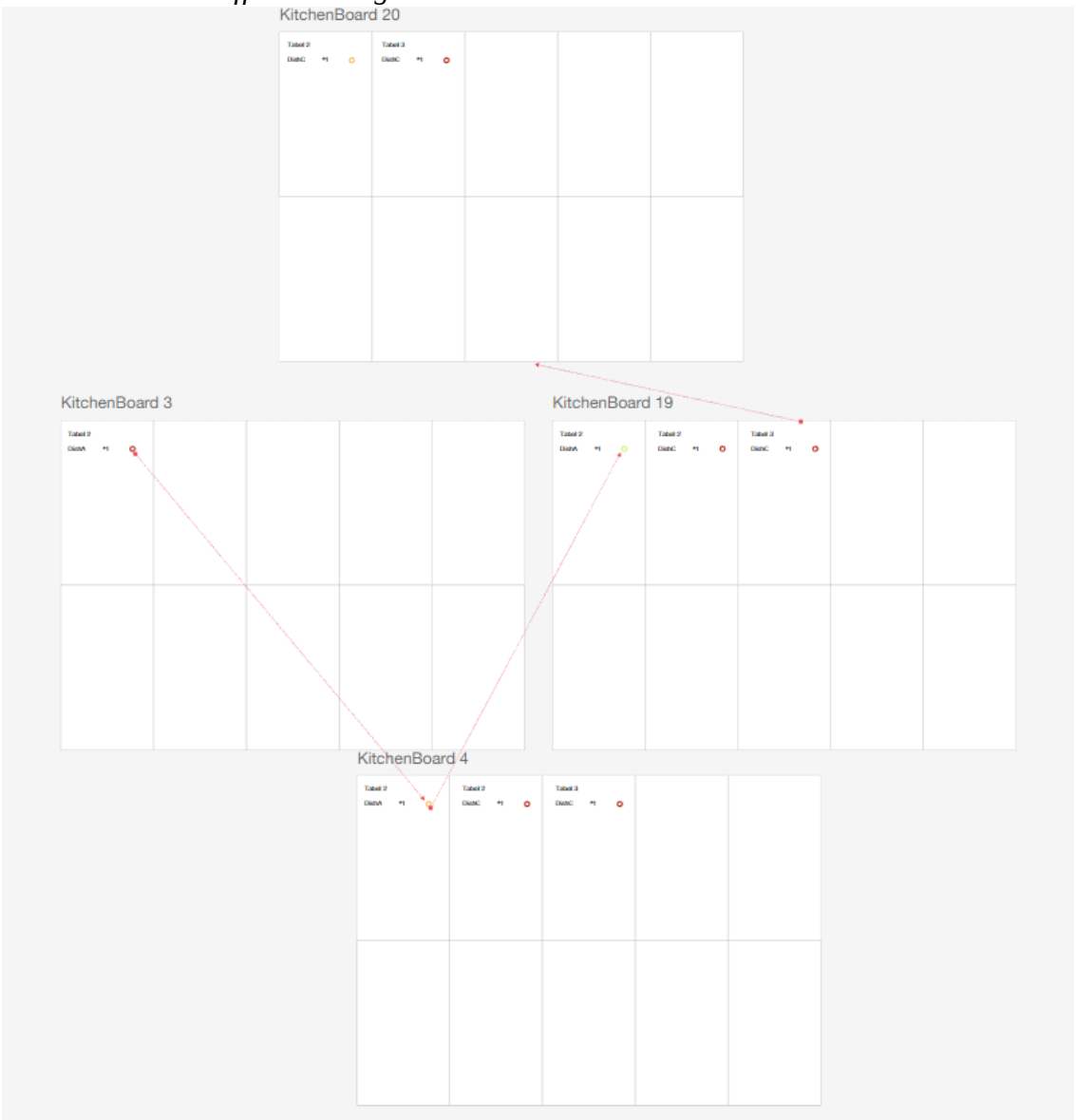
- Once customers select a table and press Enter, they will be led to the main page, where they can see their table number, find the items they want under different categories and proceed with the current order or check out. - Customers can call for help by pressing the top right button.	
- The restaurant will also give recommendations to customers by user rating of each item. - If customers press the “Top Rated” button, there will be a new page shown above the main page, which introduces top rated items in the restaurant. Also, they can choose to go back to the main page by clicking the blur area.	
- If they press the Category button on the left, the page will show us the items of that category and the following categories.	

- By using the slide bar under each category, the customer can change the items displayed.	
- If they want to add the item into cart, they can simply press the "+" button on each item card, and vice versa. - Also, if customers want more information about an item, they can press any area on a specific item card. - After the information pops out, customers can decide to add to cart or not: if they don't want it, just press any blurred area, then they will go back to the main page.	
- Customers can click the bottom right button to check what is in the shopping cart. They can order the items on the shopping cart by pressing Order. - They can also see their previous orders and the total price. - Customers can request the bill once the meal is complete by clicking the checkout button.	

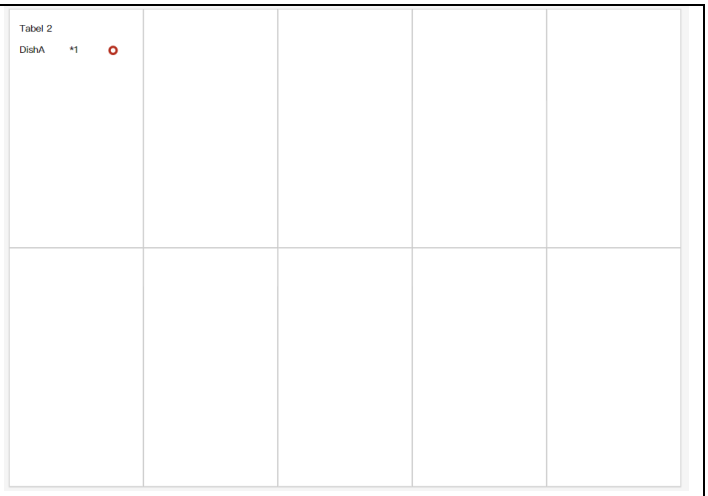
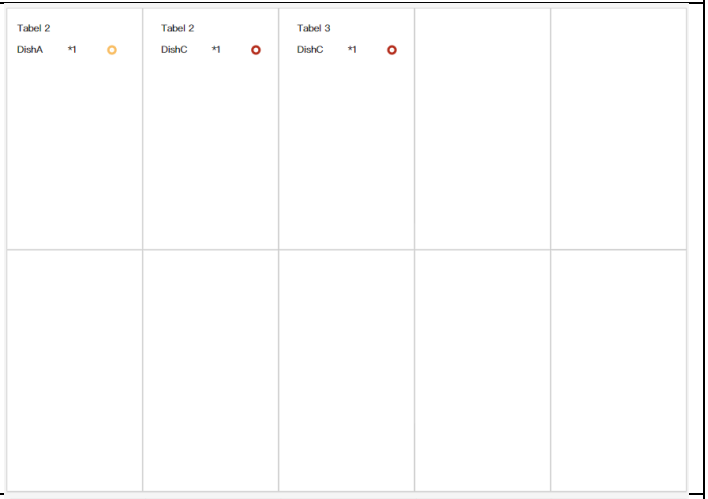
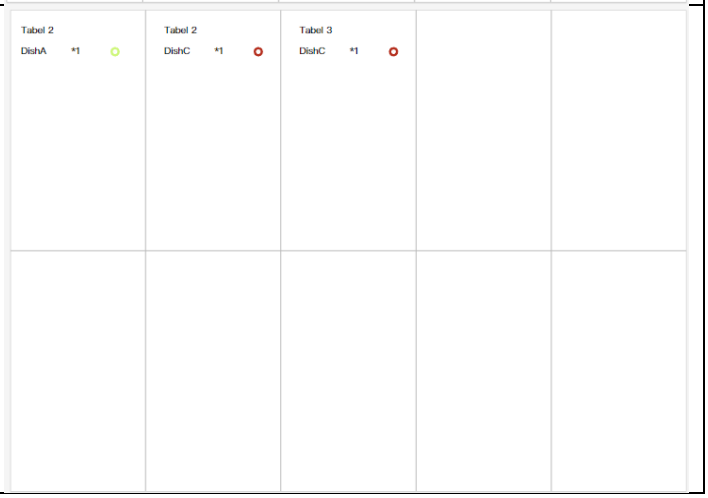
- After checkout, customers can choose to rate the items they have ordered by clicking the stars. Once they have done the rating, they can press the Thanks button to leave. They can also choose not to rate the items and leave directly.	

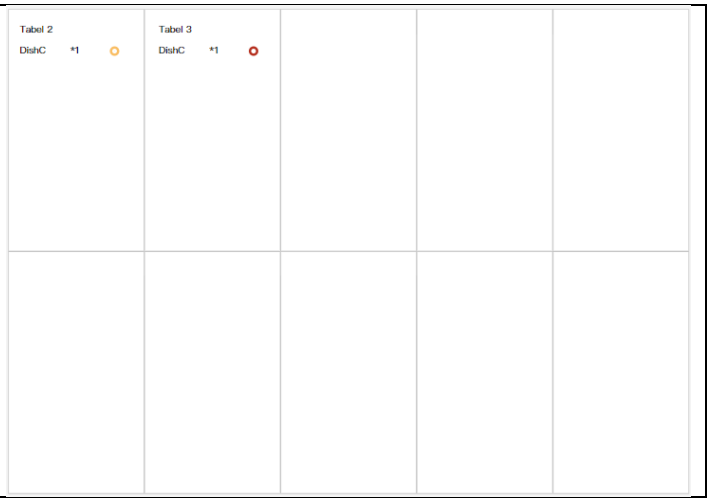
3.2 Kitchen Staff

3.2.1 Kitchen Staff Flow Diagram



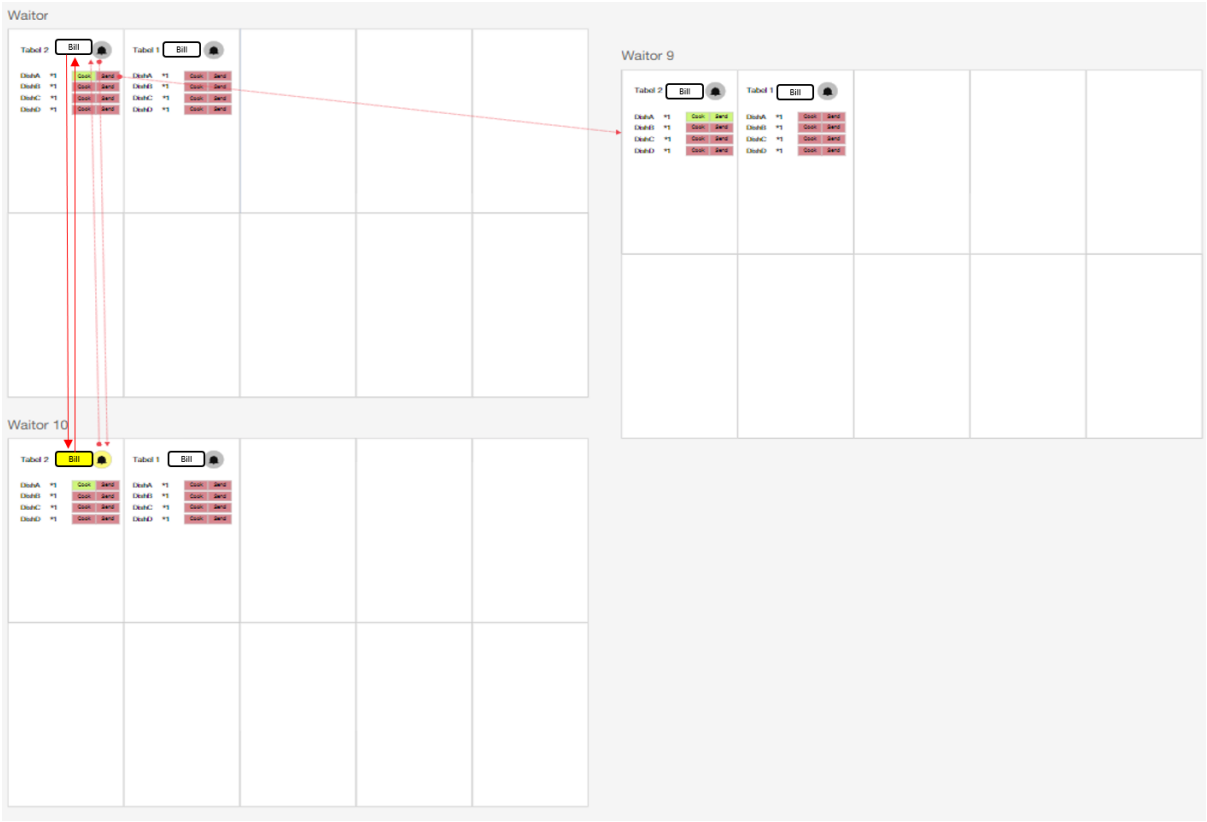
3.2.2 Kitchen Staff Interface

- Kitchen Board has 2 main features: Receiving orders by time, and flag each item status by a button's color. To be more specific, the button has 3 colors: red for not finishing, orange for working on it, green for ready, which means staff can press it once to start（go orange） and press another time to finish it （go green）. - For example, the kitchen receives a DishA order from table 2. Since it has not been done yet, the status icon is red.	
- If new orders are placed from tables 2 and 3, each order will be created as a separate entity and join the existing order queue.	
- Kitchen staff can mark an order item as prepared by clicking the status icon. Then the status icon will turn green.	

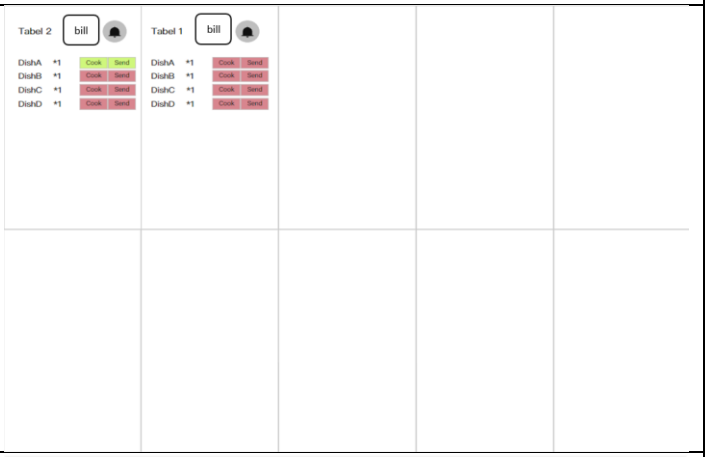
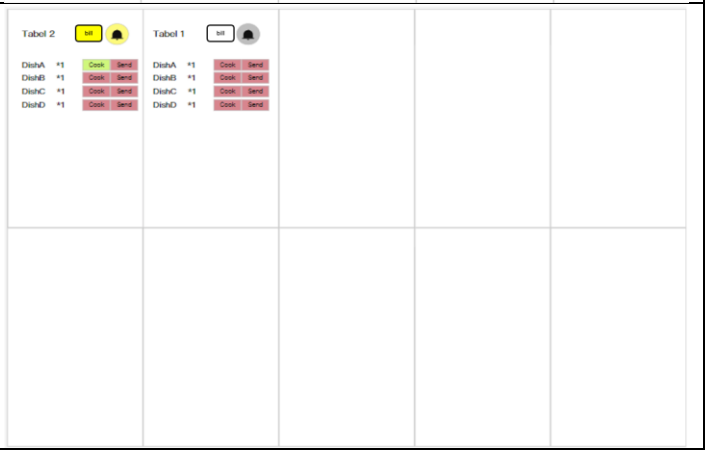
- Once the kitchen finishes all the items in one order, that order board will discard from the kitchen staff interface.	

3.3 Wait Staff

3.3.1 Wait Staff Flow Diagram

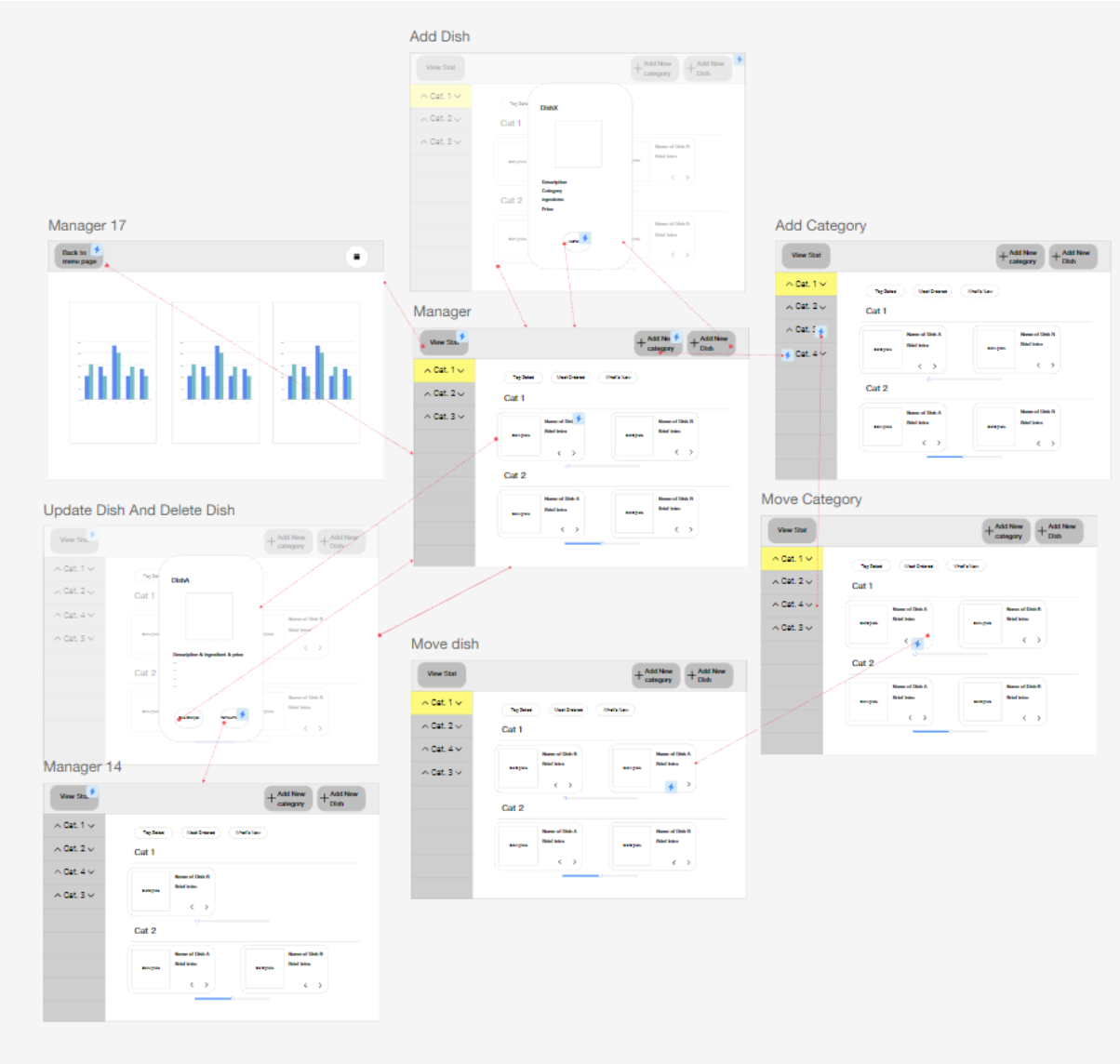


3.3.2 Wait Staff Interface

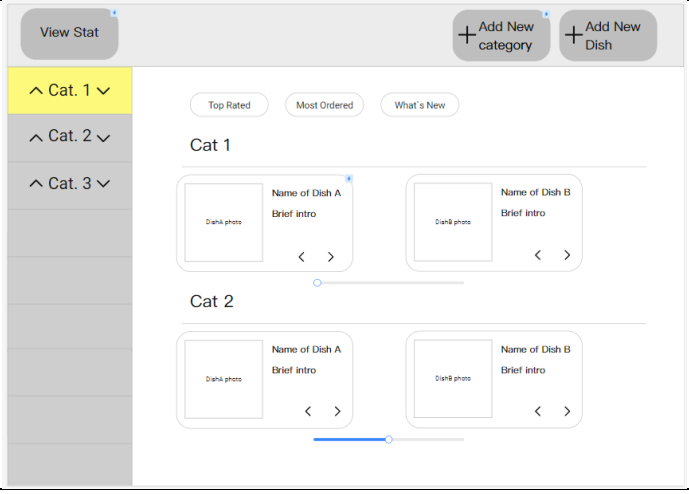
- The waiter board is similar to the kitchen board. The order of the table is coming by time. Once the item is prepared by the kitchen, the button noted as Cook will become green, and the waiter shall send it to the specific table.	
- And after that, the waiter can press the Send button, turning it from red to green.	
- If a customer calls for help, the ring symbol on that table will turn yellow. Wait staff can click on the ring symbol to mark notification as complete. - If a customer requests the bill, the bill symbol will turn yellow. Wait staff can click on the bill symbol to mark complete. After that, this table will be discarded from the interface.	

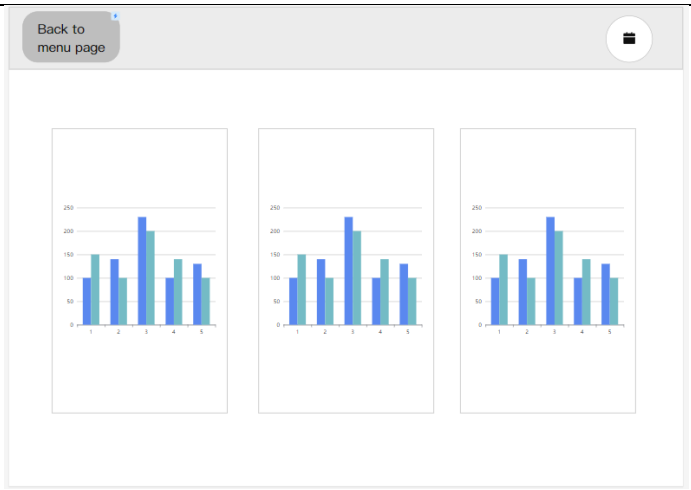
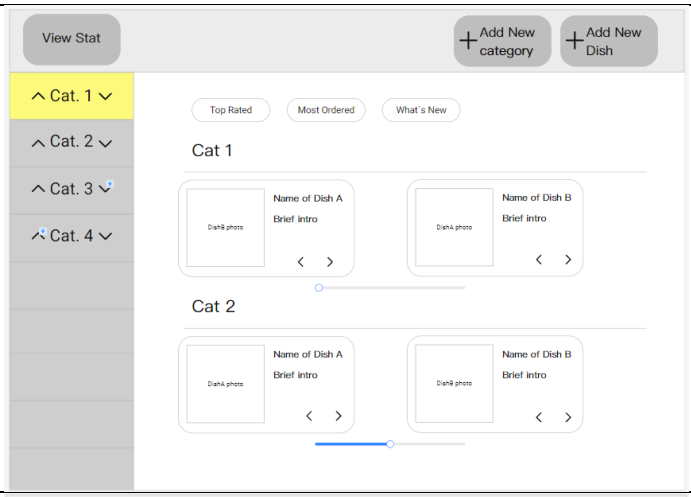
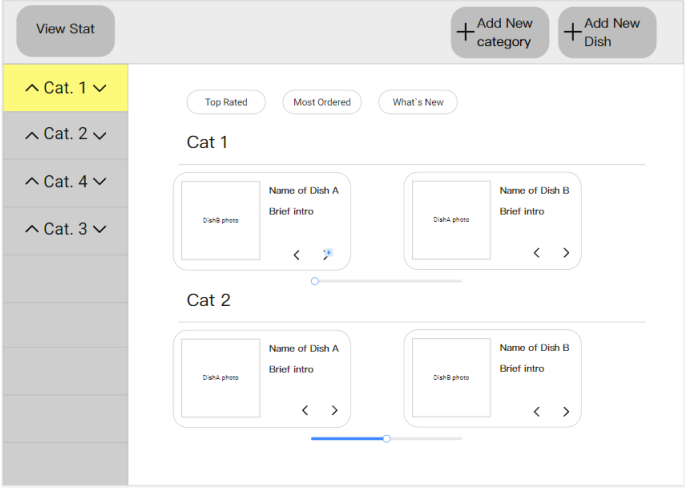
3.4 Manager

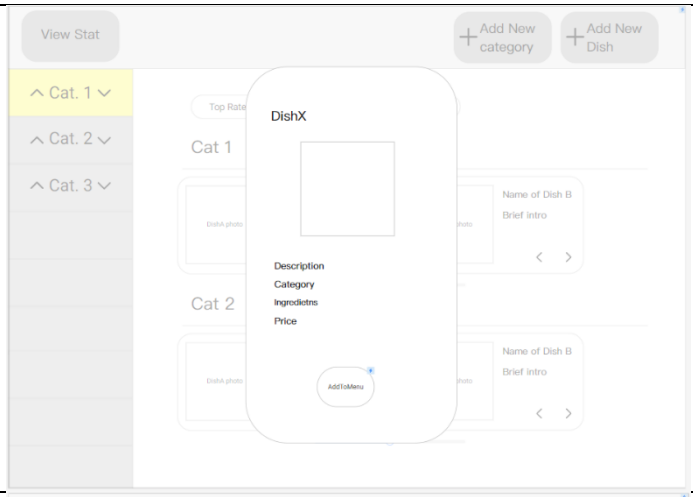
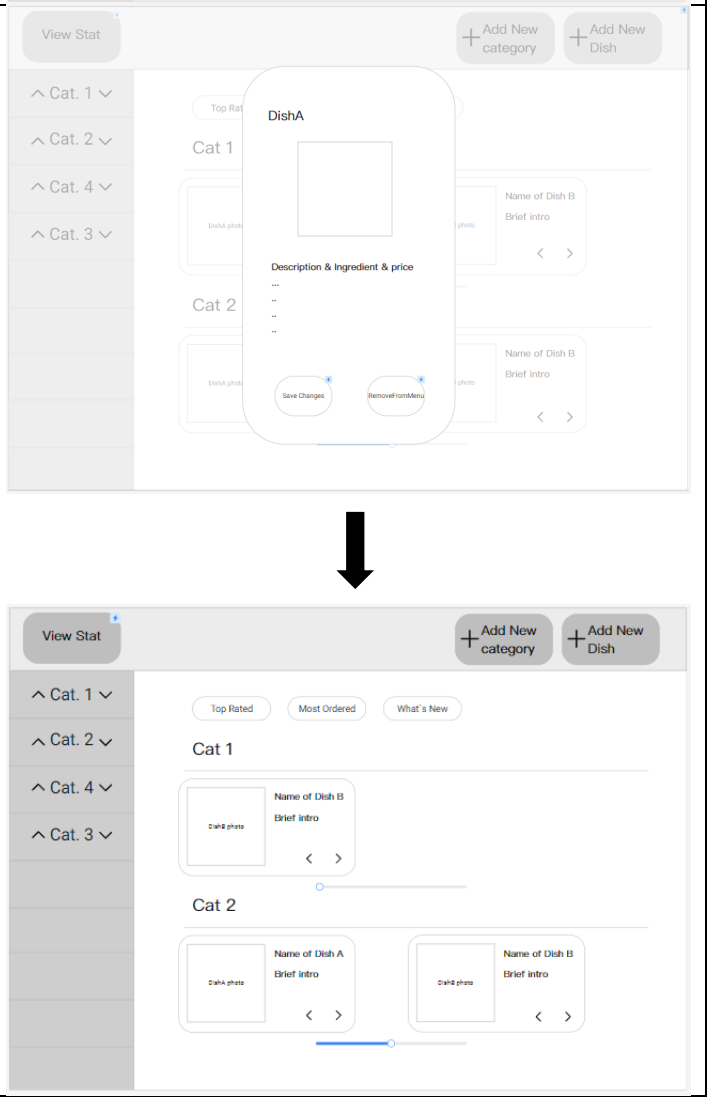
3.4.1 Manager Flow Diagram



3.4.2 Manager Interface

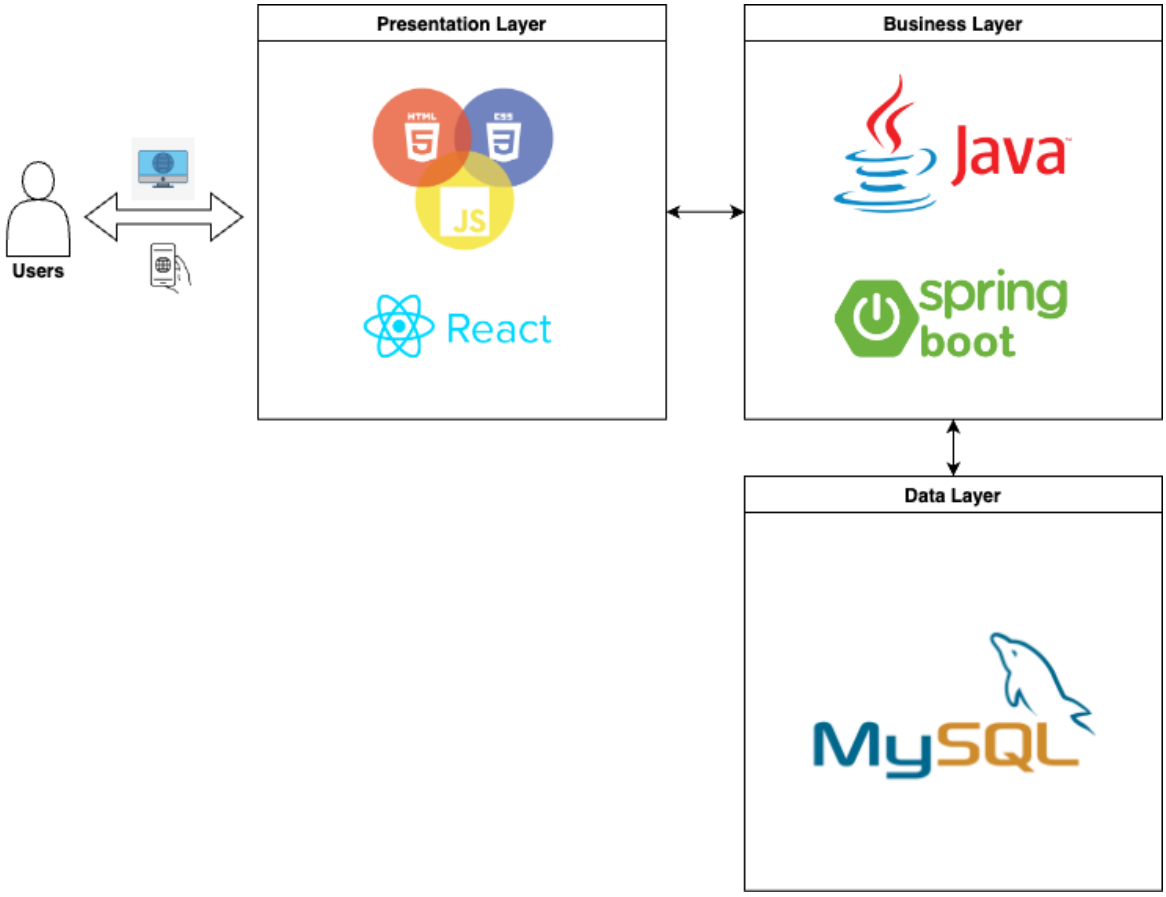
- The manager can control the waiting system from the specific end. It's more likely to be an upgraded customer version.	

- The manager can view the statistics including the top selling items, top rating items, and the profit trends by clicking the View Stat button on the top left of the main page. - The manager can select specific time periods to view the statistics by clicking the top right date button. - And if the manager wants to go back to the main page, just click the top left button.	
- The manager can add a new category to the menu by the top right button. Once you press it, it will let you input the name of that category, and it will be added into the end of the menu.	
- Manager can move the order of different categories by using up and down symbols around the category button. - Manager can also move the order of items within a category by clicking the left and right symbol.	

- Similarly, the manager can add a new item into the menu by pressing the button on the top right. It will let the manager input information. This includes name, price, category, description, ingredients and image.	
- The manager can update the existing item information (image, price, category, description, ingredients) by pressing the card of that item. After updating, pressing the “Save Changes” button will make the update and synchronize to the system. - The manager can choose to remove items from the menu by clicking the “Remove From Menu” button. Or they can choose to discard all changes by pressing the blur area.	

4 System Architecture

4.1 Architecture Diagram



The entire system is divided into two distinct subsystems: the Back-end System and the Front-end System. These subsystems are independent of each other and communicate through HTTP Request/Response JSON. The system's architecture can be broadly categorized into three layers: the presentation layer, the business layer, and the data layer. The Front-end System comprises the Presentation Layer, while the Back-end System consists of the Business Layer and the Data Layer.

4.2 External Actors

4.2.1 Customer

Customers are the primary users of the wait management system. They use the system to perform various actions such as selecting a table number, browsing the menu, adding items to their order, requesting assistance from a waiter, and requesting the bill once the meal is complete.

4.2.2 Kitchen Staff

Kitchen staff are responsible for preparing and cooking the dishes ordered by customers. They can interact with the system to receive orders and menus, as well as update the order status to "completed" to notify the wait staff.

4.2.3 Wait Staff

Wait staff are the personnel who directly interact with the customers. They use the system to record the order of customers, update status of orders, and communicate with customers regarding their status in the queue.

4.2.4 Manager

Managers have administrative control over the system. They can perform various managerial tasks such as adding new categories and menu items to the menu, removing existing menu items, updating descriptions, ingredients, categories, and costs of menu items, and managing the order in which menu items and categories are displayed on the menu.

4.3 Technology Description

4.3.1 Presentation Layer

In the presentation layer, we are using the React framework. React is a popular JavaScript library for building user interfaces. It introduces the virtual DOM concept, which improves web performance by efficiently updating and rendering UI components. React's declarative approach simplifies UI development, making it easier to create and manage reusable components. The framework has a vibrant ecosystem and integrates well with other JavaScript libraries. By utilizing React, we can deliver responsive and interactive interfaces that enhance the user experience.

4.3.2 Business Layer

Programming language: Java. Java is a widely adopted, high-level, object-oriented programming language known for its readability and versatility. It provides developers with a robust platform to express their ideas efficiently and effectively.

Web framework: Spring Boot. In our implementation, we primarily utilize Spring Web MVC, which is a module within the Spring framework. It enables us to build RESTful APIs rapidly, allowing for quick and convenient creation of Swagger API documentation with customizable descriptions. This streamline testing and collaboration with front-end developers.

For database interactions, we leverage the power of Spring Data JPA, which provides an easy-to-use object-relational mapping (ORM) approach. This eliminates the need for writing complex SQL queries, enabling us to perform CRUD operations effortlessly while ensuring protection against SQL injection and maintaining the security of the entire system.

To enhance code structure and maintainability, we follow the Spring Boot Application Factory pattern. This allows us to separate logic across files and modules, resulting in a more organized and readable codebase. It also facilitates collaborative development efforts.

By leveraging the features of Java and the Spring Boot framework, we can build a robust and efficient business layer that supports the overall functionality of our system.

4.3.3 Data Layer

Database: MySQL. MySQL is a popular open-source relational database management system that offers a robust, scalable, and high-performance solution for storing and managing structured data. MySQL's compatibility with Java and Spring Boot ensures a smooth development experience. It eliminates the need for complex configurations and installations, allowing developers to focus on implementing business logic and efficiently handling database modifications.

For database migration and management, Spring Boot offers tools such as Flyway or Liquibase, which enable seamless migration of database schemas and data while maintaining data integrity.

Overall, MySQL serves as a reliable and efficient choice for the data layer in your Java and Spring Boot application, facilitating seamless integration and optimal performance.

5 Reference

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