Information Technology for Business

Final Year Project

Project Title:

Applications for Traditional Chinese Restaurants in Hong Kong

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Content

Acknowledgements

In these months, there are many bad things happened around the world and in Hong Kong. A democratic movement, Anti-Extradition Law Amendment Bill Movement broke out in Hong Kong last year. Unfortunately, with the passing of time on negative relationship between Hong Kong Polices and protesters, a clash between the police and the protesters happened. When this movement was not settled yet, another tragedy happened. The 2019-nCoV spread around China and soon spread around the world. The World Health Organization soon announce the 2019-nCoV is a pandemic. Everyone else is jittery. On the other side, suspension start from last semester to new semester and now still continue, totally upset my learning plan.

But my parents do support me, they do go out buy food or other things which I need, they talk to me to let me not getting nervous. I am very grateful for their love and support.

Also, I do like to thanks for my teachers. Even being suspension, my teachers do answer my questions detailly on different assignments. Without their help and my parents support, I won't able to finish this report in time. Thank you for your support and help!

Abstract

This report is about two applications details and how these two applications help tradition Chinese restaurant in Hong Kong to increase them competitiveness.

For these two new applications, this report will cover on both data research by literature review and questionnaire, also will cover on different diagram about the program and serval chapters on introducing the applications and development idea and technique used with the code works.

Background:

Hong Kong is high cultural cooperation city. The catering industry is one of the major industries in Hong Kong and has a long history of development. From a traditional Chinese society, Hong Kong has become a cosmopolitan city today. Many traditional Chinese food cultures and dishes have been preserved, such as Cantonese, Hakka and Chaozhou dishes. For the traditional Chinese, dinning, in addition to the fill the stomach, also includes the meaning of communication between people and a gathering together. Hong Kong's teahouse culture (*Teahouse means Traditional Chinese Restaurants*) just happens to experience this feature.

Today, Hong Kong is also a well-known global food gathering point. Various western foods (for example: French, Italian, American) and Asian foods (including: Japan, South Korea, Vietnam, Thailand) and other restaurants gather in Xiangjiang, where flowers bloom. Some of them are loyal to traditional cooking methods, and some of them are adapted to meet local tastes. Together they have created a reputation of "food paradise". Attracting tourists from all over the world to Hong Kong to taste delicious food every year, the catering industry has become increasingly vigorous, and it has also brought great benefits to the Hong Kong economy.

The catering industry in Hong Kong has always had an inseparable relationship with economic development. According to a government survey (HK Gov,2019), there are currently about 15,000 restaurants in Hong Kong, and about 240,000 people are engaged in catering services related industries, accounting for about 6.4% of the employed population.

Nowadays, many restaurants start to use modern technology for customers to order food and do restaurant managements. In 2019, total revenue generated of Food Ordering App for the restaurant industry reached $615 million a year-on-year increase of 9.9% in Hong Kong. One of the highest revenue growths for any industry in terms of mobile application sales (Statista,2019). There are mainly 6 sessions of Hong Kong Restaurant Industry (HKEXnews,2018). But still some sessions don’t have a modern system for customers and the managers, most of them are Chinese restaurant session (HKEXnews,2018). In this project, I am going to code applications for local Chinese Traditional restaurant, by using modern technology, how can it improve the total all competitiveness. From increasing the service diversity to customers’ loyalty.

On the other side, many teenagers like eating at non-Chinese traditional restaurants, such as different fast food shops, McDonald or KFC and western restaurant, such as Pizza Hut or Spaghetti House, they both have a modern restaurant system included many categories. What attract them is fast and convenience dining experience and services quality. During peak hours in Chinese restaurant, customers always need to wait for waiters to collect their order menu or call for other request such as refill the tea pot etc. It is regret that no any waiters can response on you. As Hong Kong is a city that emphasis on speed, waiting should not be too long. This reflects Hong Kong Traditional Restaurants are fall behind the new modern technology.

Also, the Chinese restaurant do not have a modern restaurant management system which only has an old sit and order management system. Employee need to mark on papers when customers call for a booking. Also, no any statistic on data, employees need to calculate income by hand which is totally wasting time.

In this project, I am going to improve traditional restaurant services from technology to management. Create a website for customers. By using this website, customers can order food online, no need to wait for waiters distribute and collect the order menu. It may decrease the work load on waiters and can provide higher response on customers request.

Also, the new back-end system may manage menu details and also have a statistic report on income and distribution on different food items. Saving work load on different repetitive works.

Introduction:

This project is to increase the total all competitiveness of traditional Chinese restaurant by using modern technology on creating POS system:
First, there will be a website developed. The website may able to support all smart phone devices and computers. The website will have many functions for customers. The main functions are online booking, news, online ordering and coupon redeem etc.;
Second, a back-end GUI restaurant management system will be developed. This GUI is an in-house application. May support computers operate by Windows and installed Java. The GUI may able to provide different data analysis on the business and also may able to maintain the front-end data and other company or business data, such as employee details and association cooperative details.
During this project, both applications will be using Traditional Chinese Restaurant “Fu Lum” (富臨) for system example.

There are 4 objectives in this project.
First, literature review will be done for data collections on different well-developed restaurant systems and different other reports or reading materials. A literature review is a scholarly paper that incorporates the latest research, including empirical observations, as well as theoretical and methodological contributions to a particular topic. As literature review can collect data from strong authority sources such as big company or doctor, these data may provide well opinions and can be a worth references.
Second, data collection will be done for collecting different data from stakeholders whose often go to traditional Chinese restaurant. This method will be done by using questionnaires and spread around the community. These data may collect different opinions from the stakeholders. It may help us to understand more and give useful information on how to improve the total all service quality.
Third, two applications will be developed. As I mentioned, one is a website, work as a POS, second one is an in-house application GUI. They are being a front-end and a back-end system. Mainly can cover the whole company’s business scope. Also, the database setup and record will be done too in this session.
Fourth, system testing will be done after both applications finish developed. System testing is to test the software to be tested as an element of the entire computer-based system, combined with computer hardware and environments. The purpose of system testing is to find out where software and system can be operating smooth and without bug. Any updates or improve will be done by next time.

Literature Review:

The catering application can be an online website or mobile client for catering companies. It can provide users with special features such as online ordering, online consultation, line navigation, discount promotion and online booking. Use the catering application to serve every user who comes to eat, and accumulate the user's eating habits and hobbies, comments and feedback, effectively improve the service quality and help the restaurant achieve more efficient management.

With the development of Internet and catering, using online payments in store has become a trend. According to cool bee technology market researcher statistics (KK news, 2016), in 2014, the O2O market size of the entire restaurant industry was close to 100 billion, accounting for 3.5% of the overall restaurant industry. It is estimated that by 2017, the O2O market of China's catering industry will exceed 200 billion. According to the China Bureau of Statistics (KK news, 2016), in 2014, the total all catering revenue was 2.79 trillion yuan. It is expected that in 2015, China's catering industry will enter 3 trillion yuan.

So, in this project, I am going to have literature review on different Chinese and Western IT companies which provide catering applications and reviews on company which have successful system for their catering business. These kinds of review are highly usability as it’s based on many year’s experiences. As one of the review objects, “POS Link”, this company has customers located in Hong Kong, Macau and China. With more than 20 years of continuous practical experience of computer professionals and the continuous research and improvement, this company’s system is more flexible and easier to use, which is a good reference object (Poslink, 2020). Other companies I choose to review do have the same reason as this one. For back-end system, I read system demo function lists from these companies, they are Wish Mobile (wish mobile, 2020), iCHEF POS (iCHEF POS,2020) and mbsposhk(mbsposhk,2020). For the website, I read system demo function lists from these companies, they are ordering online system (ordering online system,2020) and Wix (wix,2020). I also read a passage about POS most have functions from ordering (ordering,2020).

There will be 2 parts for introducing the functions of the back-end and front-end applications.

Part 1 Back-end GUI System functions:

A. Order functions

1. The system supports keyboard, touch screen and connectable barcode scanner. These kinds of system should able to let user to select a satiable control method to use. Using different device action listener can able to support more control method, which can be convenient for the user.

2. Multi-language switching function. (Chinese, English, etc. ...)
   A system must be able to handle multi-language. As a system may not only service in one locale. On the other side, users also may not all are native. Most systems around the world do contain this function. Fulfill expatriate labor needs.

3. Security features restrict employee access to prevent errors or prevent cheating. This function can able to prevent employee login in different sessions or use functions which he or she does not have authorize to access. For example, a waiter may not able to access the kitchen session and the cashier may able to open the cash saver when billing only.

4. All prices can be changed automatically at different dates and times.
   In Hong Kong, many restaurants do have different price on a same set during lunch time or dinner time. Some of them may also have different price on holiday and public holiday. This function may able to have a convenient way for the user to change the menu prices.

5. Dishes orders can be change by table to another table.
   This function can be used for restaurant with seat reservation. Able to change whole order from a table to another table and automatically update the table ID to the kitchen session. A more flexible method to handle for real life situation happened.

6. Can view business information and various reports at any time.
   User may able to view reports of business information in any time. This function can generate report when request is sent. Convenient way for the user to check information if needed and no need to wait for manager system to generate report.

7. Special requirement function. (Less sweet, Less ice, etc. ...)
   Special requirement can be more flexible for customers to have a more customization order. This function can let people to order him or her own taste. For example, a woman who is dieting, she may able to order a drink with less sugar or even sugar-free, which can increase the personalization of the menu.

8. New dishes orders adding, ready for cook(叫起), ready for serve(起菜), rush(急起) order.
   Customers may order new dishes during the meal, so the system must be able to handle adding new dishes record to the order. Also, in traditional Chinese restaurant, people may request not to start cooking or server the dishes before all invitees are came. This kind of customization order may be useful for these kinds of situation. While rush order may use to tell kitchen cut in the food wait line.

9. Multiple payment methods
   It is very simple to pay on online now, there are many types of method to pay as e-commerce is become more popular. On the other hand, as mobile wallet services and apps appear, it is easier to pay on online. So, it is important to provide different kinds of online payment for customers to choose. Providing flexibility of payment method to customers such as credit card, mobile wallet or by cash can make them feel comfortable.

10. Membership (different membership levels with different discount level.)
    Its simple to be a membership in different company, as there is different additional value for being a member. No one will refuse on offers and coupons. Discount and offers are a way to attract more customers and generate more profit. When customers complete consumption, loyalty points will be given to customers. Customers can exchange different offers or coupons by loyalty points. After getting the loyalty points, customers may do more consumptions to get enough points to exchange coupons and offers, this may attract more customers to market by month. As being member can be free, with generate different types of coupons based on season, festival etc., customers will come back to use the points. This may cause more income and more profit.

11. Membership, available on Smart Cards
    Same as the above, but with a card reader for physical member card.

12. Floor Plan Version
    A floor plan may able to let the user easy to find out which table he or she want to operate. With different color separate the different state of a table may easier to distinguish which table is full, non-full or free. The floor plan can be real-time updating the states of all the table. Simple design and color can let user easy to understand and use.

13. Search by food name or id.
    Some restaurant may provide many kinds of food. So, providing a sorting function when inputting dishes order may save the time for the waiter to find the food location.

14. Input weight value for specific items (Seafood, etc.)
    There are some dishes' price based on the item weight. This function may able to let user input the weight and automatically calculated the price and update to the order. Able to handle these kinds of item.

15. Multiple discounts.
    Some restaurant may provide different kind of coupons or membership discount. Also, there may have discount on using specify bank's credit card when billing. The function may able to handle this situation when multiple discounts happened.

16. Different colors available for each key.
    Let the user to customize each key and button's color. May be a good function for colorblindness.

17. Bills are calculated at the time of sitting or checkout.
    Let the user to select what time to be present in the invoice. Customize function.

18. Station and room number timing function (suitable for buffet billing)
    Some restaurant may have buffet, timing function can be convenient for the staff no need to calculate the dining time of each table. Customize function.

19. Takeout order and checking list Function
    Able to add order for takeout order and show a list of all takeout order for confirm use. Save time for user to find and check the records.

20. Minimum consumption function per person
    There are some restaurants that have a minimum consumption on busy period. This function may easy for staff to setup the minimum consumption environment in different period.

21. Cancel Order
    Able to cancel an order or whole order. More flexible for real-life situation management.

22. Check for the expiry date and authenticity of the coupon
    Check that does the coupon expired and is it true. Prevent fake coupon and expiry coupon. No need to waste time for employees to check the coupon by themselves.

23. Select shop location before operating (Update sales and receive takeout orders by shop ID)
    Some restaurant does have more than one branch, user can select which shop the user want to operate. The selection will be a key on update sales and receive takeout orders with this shop ID.

24. Network socket receive order from third-party platform (Food Panda, etc.)
    Third-party platforms are being more popular in nowadays. Cooperation with those platforms may increase benefit and guests. Receiving order by socket may increase the data flowing between 2 companies' system, safe time and convenient for staff.

25. Able to update takeout order details
    User may able to update the takeout order details such as changing the address or phone number. Increase flexible on management order records.

26. Seat reservations record
    Online seat reservation is a common function for customers. Customers may want a reservation as customers may find difficulty to get a free table by walk-in. A reservation function can help customers no need to having a long waiting time and give an opportunity to have a perfect planning on their events.

B. Management Functions

1. Can update, add and delete different menu details.
2. Can update, add and delete different special requirement details.
3. Can update, add and delete different coupon details.
   A back-end system should have a full menu setup function, included menu update, add, update and delete on food item details, combo set and special request. Employees can easy to use these functions to add, update and delete the menu and also will update to database which all applications linking to the same database will also updated all changes immediately.

4. Can update, add and delete different shop details including seating plan.
   A back-end system should have a direct control on shop details including seating plan. Employees may able to move the table around and add more seat for a table in real life, so this function may able to change the planning of a shop by editing the details of each table. Increase the flexible for management.

5. Automatically send the number of sales of the day to the office.
   Able to send over-all report to office each day. Save time and convenient for civilian to handle accounting, trend analysis etc.

6. Automatically send the material order to suppliers if the material number is near the safety line.
   Able to send email to supplier company when material number is near or lower than the safety line which set by manager. It may save time for employees to check the numbers of material every day. The material number may auto increase after confirm the deal is complete.

7. Centrally view the shift records of employees in different stores.
   Able to read all shift records with sorting functions. Convenient for manager to know and read the schedule and does manpower enough during peak time.

8. Manager login permissions
   Only high permission user can login for manager session. Present for non-authorized user cheating or access.

9. Group report (one or more stores can be displayed in one report at different times)
   An over-all report that contain total all profit, expenses, food trends, ratio of dining area etc. Able to present on a single shop and single time or all shop with one-year record.

10. Sell-off, limited sales and inventory management
    A function that can provide information on all food, appliance such as takeout tableware, daily operation supplies inventories. Manager may able to set a safety line for each material. Save time to calculate the material amount.

11. Supplier and cost calculation functions
    A function that can provide data sent from the suppliers, including the material cost and number. Able to calculate the total prices and the new inventory quantity. Save time and reduce human errors.

12. List of employee details and update functions
    Able to update, add or delete employees' details. A convenient method to save and manage employee details.

13. Able to update menu details to third-party platform (Food Panda, etc.)
    Using network socket, sending data to third-party platform for update, add or delete food details. Save time on communication with the other company and increase the data flowing between 2 companies' system.

C. Kitchen Functions

1. Real-time update orders and show with special requirements.
   Real-time update able to let cooks get the order immediately, no need to update the record by hand. Show the special requirement is a must-have feature. Able to provide fast and simple order to kitchen to let the cook prepares the order items.

2. Different color added for easy separation on takeout or dine in order.
   Using color to replace words. Read less word save time and increase working speed.

3. Automatically deduct material numbers when dishes are ready to serve.
   Based on inventory function. Able to have a perfect management on inventory control, user may choose not to deduct the material when special case happened, such as order was cancelled after the dish is ready to serve. When food is served, the system may automatically deduct the material.

Part 2 Front-end Website functions:

1. Responsive Website
   Responsive Web Design is about using HTML and CSS to automatically resize a website for making it looks good on all devices such as phones, tablets and desktops.

2. Different types of category
   User may able to choose category on the menu. A simple function that can convenient user for looking an item.

3. Personalized menu options
   Customers can choose food types what they want. A filter searching function is providing a personalized menu option. What if a customer wants to have some Diu Sum, but the app menu keeps on showing dinner combo sets or side dishes? A pure vegetarian finds no nonvegetarian options displaying in the menu. Customers must be getting frustrated in no time and just go on to uninstall the app. So, providing a personalized menu option is a must have features, filters on different types, price ranges, marks and commands and so on can be a consider on this function.

4. Look for stores
   A company may have branches. Having a page able to search for stores nearby or read for store's details may comfort user.

5. Order information
   Show order information with detail and simple design can let user easy to read and understand. After customers ordering food, customers can review and check what they have ordered, just like an invoice. A clear outline with prices is needed in here because we need to ensure transparency, no other charges which do not clearly show to customers. Otherwise, there may be a legal action on dishonest behavior and damage the corporate image.

6. Product Images
   A good photo may increase attractive.

7. Product options selection (special requirement)
   Special requirement can be more flexible for customers to have a more customization order. This function can let people to order him or her own taste. For example, a woman who is dieting, she may able to order a drink with less sugar or even sugar-free, which can increase the personalization of the menu.

8. Edit order
   User may able to check all order details before and able to update and continuing to checkout and pay.

9. Pre-order functionality
   Customers may want a pre-order. Give a detail page for customers to select food items, time, date and other information.

10. Confirmation Page
    A confirm page with an order ID and order details. Show information that customers need to know.

11. Social Media
    Able to share the order on different social media for some simple steps. This can be a chance of free advertisement.

12. Login, register function
    A login system is need for membership to login, change or check personal information and exchange offers and coupon by the loyalty points. Register function for new membership should also be needed.

13. Profile information
    Able to let user to manage their account details.

14. Customer Reviews
    Customers feedback is the most effective and simplest way to collect opinions of this app. These kinds of opinions can help to improve the mobile app. Continuously review and update app is imperative and necessary. Keeping the app fit to have competitiveness with other competitors. Furthermore, adding a feedback platform is need in the mobile app, customers can be allowed to share their experiences to developer easily and it may help how to enhance user experience.

15. Multi-language
    A system must be able to handle multi-language. As a system may not only service in one locale. On the other side, users may come from all or the world. Most systems around the world do contain this function. Fulfill different customers need.

16. Business Location
    Update the shop location with popular tools such as google map. A position may increase customers confidence on your company.

17. Photo gallery
    Share different image about your company may making a deal with customers and showing company's business right.

18. Business timing
    Show detail of each store may avoid confusion to customers.

19. Payment Gateways
    It is very simple to pay on online now, there are many types of method to pay as e-commerce is become more popular. On the other hand, as mobile wallet services and apps appear, it is easier to pay on online. So, it is important to provide different kinds of online payment for customers to choose. Providing flexibility of payment method to customers such as credit card, mobile wallet or by cash can make them feel comfortable.

20. Coupon redemption
    After login, customers may able to see the loyalty point they have and able to exchange them to coupon. Attract them consumption again.

21. Seat reservations
    Customers may want a reservation as customers may find difficulty to get a free table by walk-in. A reservation function can help customers no need to having a long waiting time and give an opportunity to have a perfect planning on their events.

22. one-touch call for waiters
    Customers may need to ask for request, such as need to change sit or refill the tea pot. Add the button for a direct call to waiter can have a quick response and less waiting time for the services.

23. QR code scanning for local ordering
    Customers may order food when dinning in. So, same as takeout order, customers can order food by scanning QR code provided by waiter and scan. Therefore, customers may online ordering and no need to wait for waiters to come and serve, very convenience.

24. View restaurant capacity in real-time
    Customers may able to see the capacity in real-time by online. Let customers avoid long waiting time on peak hours.

25. Customers Support though Chat by Chatbot or Phone call
    Customers may have question on the services, so a customer support is important. Using a chatbot is a new modern technology, which is a program or AI with mimic's conversations with customers and provide a solution by a simple FAQ. By using this chatbots, no need to add more human resources on customer support and can be served by 24 hours every day.

26. Deals, offers and loyalty points
    Its simple to be a membership in different company, as there is different additional value for being a member. No one will refuse on offers and coupons. Discount and offers are a way to attract more customers and generate more profit. When customers complete consumption, loyalty points will be given to customers. Customers can exchange different offers or coupons by loyalty points. After getting the loyalty points, customers may do more consumptions to get enough points to exchange coupons and offers, this may attract more customers to market by month. As being member can be free, with generate different types of coupons based on season, festival etc., customers will come back to use the points. This may cause more income and more profit.

Project Methodology:

Method of collecting data:

As we collected many functions in the literature review part, I am going to collect the function's priority from the stakeholders. So that I can base on the priority to design the web application.

To collect users' the function's priority, I selected to use questionnaire to done this survey. According to researches, using questionnaires are better than doing interviews. Questionnaires are inexpensive, practical, quick way to get results and also scalability (Debois 2019). Based on this case, I am sure that using questionnaire will be the greatest method to collect the opinions from our target.

On the design of this questionnaire, there are 3 parts with each Opening and Ending messages. The first part of the questionnaire is filter question. There will be one question ask to the target does or not dine in a Chinese traditional restaurant in the past 6 months. To keep the information reposed on effective period, I set the threshold at 6 months. The second part is asking on demographic and classification information such target's age level and frequency to Chinese Traditional restaurant. Which can use this information to statistics the result will or not will affected by the above demographic and classification factors. The third part is core questions part. There are 1 matrix tables within 26 functions on a 5-point Likert scale which a related as 1 = Lowest Priority and 5 = Highest Priority which based on his or her own personal experience, personal values etc. to select.

The sampling method I used is snowball sampling method. Snowball uses a small number of initial information providers to nominate other participants who meet eligibility criteria and may contribute to a particular study through their social network. The term 'snowball sampling' reflects a similar snowball that increases when going downhill (Wiki 2020). Using snowball can have a quick sample search, with reliable sources, referees can quickly and easily search for topics. At this time, the additional tasks of the researchers were saved for research. Also, it's more cost-effective, this approach is cost-effective because referrals come from key data sources. Convenient and cheap compared to other methods (Bhat, ND).

The questionnaire sample will be placed at Appendix 1.

As I have friends and cousin work at Chinese traditional restaurant. I am going to interview them and collect data about the back-end system from them. The interview from is non-structure. Make sure the priority of the back-end system functions, more resources for high priority and low for others and may add new function based on useful feedback.

The above data should let the website and back-end GUI be more user-friendly.

Table for functional & non-functional requirement:

There will be a table represented about the functional and non-functional requirement. Both tables will have a list of priority on functions which based on the result from the questionnaire and interview mentioned in Method of collecting data. Lower priority functions may do in next maintenance as time consuming reason. Both tables will have a line separate which functions may be done in next maintenance.

Process Modeling:

There will be use case diagram for presenting the process modeling. The primary type of device or software specifications for underdeveloped new software application is a UML use case diagram. Use cases define the desired actions and not the exact way it will happen (visual-paradigm, Nd). Use cases can be denoted as textual as well as visual representation once defined. A core principle for use case modeling is that it allows one to build a program from the viewpoint of the end user. It is an effective method of communicating system behavior within the terms of the user by specifying all externally visible system behavior. As use case diagram is simple and easy to read, so I select to use this diagram for process modeling.

Data Model:

There will be 2 tools presented in this part.
The first one is Entity–relationship diagram. An entity relation diagram (ERD) shows the entity sets relationships that are stored in a database. An entity is an object, a part of the data in this context. One set of entities is a group of similar entities. Many entities may have characteristics describing their properties. An ER diagram shows the logical structure of databases by describing the entities, their attributes and by showing the relationships between them. ER diagrams are used to delineate a database architecture (smart draw, Nd). ER diagram may easy for reader to understand the whole picture of the database relationship, so I am going to use ER diagram for database data model.

The second one is data directionally. A data directionally is a directionally data form of a database. This will present the whole database from each table to each attribute. This method may able to let the reader know about what the use of each table and each attribute including explanation of each attribute name and data format. I will use data directionally as to let the reader know and understand the structure of the database.

System Design:

On system setup, the web-based application is for customers use. Customers may able to order, check information on menu, shop details and their own credit of bonus point etc. All these functions can be done by online, fast and convenient. Customers just need to have a device which has a browser and can connect to internet, then they may able to use the online website.

The GUI application is for staff and manager to use. It is an in-house application. It may need a computer or other device which have a Windows operator and Java installed. Also need to be connected to the internet as to receive and send data from database and socket server. The application may able to manage front-end data and real-time review order and update different data.

As both systems will be code by object oriented, there will be class diagrams to present the method and confirm the program structure.

Screen & Report Layout Design:

In this part, I am going to present what data record will be show in both applications. There will be image of the program UI and explanation about what kind of record will be show and what does it use for. For example, booking record, the staff may able to see a list of booking record in the GUI application, which can let the staff to plan on when to free the table for the reservations.

Testing:

There are be two kind of testing methods to use on both systems. The first one is unit test, a simple testing method by testing different code functions. By inputting different inputs, such as normal or extreme numbers, see how the system response. The second one is user acceptance test.

For user acceptance test, this test is to run the application by a non-end user or model builders or programmer. As this user does not have any knowledge on this application, therefore no expected system behavior (Anaplan community,2020). So, I can check that the introduction and UI is or not clear enough and will the user can run the application as like as the user stories. Confirm that the application is ready to go live.

There will be 4 scenarios to test and each of the testing will have one tester. The first scenario will be register and login on web-based online application. Second is QR Code and order 1 food item and 1 set item with special requests on web-based online application. Third is to login and do a coupon redemption on web-based online application. Fourth one is adding new order in GUI system. These four scenarios are covered the most main functions of this web application and the back-end GUI system. This testing will confirm that the applications are or not ready to go live.

System Analysis:

Data Collection

The data collecting period is around 2 months. From November 2019 to January 2020. The initial sample size is 66 and after filtering un-useful response, the final sample size is 51. The report data is export from the questionnaire provider Qualtrics and the raw data has been analysis by Qualtrics own analysis tools and SPSS analysis tools.

In the 51 completed questionnaires, the greatest age level is 66 or above, has 35.3%. The second highest is age level 46-65, has 25.5%. The lowest age level is 0-10, has 0 %.

Age Group	0-10	11-25	26-45	46-65	66~up
Number	0	12	8	13	18
%	0%	23.3%	15.7%	25.5%	35.3%

On frequency to traditional restaurant, there are 26 of them has visit traditional restaurant 7 or more times per years, while 17 of them visit 4 to 6 times per year and 8 of them visit 1 to 3 times per year. Most of the interviewees visit traditional restaurant per year is 7 or more times on 51%.

Frequency	1-3	4-6	7 or more
Number	8	17	26
%	15.7%	33.3%	51%

After analysis the result from the sample data, I create a table based on the result. The highest mark of each function will be typed in red font color.

	1	2	3	4	5	Total
1. Responsive Website	0	0	0	9	42	51
2. Different types of category	0	0	2	3	46	51
3. Personalized menu options	9	40	2	0	0	51
4. Look for stores	1	0	34	10	6	51
5. Order information	0	0	0	3	48	51
6. Product Images	0	0	0	0	51	51
7. Product options selection (special requirement)	5	0	6	39	1	51
8. Edit order	12	34	4	1	0	51
9. Pre-order functionality	10	39	2	0	0	51
10. Confirmation Page	0	0	1	5	45	51
11. Share on Social Media	1	50	0	0	0	51
12. Login, register function	0	0	1	47	3	51
13. Profile information	0	10	42	2	1	55
14. Customer Reviews	13	28	9	1	0	51
15. Multi-language	0	0	2	43	6	51
16. Business Location	0	0	0	2	49	51
17. Photo gallery	12	35	4	0	0	51
18. Business timing	0	1	36	12	2	51
19. Payment Gateways	0	1	4	42	4	51
20. Coupon redemption	0	0	0	0	51	51
21. Seat reservations	0	0	1	49	1	51
22. one-touch call for waiters	0	1	0	46	4	51
23. QR code scanning for local ordering	0	1	2	43	5	51
24. View restaurant capacity in real-time	0	1	2	2	46	51
25. Customers Support though Chat by Chatbot or Phone call	0	2	1	46	2	51
26. Deals, offers and loyalty points	0	0	0	0	51	51

Functional Requirements

Priority 1 (Highest)	Description
1. Responsive Website	Able to have suitable UI for different device.
2. Different types of category	Easy to find for target food by category
5. Order information	Able to read the order detail
6. Product Images	Able to see the product image
10. Confirmation Page	Able to confirm, avoid miss clicking
16. Business Location	Able to find the shop location
20. Coupon redemption	Able to use coupon and redeem
24. View restaurant capacity in real-time	Able to know the usage and avoid waiting
26. Deals, offers and loyalty points	Able to attract customers

Priority 2	Description
7. Product options selection (special requirement)	Able to have more personal request
12. Login, register function	Every application does have
15. Multi-language	Able to serve nationalities
19. Payment Gateways	Able to choose different payment
21. Seat reservations	Able to booking seat online
22. one-touch call for waiters	Able to call waiter by one tap
23. QR code scanning for local ordering	Easy to order
25. Customers Support though Chat by Chatbot or Phone call	Easy to find help

Priority 3	Description
4. Look for stores	Easy to find the shop
13. Profile information	Update account details
18. Business timing	Know the open hour

Priority 4 (Lowest)	Description
3. Personalized menu options	Adding to my favorite
8. Edit order	Editing the shopping cart
9. Pre-order functionality	pre-ordering
11. Share on Social Media	Share order detail to social media
14. Customer Reviews	Comment function
17. Photo gallery	Photo gallery

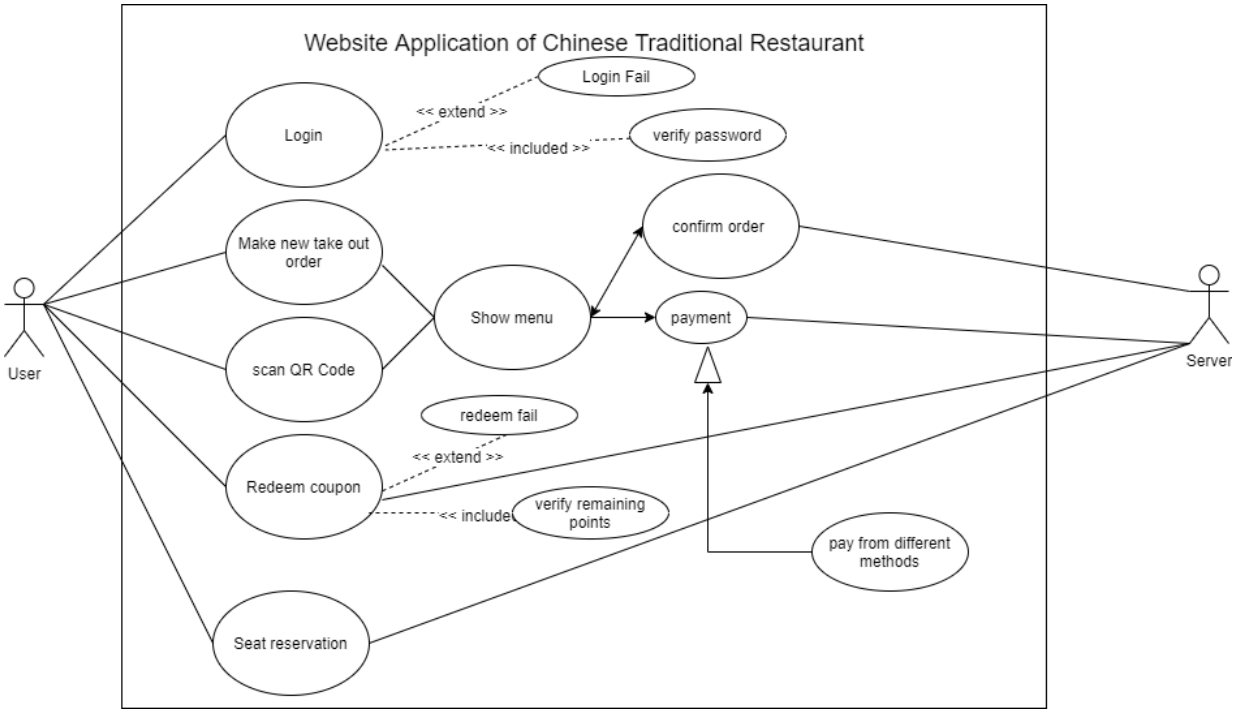
Non-functional Requirements

1. Service charge must be paid in dine in and will cost for 10% of the total all prices.
2. Tea charge must be paid in dine in and will cost HKD8 per person.
   (Same price for adults & children)
3. Tea charge is calculated before the service charge.
4. Discount coupon has expired date, if expired, will not able to use.
5. Discount will be calculated after the service charge.
6. Some food prices will be change based on day and time.
7. Plastic Bag and Box need to pay for HKD1 per one based on HK Law
8. (HK Gov, 2016).
9. Customer's seat reservation will be expired if late more than 15 minutes.

System Design

System use-cases and scenarios:

As use case diagram is simple and easy to read, so I select to use this diagram for process modeling.

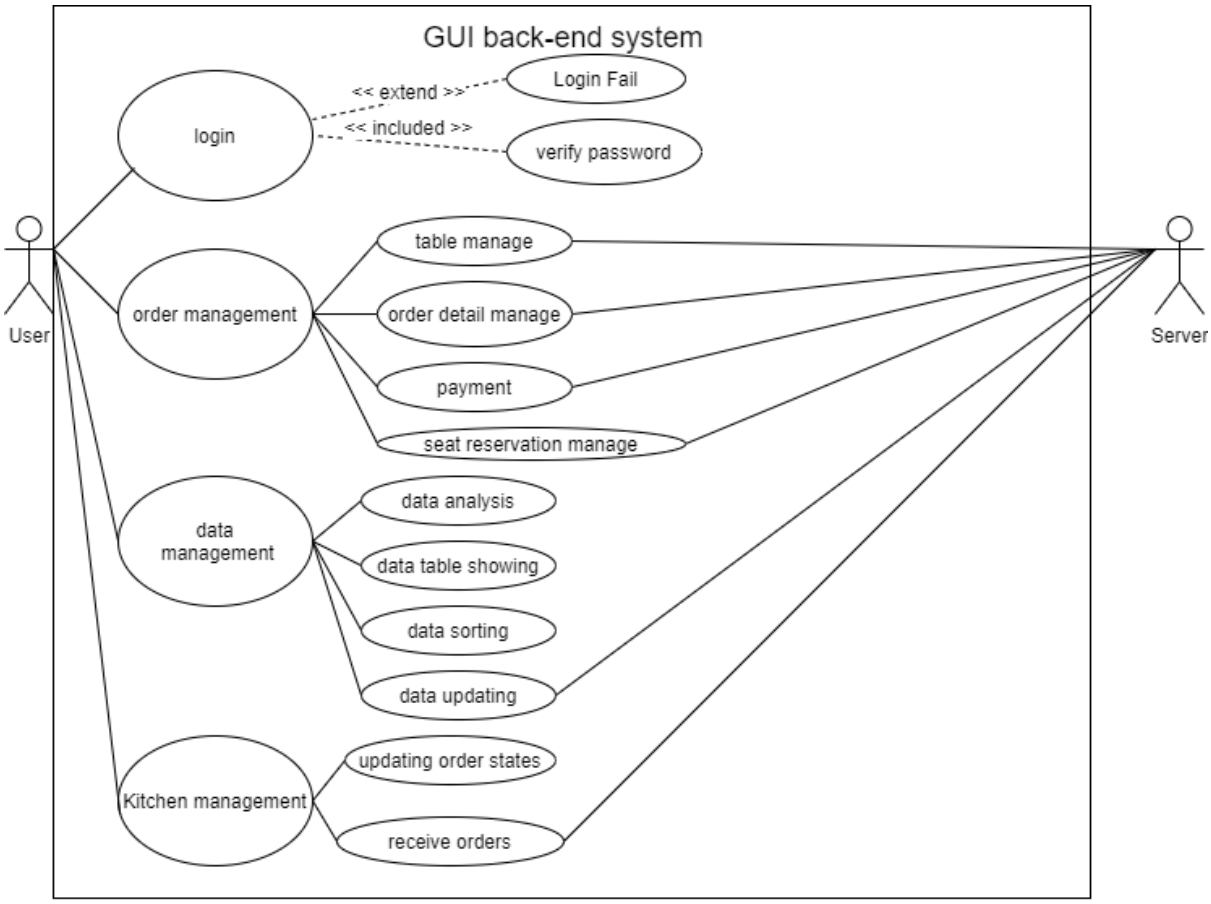


This is a simple use case diagram and will present the most main function in this diagram. The user may able to do login, make takeout order, dine in order, seat reservation and redeem coupon. All use case does have a extend on error case handling. The server will reply information sending to the client side to provide updated details. Also, the server may able to verity the data correctness and true or false Boolean to the client side.

On login, after the user input the username and password, the application will transfer the data to the server and get back the data from it. The application will be done the verity by itself so no server action will be done in here. There will be included function of verity password and an extend function for showing error notice.

On make in takeout order and scan QR code, both are simply same as only the session data will be different. After that, the menu page will show out and the user may able to start to order their food order. After that, they will confirm the order and the server side will receive the order and update to the GUI side. There will be a payment for takeout order, the user may select one of the payment methods and the server will react different method based on their selection.
On redeem coupon, the function will include a verity of user points and extend for showing point not enough error to the user. The server will update the data to the management part.

On seat reservation, the user may able to input the detail in it and the server will repose on true or false Boolean based on the number of people get.



This is a use case diagram for the GUI back-end system. There is also a login function for common staff and high permit staff for different access permission.

On login, after the user input the username and password, the application will transfer the data to the server and get back the data from it. The application will be done the verity by itself so no server action will be done in here. There will be included function of verity password and an extend function for showing error notice.

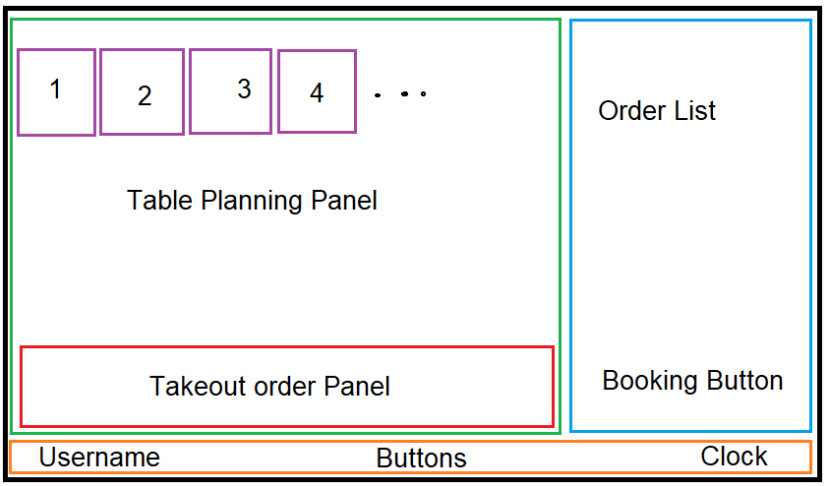
On order management, all management such as table, order detail, payment and seta reservation will react with the server and food management may able to send a JSON string to third part server such as food panda to update their database.

On data management, the server just reacts on data updating, all other function will be calculated in the GUI by itself.

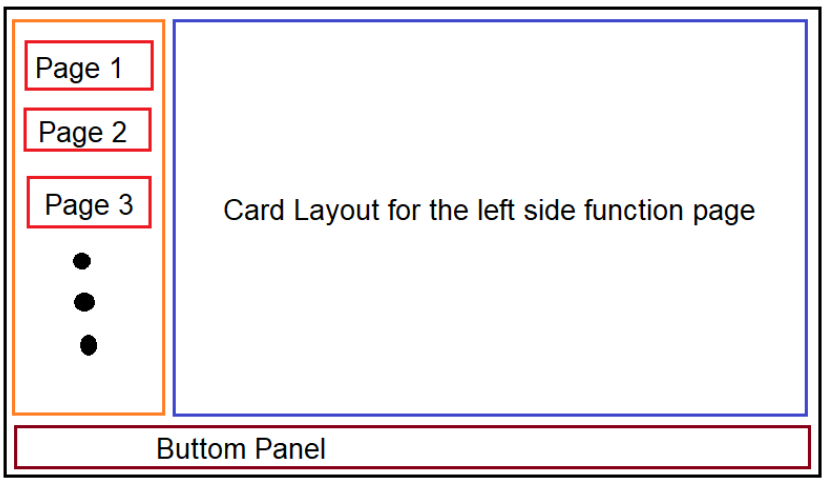
On kitchen management, it able to show all orders which need to cook and update the order flag to order management and the website application.

Screen Layout & Report Layout Design

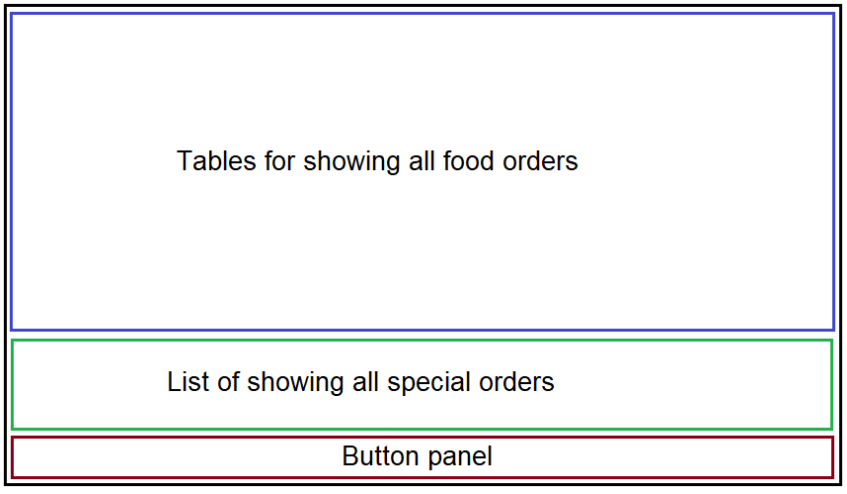
This is the screen design of the order management page of the GUI system.
Table planning will show all the table in the restaurnat, the table will be a clickable label. After click on it, the order list will show what orders have on this table. The takeout order panel will show takeout order features. The button panel will show common information such as time and username.



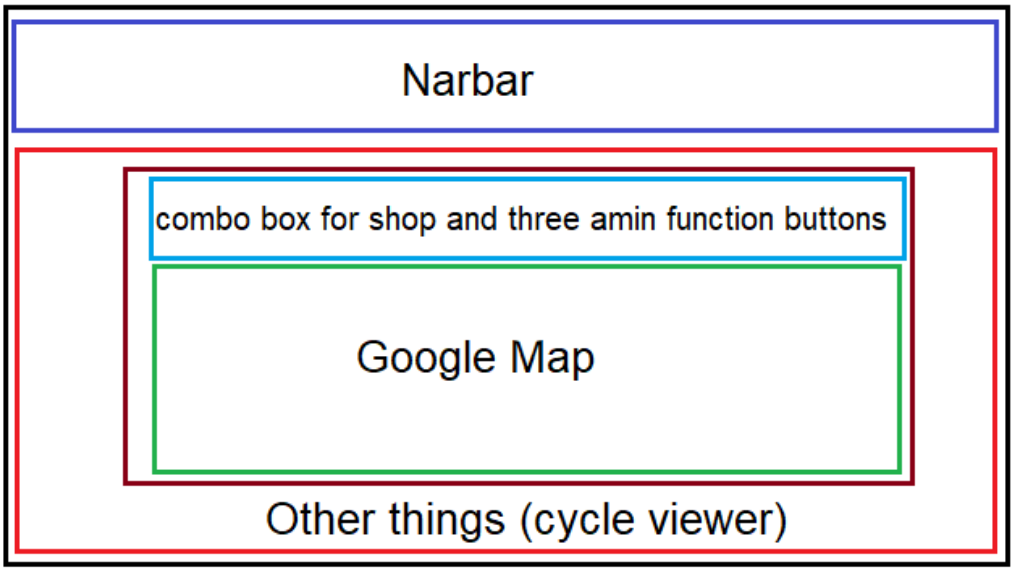
This is the screen design of the management page of the GUI system.
Left panel for different function page and the right panel is a card layout, will change the layout based on user chooing which function page.



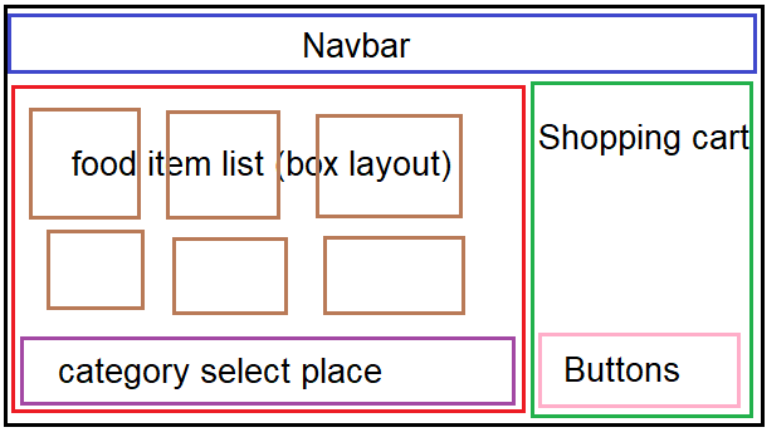
This is the screen design of the Kitchen page of the GUI system.

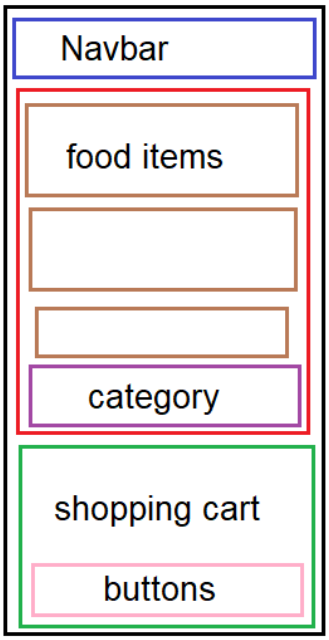


This is the screen design of the home page of the web application.

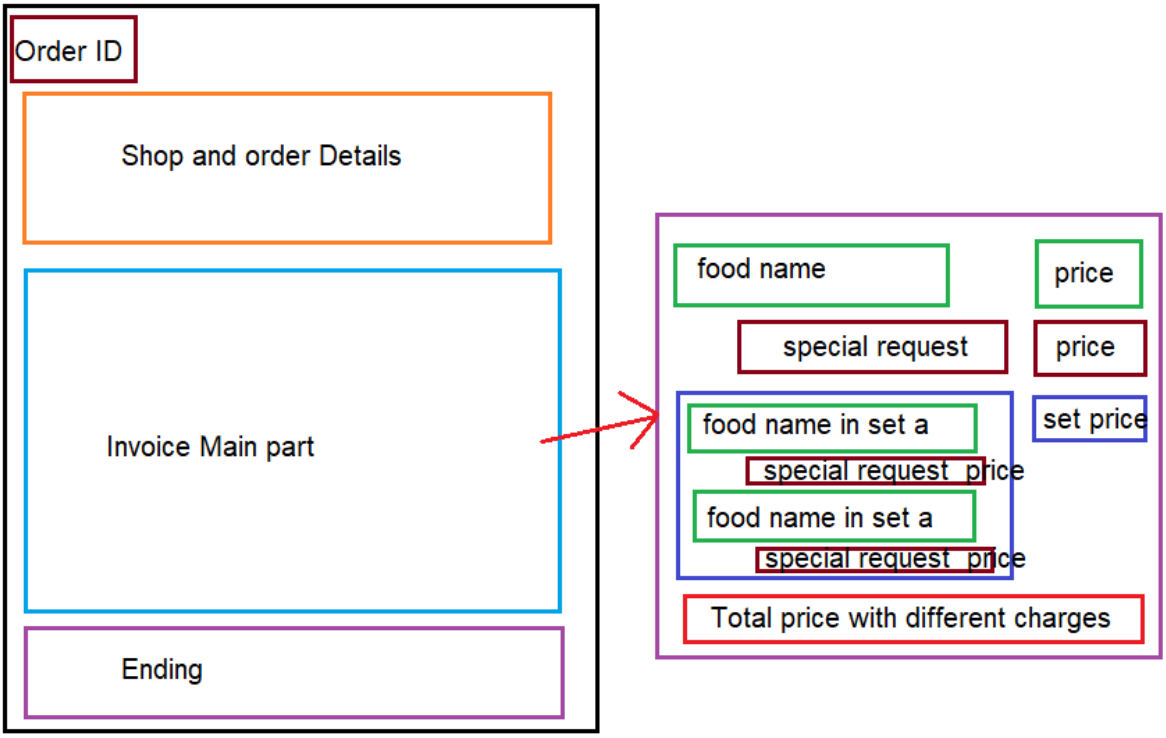


This is the screen design of the order page of the web application.
Right for common device such as PC and left for mobile device.

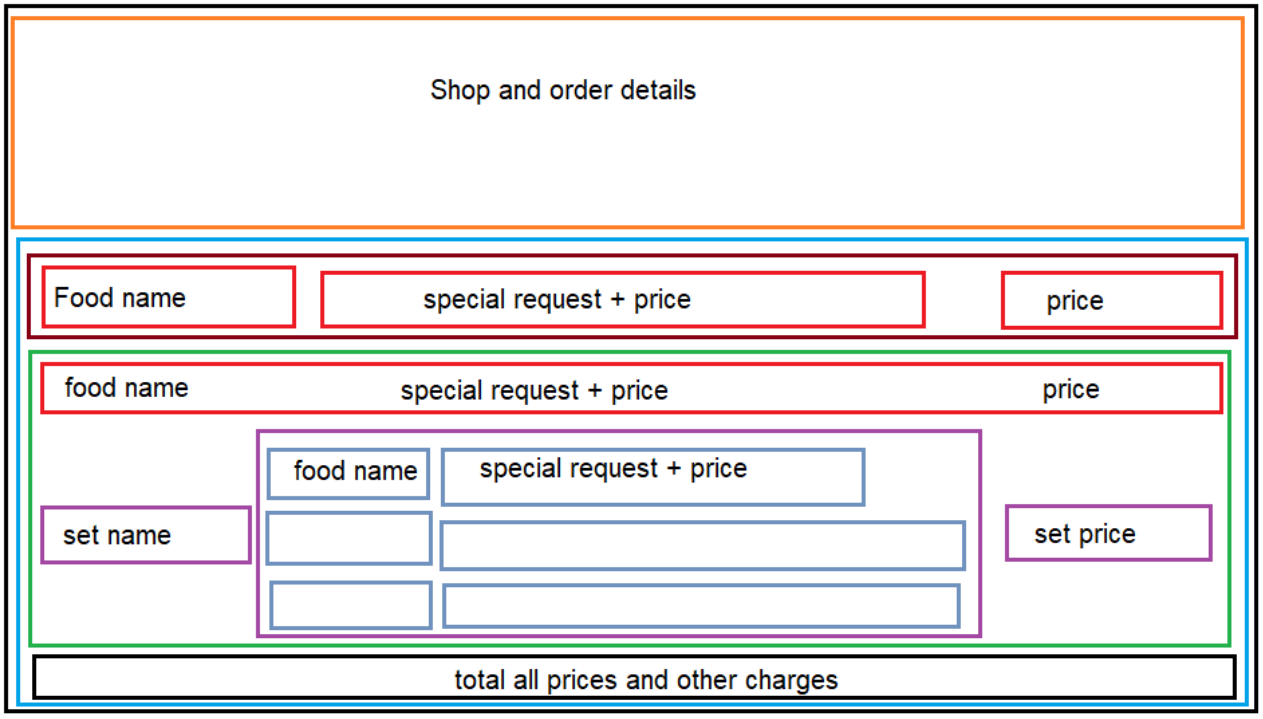




This is the report design of the invoice for GUI system.

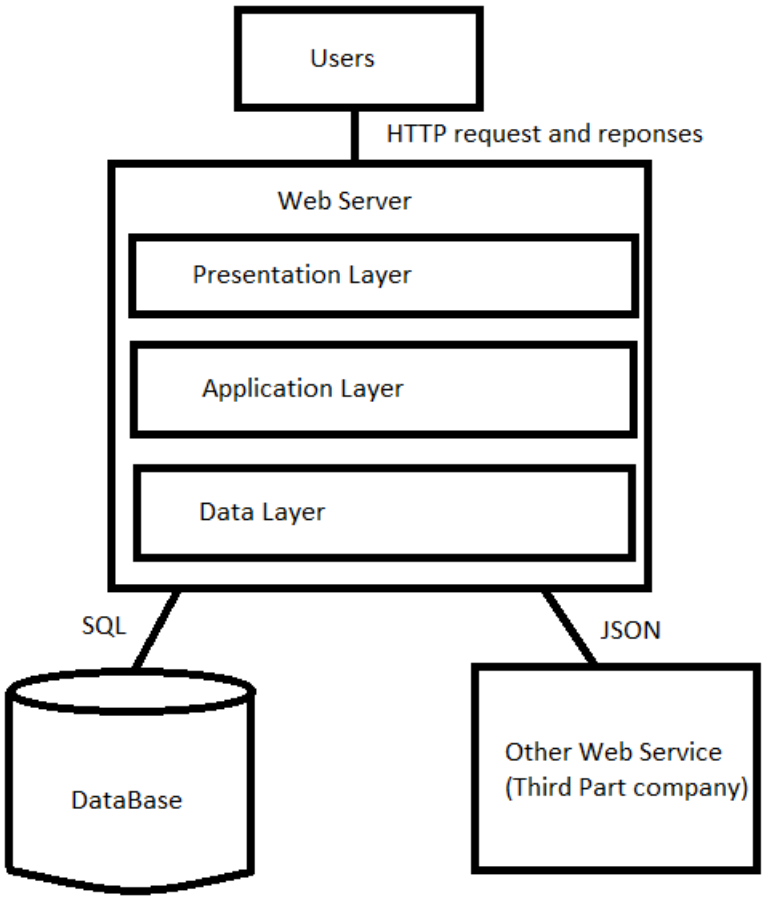


This is the report design of the invoice for web application.



System Architecture

Website application system architecture diagram:



Users: Make requests to the website server and receive responses using flask and jinja2.

Web Server: The host of the application's different layers, the structure of this system is MVC.

- Presentation Layer: User interact with the HTTP requests and responses in the browser.
- Application Layer: Manages the flow of the application, implements logic.
- Data Layer: Handle data transfer between database and other retrieval services.

Database: A place where data store and use.

Web services: Interaction with other application, such as Email and Socket.

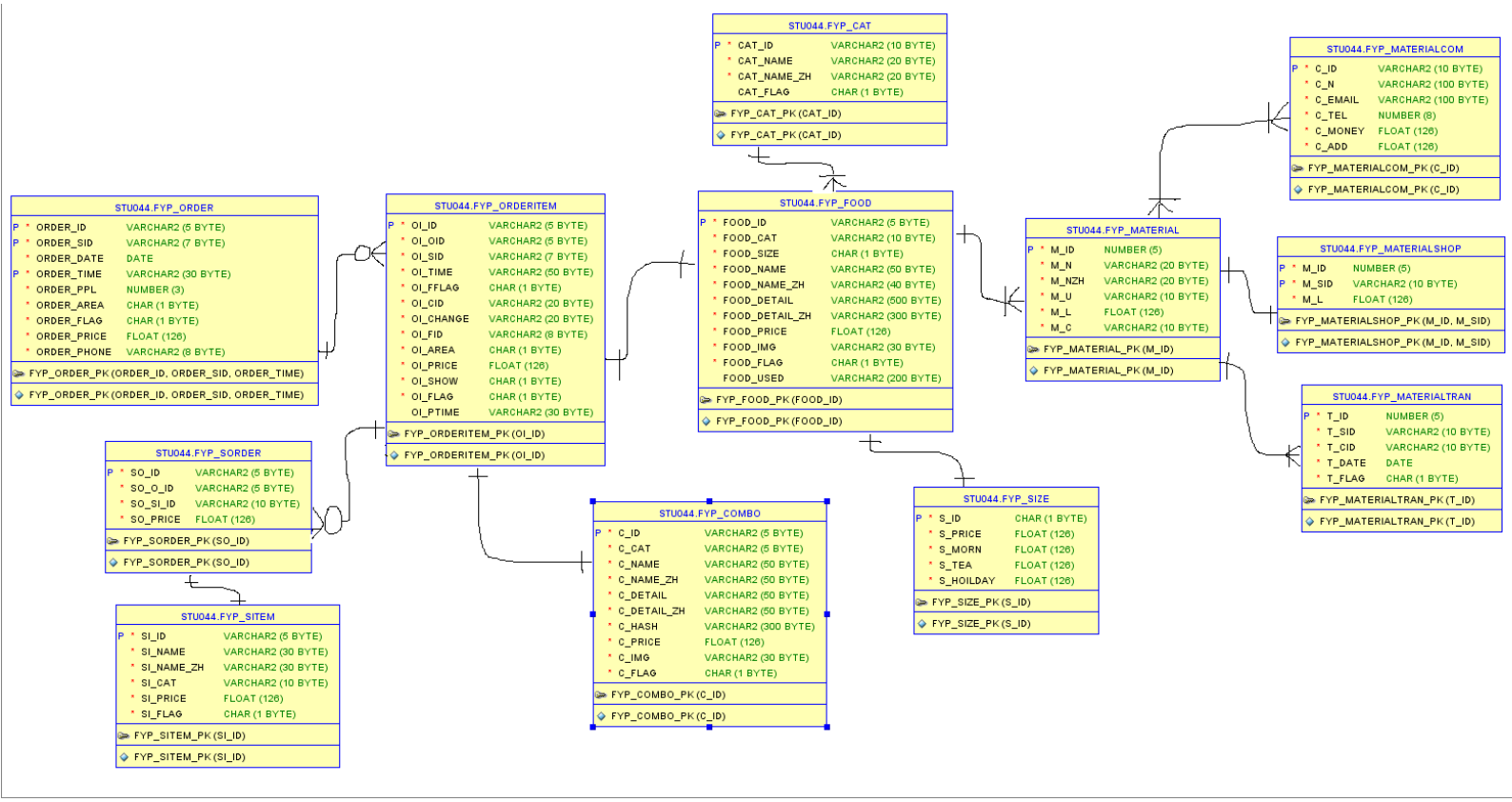
Socket: JSON – From GUI server to third-party server
I use JSON String to send socket of information to third-party server, such as food order platform Food Panda. The JSON String is included the company ID, food type, food ID, category, special request, name, name in Chinese, detail, detail in Chinses, price and flag.
The third platform server may able to receive the data and get all updated information from the company.

Socket: JSON – From Flask server to GUI server
There will be a JSON String send to GUI socket. The details of the JSON string is shop ID, table ID.
The GUI server may get the Shop ID by return function and check that is the Shop ID same as its. If yes then show out the table ID on the screen for waiters to serve, else do nothing.

Database Design

There are total 26 tables used in this project.
All tables have a tag name “FYP_” in front of it. FYP means final year project.
As all table should be in third normal form, but some of the table didn’t.
For example, the “FYP_ORDERITEM” is a second form table, as this table will be always calling out, using third form need to join the table every time, which use many rams and waste CPU time. On the other hand, a second form table is easy for developer to read for the information record inside.

Entity–relationship diagram:



This is the main entity–relationship model of the project which is the order record and food item part. The table start from left to right. One order may have 0 or many order items, each order items many have 0 or many special orders. Each special order follows one special item. One order item will have 1 food item or 1 combo set items. One food item will follow one category and size. 1 Food item many have 1 or more material. One material many have 1 or more supply companies and be record in 1 or many shops and may appear in 1 or more transaction record table.
Other table to not have a great relationship, so no ER-diagram will show. Other details of the table will be written in the second part, data dictionary.

Data Dictionary:

Table Column	Column type	Explanation
FYP_BOOKING		Record booking record
B_ID	NUMBER(3,0)	PK, id, auto increase
B_SID	VARCHAR2(10 BYTE)	shop id
B_DATE	DATE	date and time
B_TIME	VARCHAR2(20 BYTE)	time
B_PPL	NUMBER(2,0)	people number
B_TEL	CHAR(8 BYTE)	telephone
B_NAME	VARCHAR2(20 BYTE)	user name
B_FLAG	CHAR(1 BYTE)	flag, 1 = non-completed, 2 = completed
FYP_CAT		Category table
CAT_ID	VARCHAR2(10 BYTE)	PK, id, unique
CAT_NAME	VARCHAR2(20 BYTE)	name
CAT_NAME_ZH	VARCHAR2(20 BYTE)	name in Chinese
CAT_FLAG	CHAR(1 BYTE)	flag, 1=available, 2=non-available
FYP_COMBO		Combo table
C_ID	VARCHAR2(5 BYTE)	PK, id, auto increase
C_CAT	VARCHAR2(5 BYTE)	Category id
C_NAME	VARCHAR2(50 BYTE)	name
C_NAME_ZH	VARCHAR2(50 BYTE)	name in Chinese
C_DETAIL	VARCHAR2(50 BYTE)	detail
C_DETAIL_ZH	VARCHAR2(50 BYTE)	detail in Chinese
C_HASH	VARCHAR2(300 BYTE)	hash code for the combo item inside. E.g., 2:4_5 means food ID 4 and 5, 2 of them choose one
C_PRICE	FLOAT	price
C_IMG	VARCHAR2(30 BYTE)	image link
C_FLAG	CHAR(1 BYTE)	flag, 1=available, 2=non-available

FYP_COUPON		
C_TYPE	VARCHAR2(5 BYTE)	PK, id, unique
C_N	VARCHAR2(50 BYTE)	name
C_NZH	VARCHAR2(50 BYTE)	name in Chinese
C_D	VARCHAR2(50 BYTE)	detail
C_DZH	VARCHAR2(50 BYTE)	detail in Chinese
C_VALUE	NUMBER(3,0)	discount value
C_FID	VARCHAR2(5 BYTE)	food id
C_MON	NUMBER(2,0)	expired month
C_IMG	VARCHAR2(50 BYTE)	image link
C_NP	NUMBER(3,0)	need how many points to redeem
FYP_COUPONLOG		record all activity of coupons
L_ID	NUMBER(5,0)	PK, id, auto increase
L_CID	NUMBER(5,0)	coupon id
L_UID	NUMBER(10,0)	user id
L_DATE	DATE	date
L_FROM	VARCHAR2(20 BYTE)	from where, record with “net” or “shop”
L_SID	VARCHAR2(20 BYTE)	shop id
L_FLAG	CHAR(1 BYTE)	flag, 1=available, 2=non-available
FYP_EXPENSES		
E_ID	NUMBER(5,0)	PK, id, auto increase
E_DATE	DATE	date
E_SID	VARCHAR2(10 BYTE)	shop id
E_TID	NUMBER(10,0)	transaction id
E_D	VARCHAR2(80 BYTE)	detail
E_DZH	VARCHAR2(50 BYTE)	detail in Chinese
E_V	FLOAT	cost used

FYP_FOOD		food item table
FOOD_ID	VARCHAR2(5 BYTE)	PK, id, auto increase
FOOD_CAT	VARCHAR2(10 BYTE)	category id
FOOD_SIZE	CHAR(1 BYTE)	size id
FOOD_NAME	VARCHAR2(50 BYTE)	name
FOOD_NAME_ZH	VARCHAR2(40 BYTE)	name in Chinese
FOOD_DETAIL	VARCHAR2(500 BYTE)	detail
FOOD_DETAIL_ZH	VARCHAR2(300 BYTE)	detail in Chinese
FOOD_PRICE	FLOAT	price
FOOD_IMG	VARCHAR2(30 BYTE)	image link
FOOD_FLAG	CHAR(1 BYTE)	flag, 1=available, 2=non-available
FOOD_USED	VARCHAR2(200 BYTE)	material hash code, what material will need to use in this food item. E.g., 1:1, need to reduce 1 from material ID 1.
FYP_MATERIAL		material table
M_ID	NUMBER(5,0)	PK, id, auto increase
M_N	VARCHAR2(20 BYTE)	name
M_NZH	VARCHAR2(20 BYTE)	name in Chinese
M_U	VARCHAR2(10 BYTE)	unit use (each/ml/kg)
M_L	FLOAT	break point
M_C	VARCHAR2(10 BYTE)	supply company ID
FYP_MATERIALCOM		material company table
C_ID	VARCHAR2(10 BYTE)	PK, id, unique
C_N	VARCHAR2(100 BYTE)	name
C_EMAIL	VARCHAR2(100 BYTE)	email
C_TEL	NUMBER(8,0)	telephone
C_MONEY	FLOAT	cost needed per each transaction
C_ADD	FLOAT	material add per each transaction

FYP_MATERIALSHOP		Record each shop's material quantity
M_ID	NUMBER(5,0)	material ID
M_SID	VARCHAR2(10 BYTE)	shop ID
M_L	FLOAT	quantity
FYP_MATERIALTRAN		material transaction record
T_ID	NUMBER(5,0)	PK, id, auto increase
T_SID	VARCHAR2(10 BYTE)	shop id
T_CID	VARCHAR2(10 BYTE)	company id
T_DATE	DATE	date
T_FLAG	CHAR(1 BYTE)	flag, 1=available, 2=non-available
FYP_MONTH		month table, used to joint table FYP_PROFIT
M_ID	NUMBER(3,0)	month id
M_P	NUMBER(1,0)	no use column
FYP_ORDER		Order record table
ORDER_ID	VARCHAR2(5 BYTE)	PK, id, auto increase
ORDER_SID	VARCHAR2(7 BYTE)	shop id
ORDER_DATE	DATE	order date
ORDER_TIME	VARCHAR2(30 BYTE)	order date and time
ORDER_PPL	NUMBER(3,0)	people
ORDER_AREA	CHAR(1 BYTE)	area
ORDER_FLAG	CHAR(1 BYTE)	flag, 1=non pay, 2=paid, 3=cancelled
ORDER_PRICE	FLOAT	total price
ORDER_PHONE	VARCHAR2(8 BYTE)	phone number (mainly for takeout order use)

FYP_ORDERITEM		order item table
OI_ID	VARCHAR2(5 BYTE)	PK, id, auto increase
OI_OID	VARCHAR2(5 BYTE)	order id
OI_SID	VARCHAR2(7 BYTE)	shop id
OI_TIME	VARCHAR2(50 BYTE)	order item added time
OI_FFLAG	CHAR(1 BYTE)	flag, f=food item, c=set item
OI_CID	VARCHAR2(20 BYTE)	combo id
OI_CHANGE	VARCHAR2(20 BYTE)	hash code for choosable set item
OI_FID	VARCHAR2(8 BYTE)	food id
OI_AREA	CHAR(1 BYTE)	area
OI_PRICE	FLOAT	price
OI_SHOW	CHAR(1 BYTE)	flag, 1=show in invoice, 2=non-showing
OI_FLAG	CHAR(1 BYTE)	flag, 1=making, 2=served, 3=cancel,4=cancel with material
OI_PTIME	VARCHAR2(30 BYTE)	order time
FYP_ORECORD		order record table, for user and online takeout service only
R_ID	NUMBER(3,0)	PK, id, auto increase
R_UID	NUMBER(5,0)	user id
R_OID	VARCHAR2(10 BYTE)	order id
R_SID	VARCHAR2(10 BYTE)	shop id
R_P	FLOAT	price
R_T	VARCHAR2(20 BYTE)	order time
FYP_PAYMETHOD		payment table
P_ID	NUMBER(5,0)	PK, id, auto increase
P_N	VARCHAR2(20 BYTE)	name
P_NZH	VARCHAR2(20 BYTE)	name in Chinese
P_FLAG	CHAR(1 BYTE)	flag, 1=available, 2=non-available

FYP_PROFIT		profit record table
P_ID	NUMBER(5,0)	PK, id, auto increase
P_OID	VARCHAR2(10 BYTE)	order id
P_SID	VARCHAR2(10 BYTE)	shop id
P_OT	VARCHAR2(30 BYTE)	order time
P_VAL	FLOAT	price
P_AREA	VARCHAR2(4 BYTE)	area
P_METHOD	CHAR(1 BYTE)	payment id
P_CARDNO	NUMBER(16,0)	card number (credit card or others)
P_DATE	DATE	payment date
P_TIME	VARCHAR2(30 BYTE)	payment time
P_FLAG	CHAR(1 BYTE)	flag, s=success, f=fail
FYP_SERVICEFEE		service fee table
S_ID	VARCHAR2(5 BYTE)	PK, id, unique
S_PRICE	FLOAT	price
FYP_SHOP		shop table
SHOP_ID	VARCHAR2(8 BYTE)	PK, id, unique
SHOP_NAME	VARCHAR2(50 BYTE)	name
SHOP_NAME_ZH	VARCHAR2(50 BYTE)	name in Chinese
SHOP_LOCATION	CHAR(1 BYTE)	location
SHOP_ADDRESS	VARCHAR2(100 BYTE)	address
SHOP_ADDRESS_ZH	VARCHAR2(100 BYTE)	address in Chinese
SHOP_CAPACITY	NUMBER(3,0)	CAPACITY
SHOP_X	FLOAT	x coordinate
SHOP_Y	FLOAT	y coordinate
SHOP_TEL	NUMBER(8,0)	telephone
SHOP_TIME	CHAR(13 BYTE)	open hour
SHOP_FLAG	CHAR(1 BYTE)	flag, 1=available, 2=non-available

FYP_SITEM		special item table
SI_ID	VARCHAR2(5 BYTE)	PK, id, auto increase
SI_NAME	VARCHAR2(30 BYTE)	name
SI_NAME_ZH	VARCHAR2(30 BYTE)	name in Chinese
SI_CAT	VARCHAR2(10 BYTE)	category id
SI_PRICE	FLOAT	price
SI_FLAG	CHAR(1 BYTE)	flag, 1=available, 2=non-available
FYP_SIZE		food size table
S_ID	CHAR(1 BYTE)	PK, id, unique
S_PRICE	FLOAT	common price
S_MORN	FLOAT	morning price
S_TEA	FLOAT	afternoon tea price
S_HOILDAY	FLOAT	holiday price
FYP_SORDER		special order table
SO_ID	VARCHAR2(5 BYTE)	PK, id, auto increase
SO_O_ID	VARCHAR2(5 BYTE)	order item id
SO_SI_ID	VARCHAR2(10 BYTE)	special item id
SO_PRICE	FLOAT	price
FYP_STAFF		company staff table
STAFF_ID	NUMBER(4,0)	PK, id, auto increase
STAFF_NAME	VARCHAR2(30 BYTE)	name
STAFF_NAME_ZH	VARCHAR2(30 BYTE)	name in Chinese
STAFF_PW	VARCHAR2(30 BYTE)	password
STAFF_GENDER	CHAR(1 BYTE)	gander
STAFF_ROLE	VARCHAR2(20 BYTE)	role in company
STAFF_ROLE_ZH	VARCHAR2(20 BYTE)	role in company in Chinese
STAFF_PERMIT	CHAR(1 BYTE)	permission level ,1=low,2=high

FYP_TABLE		shop table table
TABLE_ID	VARCHAR2(5 BYTE)	PK, id, unique
TABLE_SHOP	VARCHAR2(7 BYTE)	shop id
TABLE_NUMBER	NUMBER(3,0)	capacity of each table
TABLE_FLAG	CHAR(1 BYTE)	flag, 1=available, 2=non-available
TABLE_NOW	NUMBER(3,0)	usage of each table (real-time)
FYP_USER		member detail table
USER_ID	NUMBER(5,0)	PK, id, auto increase
USER_USERNAME	VARCHAR2(20 BYTE)	user name
USER_EMAIL	VARCHAR2(50 BYTE)	email
USER_PHONE	NUMBER(10,0)	phone
USER_PASSWORD	VARCHAR2(50 BYTE)	password
USER_POINT	NUMBER(5,0)	points number
FYP_USERCOUPON		table record user's coupons
C_ID	NUMBER(5,0)	PK, id, auto increase
C_TYPE	VARCHAR2(5 BYTE)	coupon id
C_UID	VARCHAR2(10 BYTE)	user id
C_DATE	DATE	date and time when coupon added
C_FROM	VARCHAR2(7 BYTE)	shop id or "net"
C_FLAG	CHAR(1 BYTE)	flag, 1=available, 2=non-available, 3=deleted

**All table columns are non-null type.

System Implementation

In this project, I have developed two applications. I have use different tools and coding language.

First, on back-end Java GUI application:
I use Java swing to code this GUI application. A traditional program language for coding a GUI. As Java is a popular platform, more than 3 billion users are using. It is easy to setup for any computer and environment.
Java Swing provides many better screen display elements than AWT. They are written in pure Java, so they can run cross-platform like Java itself, unlike AWT. They are part of JFC. They support replaceable panels and themes (the default themes specific to various operating systems), but instead of actually using the devices provided by the native platform, they merely emulate them on the surface. This means you can use any panel supported by JAVA on any platform. The disadvantage of lightweight components is the slower execution speed, and the advantage is that they can adopt uniform behavior on all platforms (wiki, 2020).
I use Eclipse Java for developing tools for this GUI application. The Eclipse platform is the foundation of the eclipse IDE, which consists of plug-ins and can be extended with other additional plug-ins. The Eclipse platform developed with Java can be used to develop rich client applications, integrate development environment and other tools. Eclipse can be used as an IDE for any programming language available (Tutorials Point, 2015).

Second, on web-based online application:
On web-based application, I use Python Flask. Python is a new programming language which become popular, compared to C ++ or Java, Python allows developers to express ideas with less code. Whether it's a small or large program, the language tries to make the structure of the program clear. The Tkinter module (Tk interface) is an interface to Python's standard Tk GUI toolkit. Tk and Tkinter can be used on most Unix platforms, as well as Windows and Macintosh systems. Subsequent versions of Tk8.0 can implement the native window style and run well on most platforms (wiki, 2020). And the Flask for Python is a extend function based on python. The object flask implements an implementation of the WSGI and serves as the core entity. The name of the program module or kit is transferred. If it is developed, the view functions, the URL rules, template configuration and much more will serve as a central registry (Flask, 2020).

I use VS Code for developing tools for this web-based online application. Visual Studio Code is an open source code editor developed by Microsoft and supporting Windows, Linux and macOS operating systems. It supports testing and has built-in Git version control function. It also has development environment functions, such as code completion, code snippets, and code refactoring. The editor supports personalized configuration of users, such as changing the theme color, keyboard shortcuts and other attributes and parameters, and also has built-in extended program management functions in the editor (wiki, 2020).

On database, I have used Oracle online database for this project. Oracle enables you to customize your database and hardware based on your solution, with a wide range of variability and design options for super tuning options MySQL, by contrast, has few configuration levels. Oracle has unlimited tools, which are essential if you want to understand what's going on behind the scenes and need to fine tune your hardware, databases, and applications. Fine grained access or row level security is trivial and elegant to implement in Oracle, and equivalently requires more code than in MySQL Overall, Oracle Security is stronger in every way. Oracle data compression is more complex and reduces it spending Oracle can scale vertically and horizontally more effectively than MySQL (Hansen,2016).

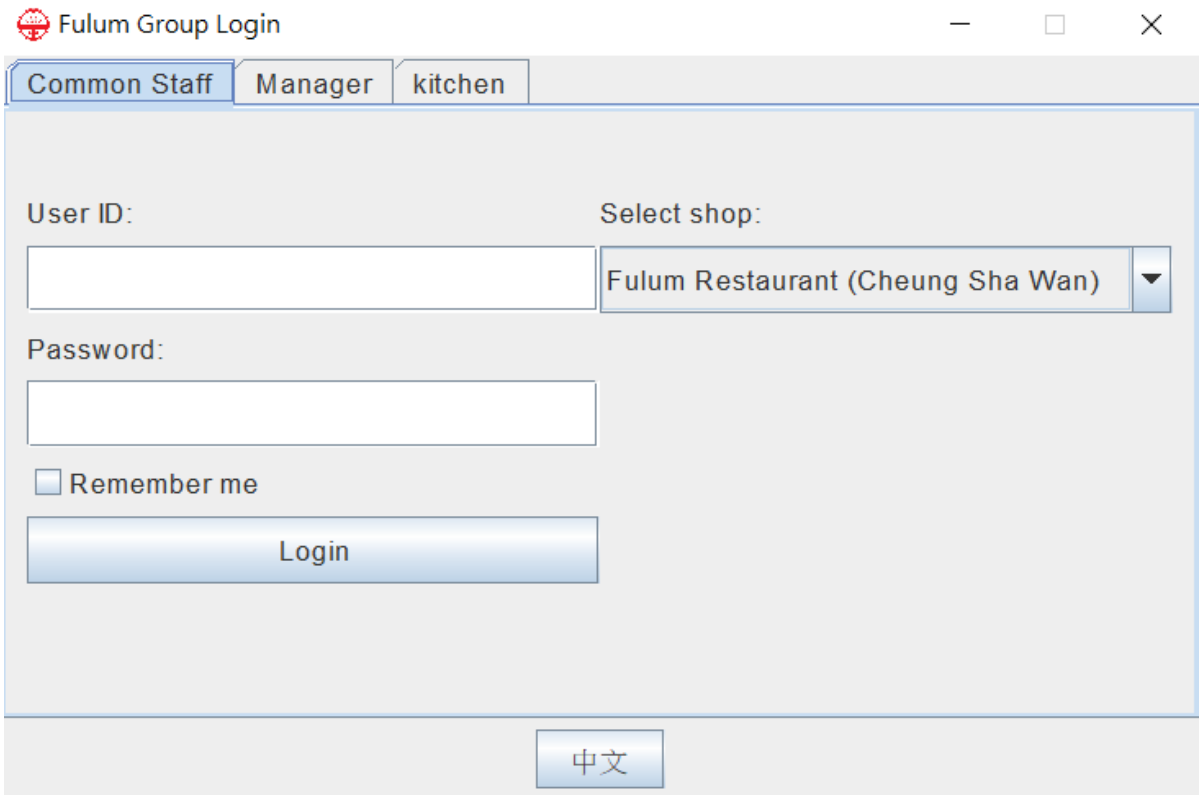
And I use the development tools of oracle database, SQL developer. Oracle SQL developer is a free integrated development environment that simplifies the development and management of Oracle databases in traditional and cloud deployments. SQL developer provides complete end-to-end development of PL / SQL applications, worksheets for running queries and scripts, DBA consoles for managing databases, reporting interfaces, complete data modeling solutions, and support for third-party databases moving to Oracle by Oracle’s migration platform (Oracle, 2020).

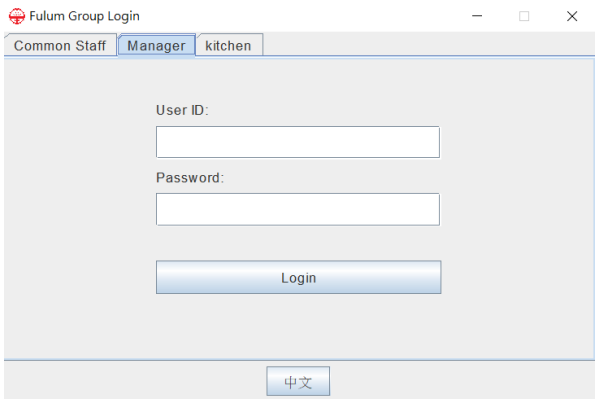
Finally, I have use mspaint.exe, a drawing tools based on windows pc, to complete different photoshop.

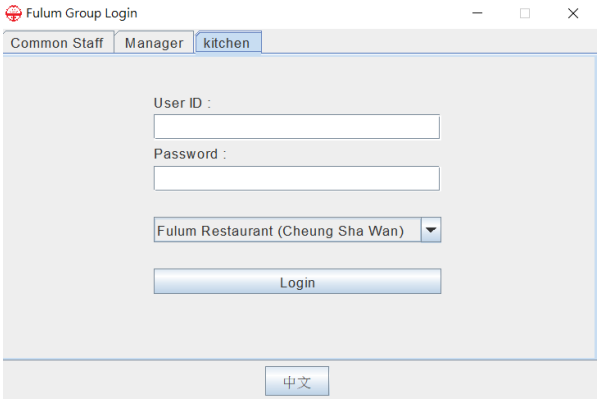
System Over View

Over view on Java GUI back-end System:

Login Page:



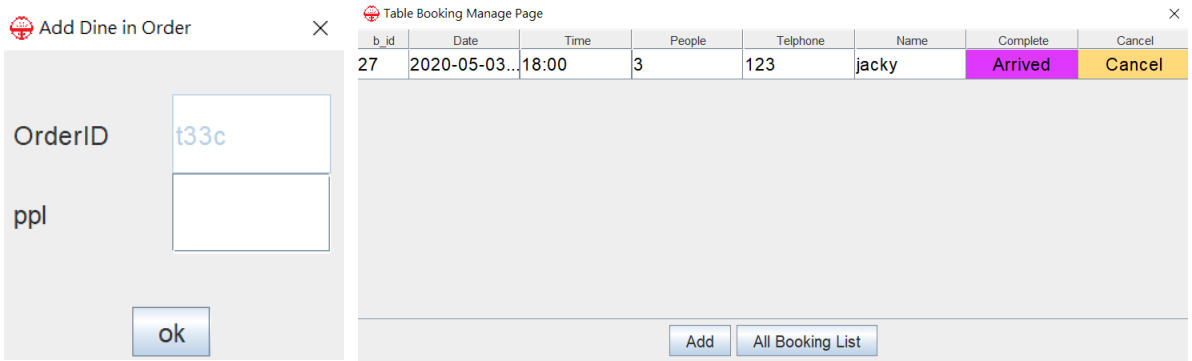




There will be a card layout on the top of the application for different user to login in. Each of them will have a User ID text field, a password text field and a login in button. Expect manager page, other do have a combo box for selecting which shop to login.

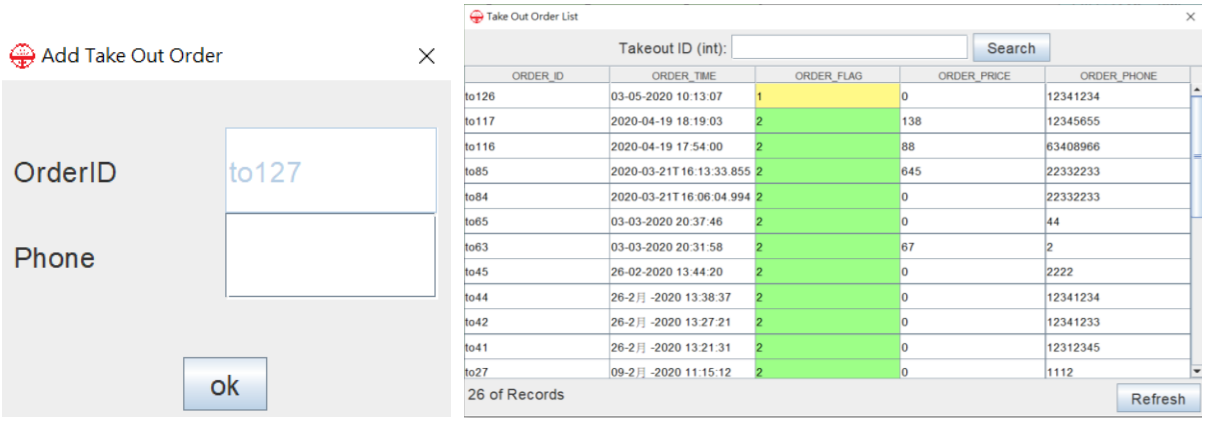
Order Management Page:

The left main panel is the table plan of the shop, each shop will show different planning. Green color for free table, yellow color for non-full table, red color for full table. By clicking the table, the right main panel will show the order of the table have. As an example, “t33” means the table ID, “t33a” means the order ID. As Chinese traditional restaurant does have a culture of sitting with other people in a big table. So, there will more than one order on each table. So, the system may able to separate the order by letter. There are two buttons on the right bottom panel, one for adding new order and one for showing booking details. The button may able to show how many booking doses have based on the date.



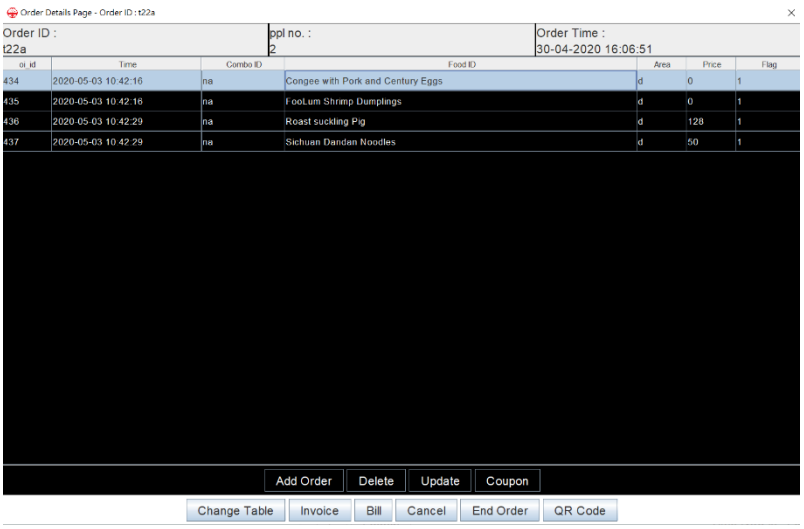
At the booking management page, there will be a table showing all the booking details and able to add new booking or show a list of all the booking from past to the future.

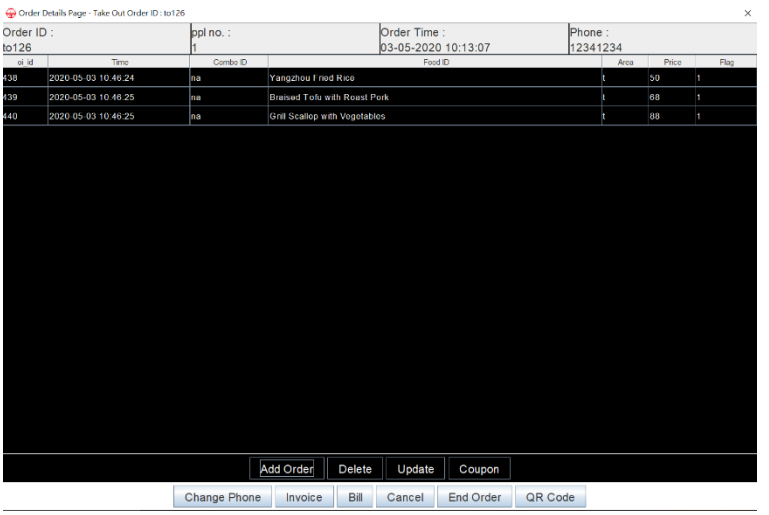
The Left bottom panel is a takeout order detail panel. It will show take out order which still not paid. There have two buttons, one for adding a new take out order and the order one is for showing a takeout list.



That the bottom of the order management page, there are two buttons. One for change present language and the other is log out button, will redirect to login page.

When the staff click on the takeout box or the “detail” button of each order, the system will show a order detail page.

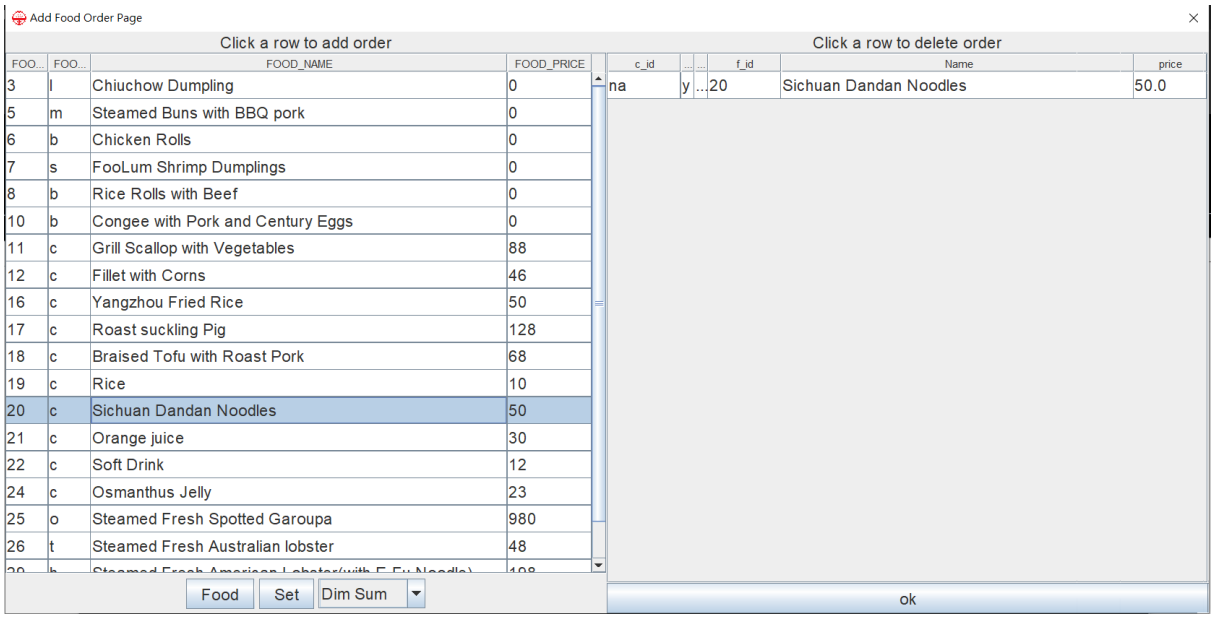




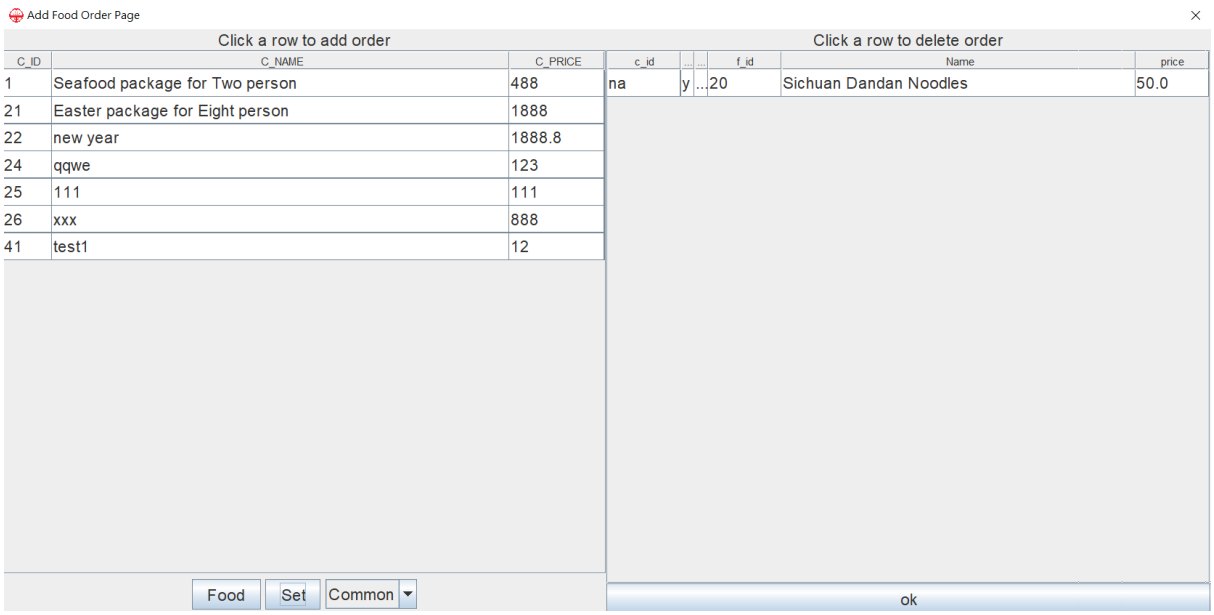
The top will show the details of the order. There will be some different between takeout and dine in order. Left is dining in and the right is taking out order.

The differences are the top will showing different information and the bottom will have a different function of change table or phone number.

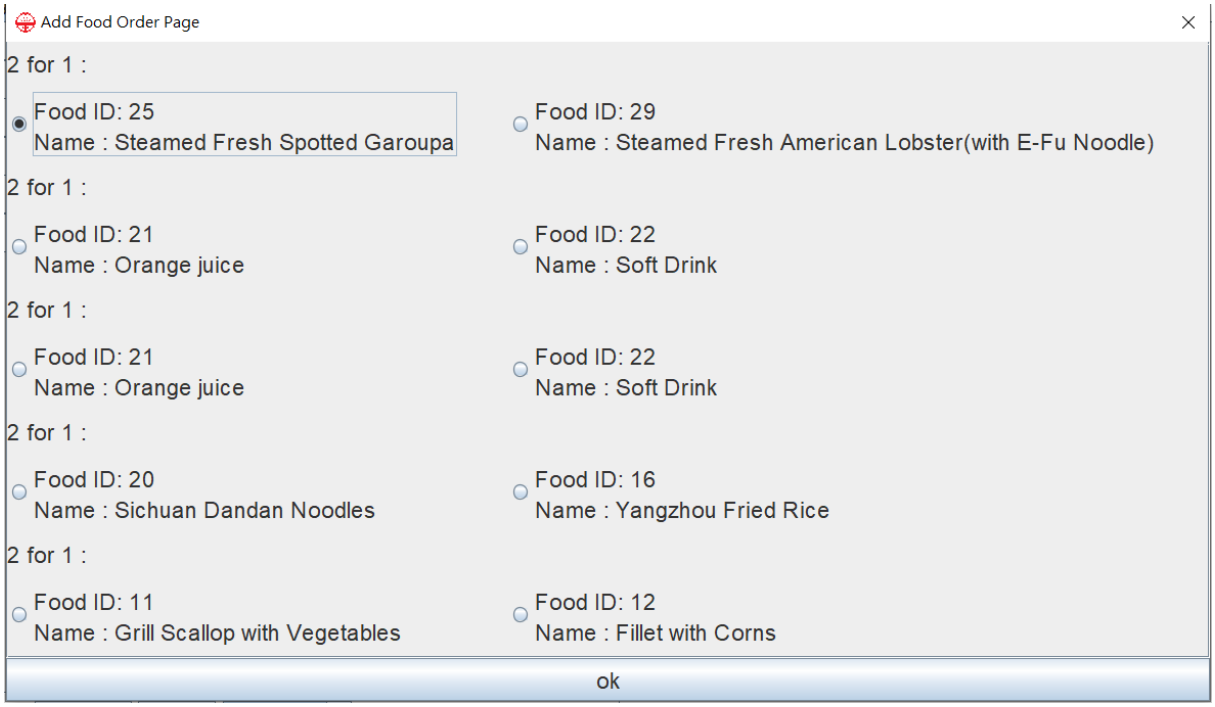
For dine in situation, the middle panel will show a table about the order items this order has. The user may click on them to update or delete. The control will be at the table bottom button. The user may also add new order for it.



User may able to click the food items on the left panel and will auto add on the right panel, click to delete the food item on right panel. There will be a sorting function by food category and button for switching to set items.

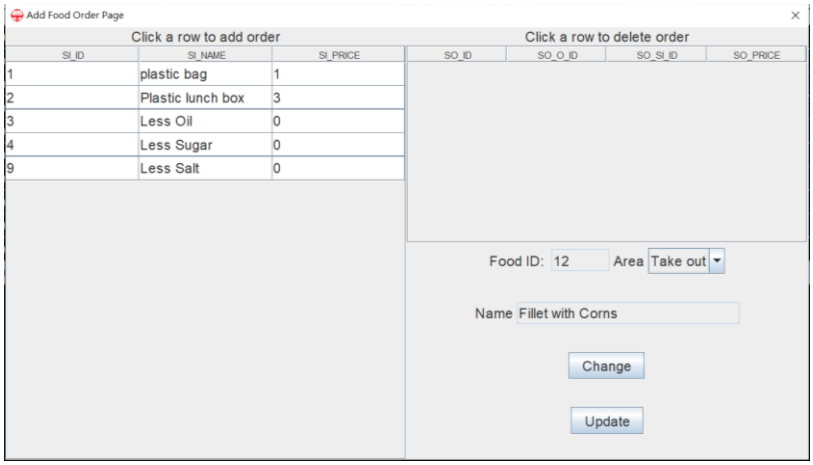


After clicking a set, there will be a page for user to select the choosable items.



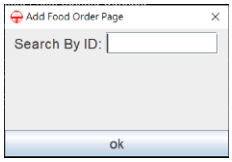
As each set item does have different selection for customer to choose. So, this page may able to input the choose selected by the customer.

On the order detail main panel, click on the table to select one item and press the update button to update detail of the food item.

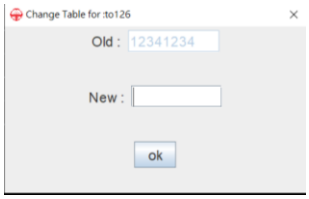


The left panel is a table of the special items, based on the food category. Click to add and auto add to the right table, also click to delete on the right table. The Right half panel can change the place of the food item on dine in or take away. Also, able to change the food item if it was a selection in the set.

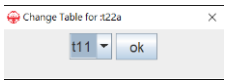
Click on the “Coupon” button, a window will show up, input correct coupon id to add a free food item for the order.



Change a phone number by clicking “change phone” button.



Change table:

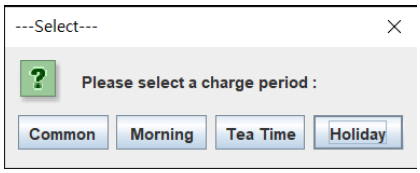


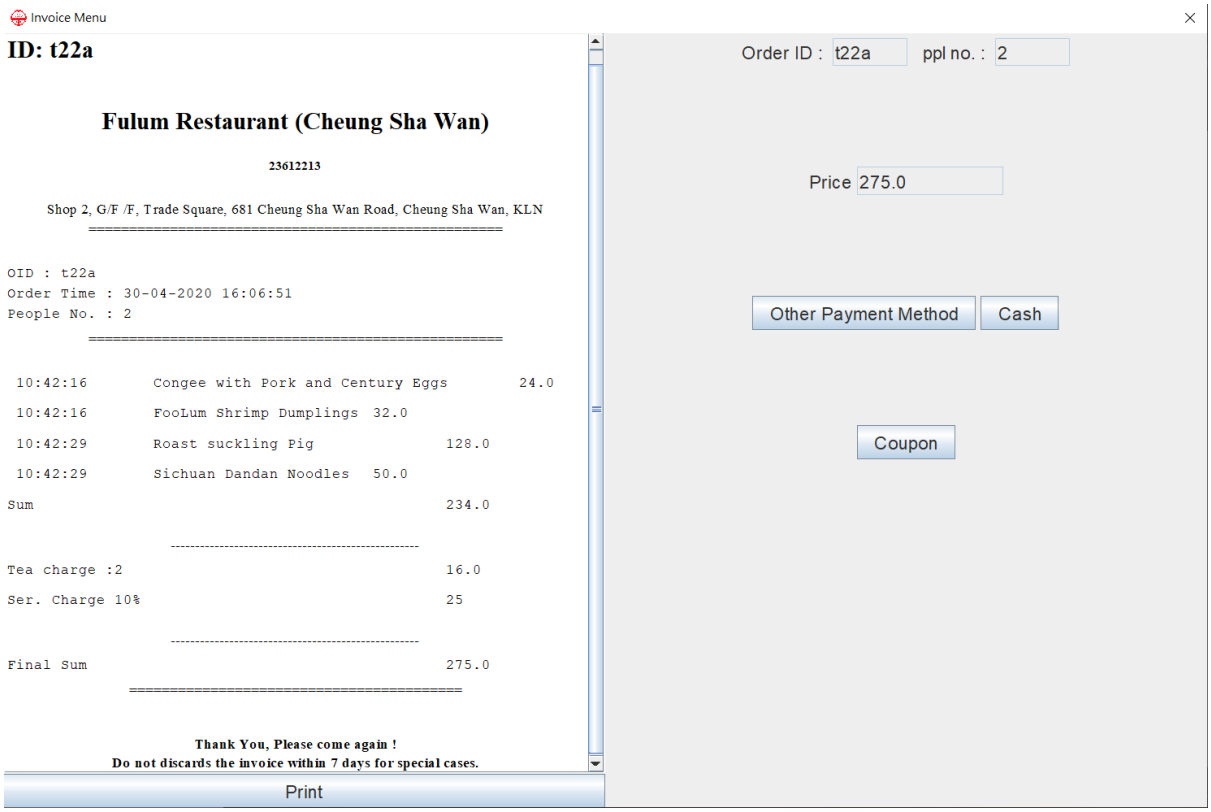
Generate QR Code by “QR code” button:

An image of this panel will be saved when press the button “print”.

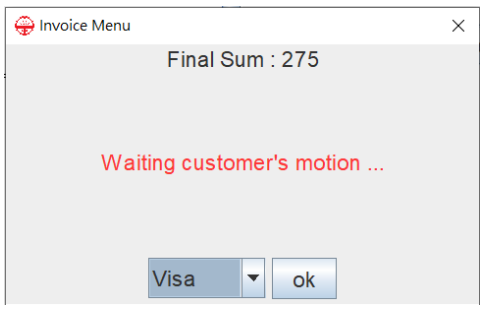
Button “End order” is to cancel the whole order with not any payment.
Button “Cancel” is to exit.

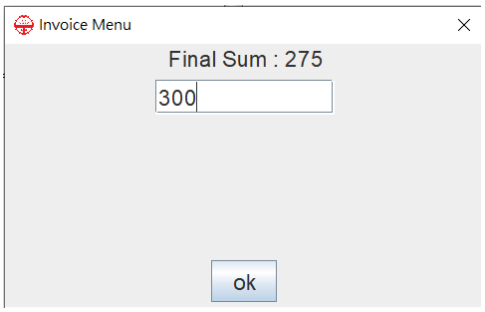
Button “Invoice” is to print the invoice.
Button “Bill” is to bill.
After clicking, the staff may able to select the pay period for this bill. Different period has different price calculation.





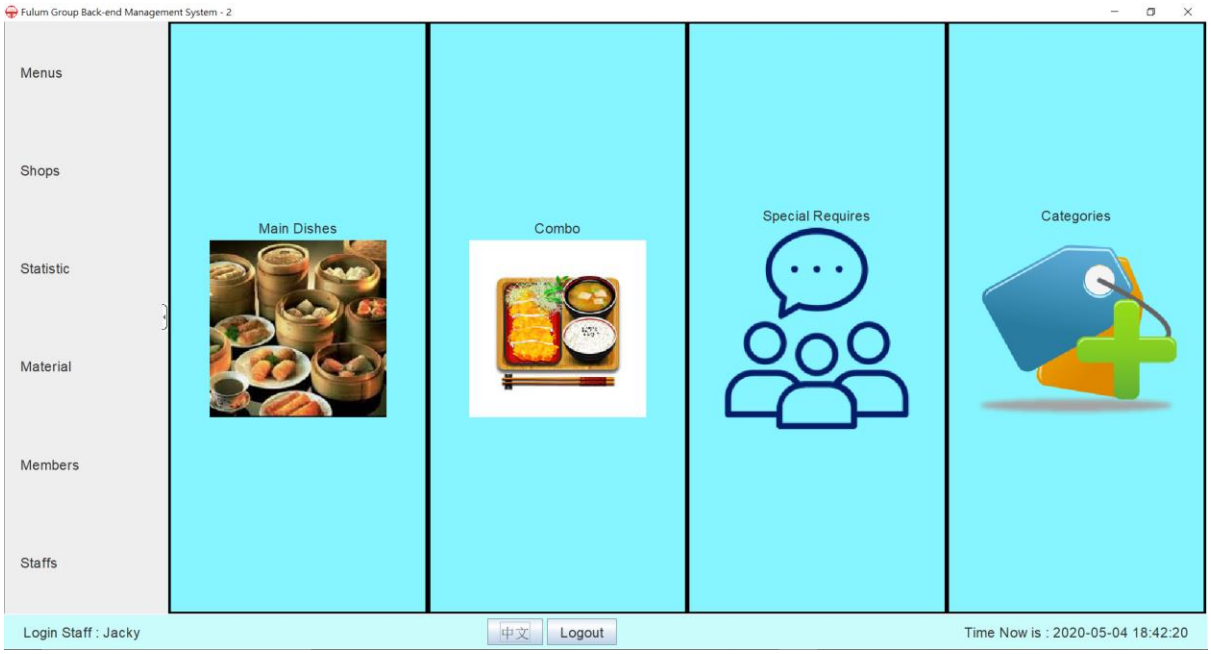
The left panel is a same as the invoice page, the right panel may able to choose the payment method or use a coupon by inputting correct and non-expired coupon ID. Also, may able to pay by cash.





Press ok to complete the order.

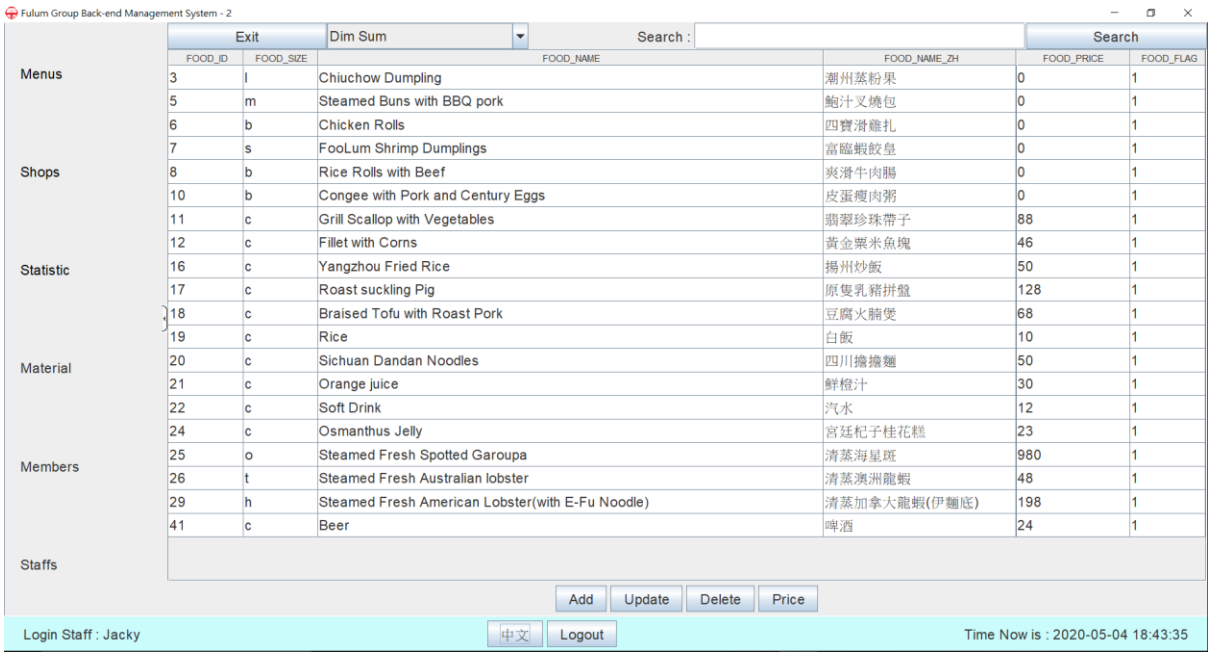
Manager Page:



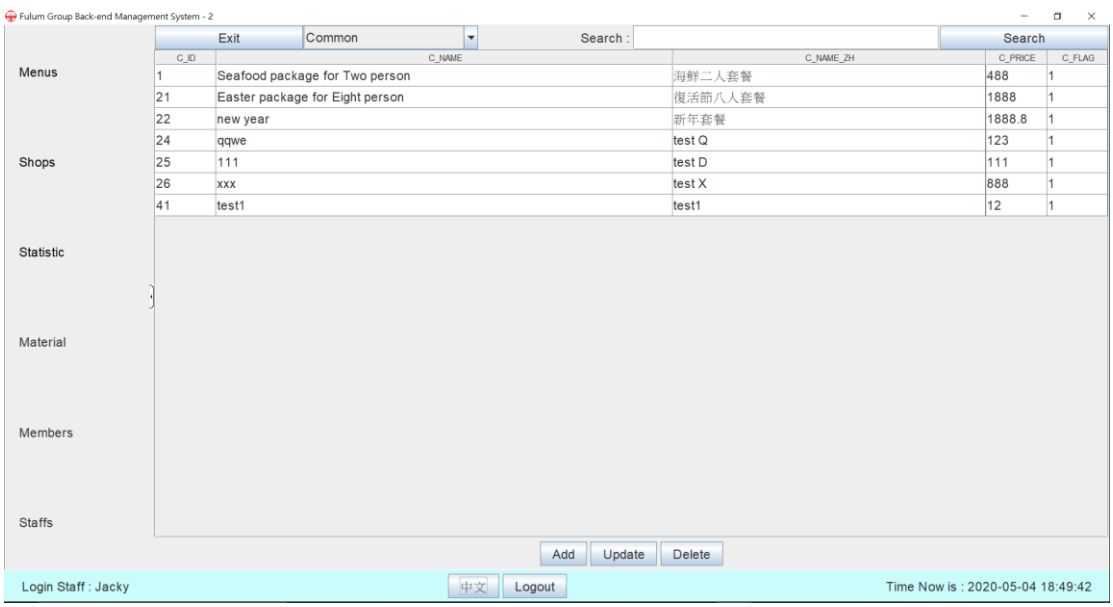
There is a card layout for this page. All selection has different layouts.

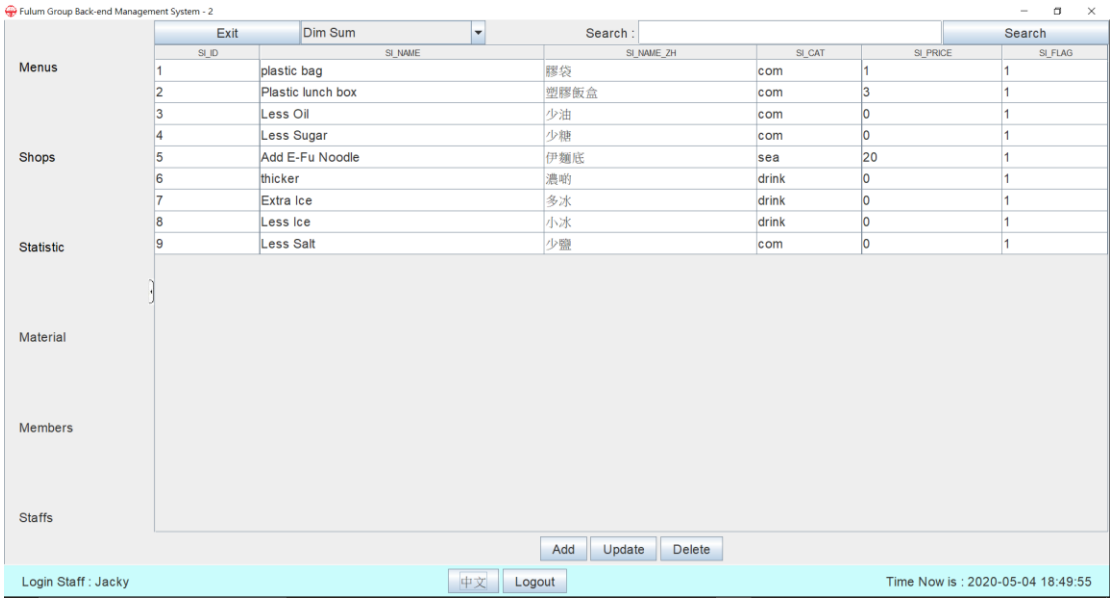
Menu Management:

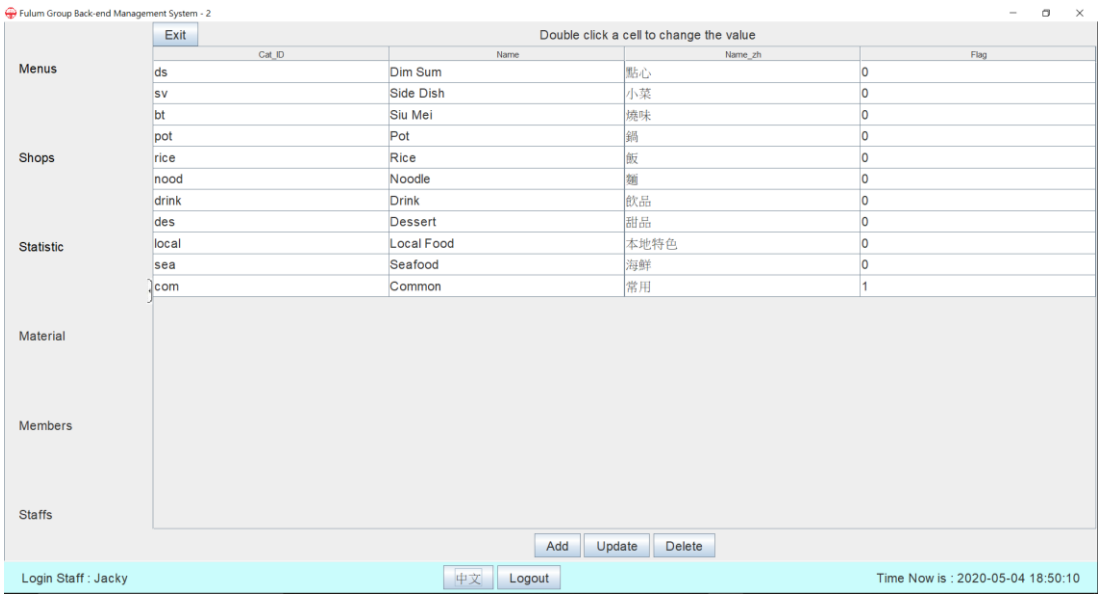
Able to add, update and delete the food items, set details item and categories and update the prices for serval categories.



FOOD_ID	FOOD_SIZE	FOOD_NAME	FOOD_NAME_ZH	FOOD_PRICE	FOOD_FLAG
3	l	Chiuchow Dumpling	潮州蒸粉果	0	1
5	m	Steamed Buns with BBQ pork	鮑汁叉燒包	0	1
6	b	Chicken Rolls	四寶滑雞扎	0	1
7	s	FooLum Shrimp Dumplings	富臨蝦餃皇	0	1
8	b	Rice Rolls with Beef	爽滑牛肉腸	0	1
10	b	Congee with Pork and Century Eggs	皮蛋瘦肉粥	0	1
11	c	Grill Scallop with Vegetables	翡翠珍珠帶子	88	1
12	c	Fillet with Corns	黃金粟米魚塊	46	1
16	c	Yangzhou Fried Rice	揚州炒飯	50	1
17	c	Roast suckling Pig	原隻乳豬拼盤	128	1
18	c	Braised Tofu with Roast Pork	豆腐火腩煲	68	1
19	c	Rice	白飯	10	1
20	c	Sichuan Dandan Noodles	四川擔擔麵	50	1
21	c	Orange juice	鮮橙汁	30	1
22	c	Soft Drink	汽水	12	1
24	c	Osmanthus Jelly	宮廷杞子桂花糕	23	1
25	o	Steamed Fresh Spotted Garoupa	清蒸海星斑	980	1
26	t	Steamed Fresh Australian lobster	清蒸澳洲龍蝦	48	1
29	h	Steamed Fresh American Lobster(with E-Fu Noodle)	清蒸加拿大龍蝦(伊麵底)	198	1
41	c	Beer	啤酒	24	1

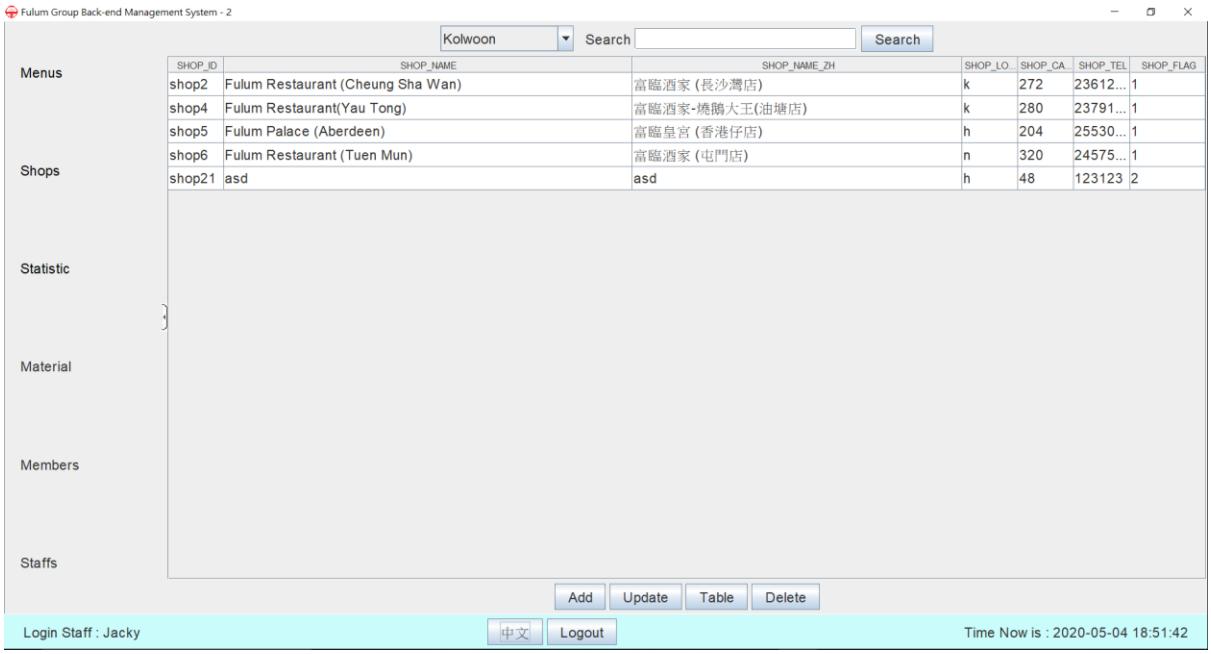

Fulum Group Back-end Management System - 2
Exit
Common
Search :
Search
C_ID C_NAME C_NAME_ZH C_PRICE C_FLAG
1 Seafood package for Two person 海鮮二人套餐 488 1
21 Easter package for Eight person 復活節八人套餐 1888 1
22 new year 新年套餐 1888.8 1
24 qqwe test Q 123 1
25 111 test D 111 1
26 xxx test X 888 1
41 test1 test1 12 1
Menus
Shops
Statistic
Material
Members
Staffs
Add
Update
Delete
Login Staff : Jacky
中文
Logout
Time Now is : 2020-05-04 18:49:42

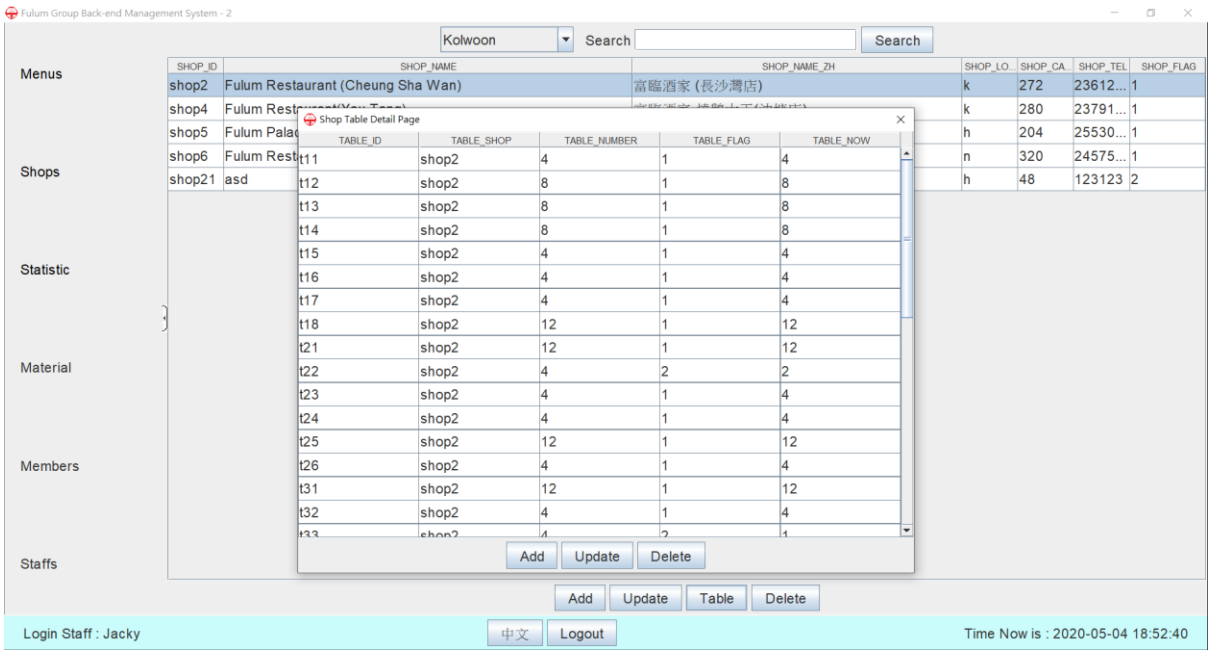

Fulum Group Back-end Management System - 2
Exit
Dim Sum
Search :
Search
SI_ID SI_NAME SI_NAME_ZH SI_CAT SI_PRICE SI_FLAG
1 plastic bag 膠袋 com 1 1
2 Plastic lunch box 塑膠飯盒 com 3 1
3 Less Oil 少油 com 0 1
4 Less Sugar 少糖 com 0 1
5 Add E-Fu Noodle 伊麵底 sea 20 1
6 thicker 濃啲 drink 0 1
7 Extra Ice 多冰 drink 0 1
8 Less Ice 小冰 drink 0 1
9 Less Salt 少鹽 com 0 1
Menus
Shops
Statistic
Material
Members
Staffs
Add
Update
Delete
Login Staff : Jacky
中文
Logout
Time Now is : 2020-05-04 18:49:55


Fulum Group Back-end Management System - 2
Exit
Double click a cell to change the value
Cat_ID Name Name_zh Flag
ds Dim Sum 點心 0
sv Side Dish 小菜 0
bt Siu Mei 燒味 0
pot Pot 鍋 0
rice Rice 飯 0
nood Noodle 麵 0
drink Drink 飲品 0
des Dessert 甜品 0
local Local Food 本地特色 0
sea Seafood 海鮮 0
com Common 常用 1
Menus
Shops
Statistic
Material
Members
Staffs
Add
Update
Delete
Login Staff : Jacky
中文
Logout
Time Now is : 2020-05-04 18:50:10

Shop Management:

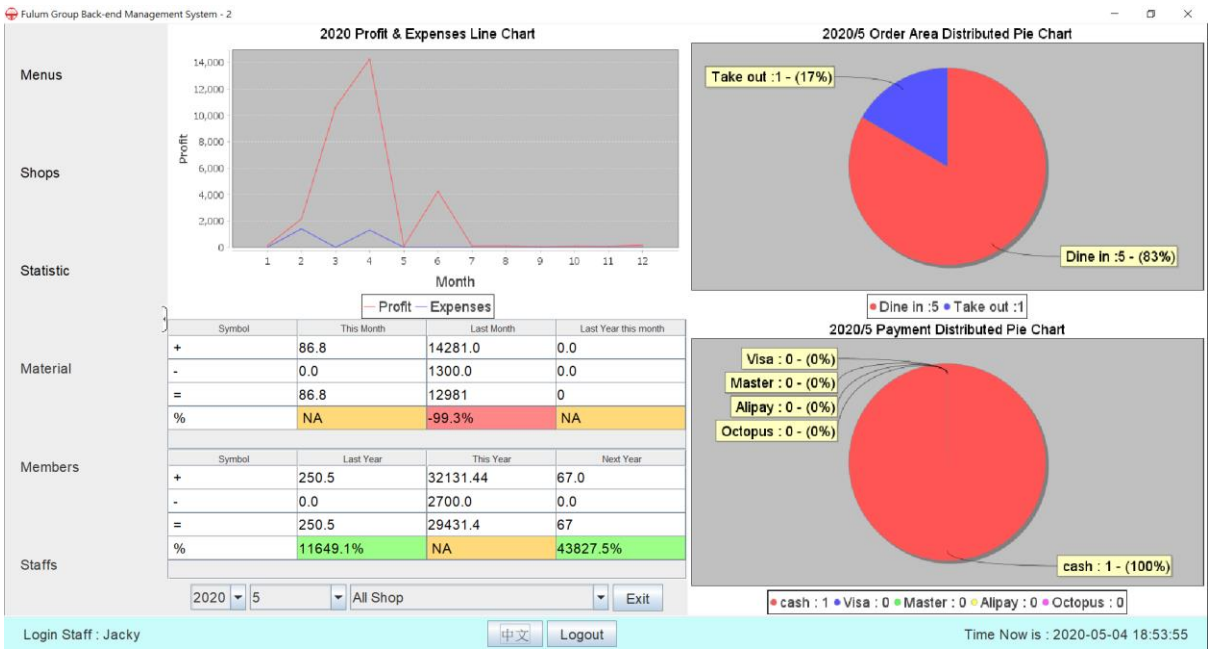
Able to add, update and delete shop details. Also, able to update the table planning of each shop.





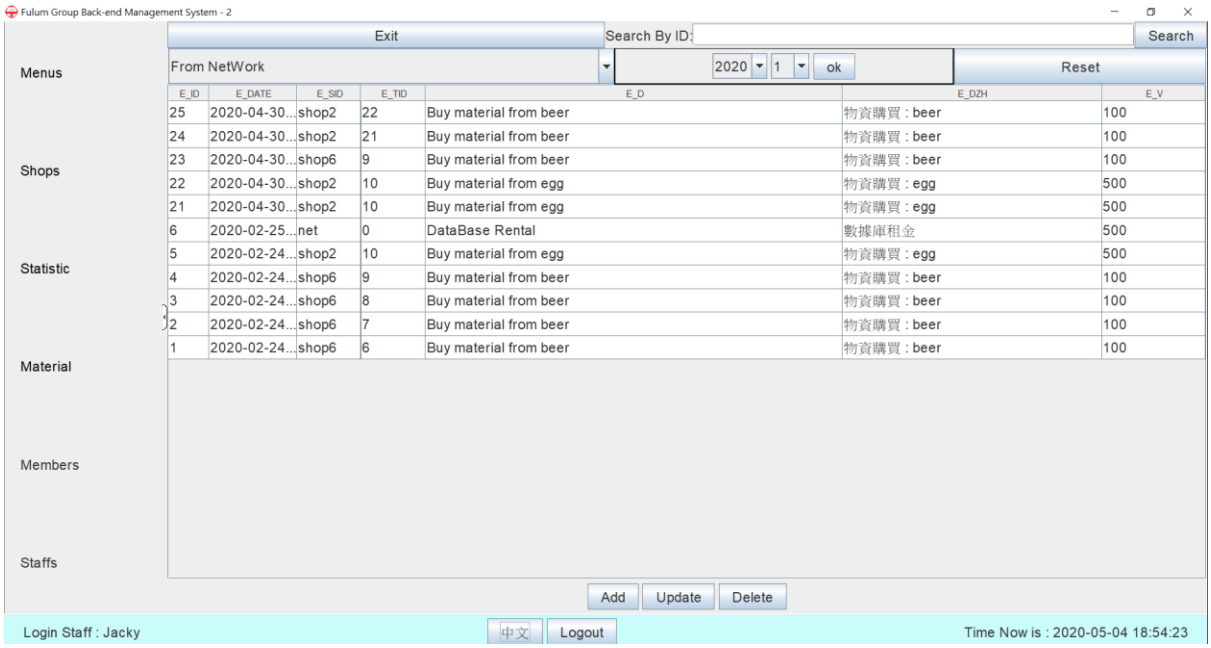
Static Page:

Over All Page:



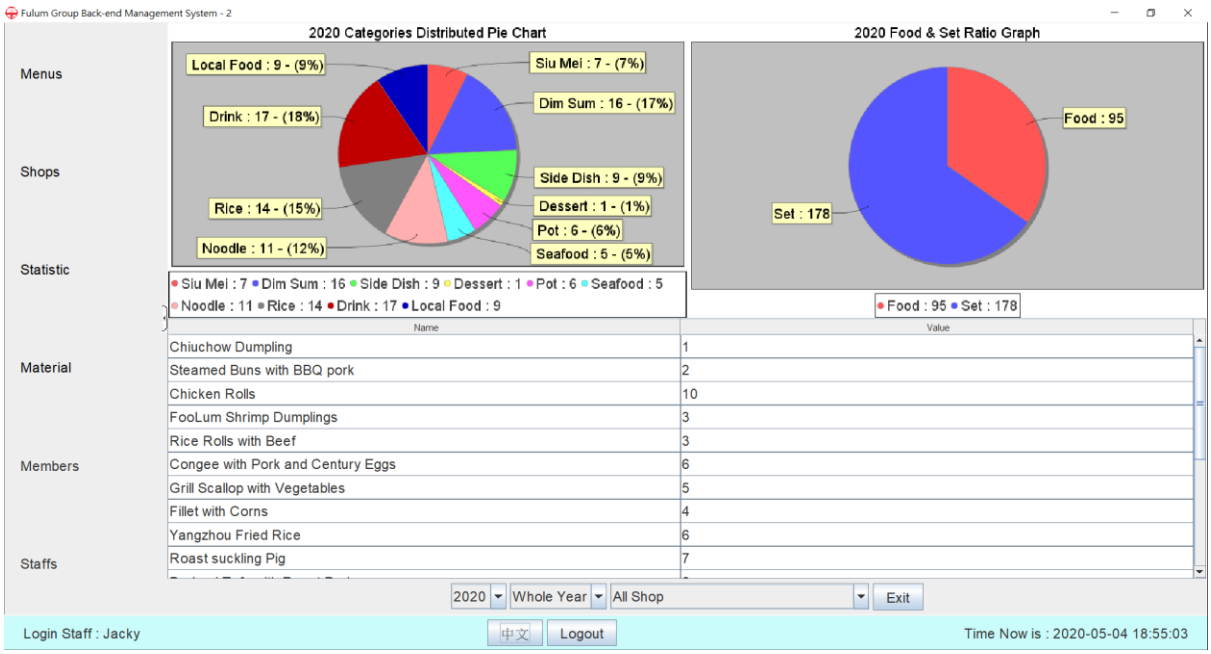
In this page, staff may ably view the overall static on the profit and the comparison between different year same season and different month. There will be different color for present the data, green for increase, yellow for no change and red for decrease. There will be also two pie charts for representing the ratio of payment method and eating area. There is a line chart for presenting the profit and expenses on this year. There are different sorting methods, including based on year, month, shop or whole year and all shop, very convenient for the manager to review the overall data.

Expenses Page:



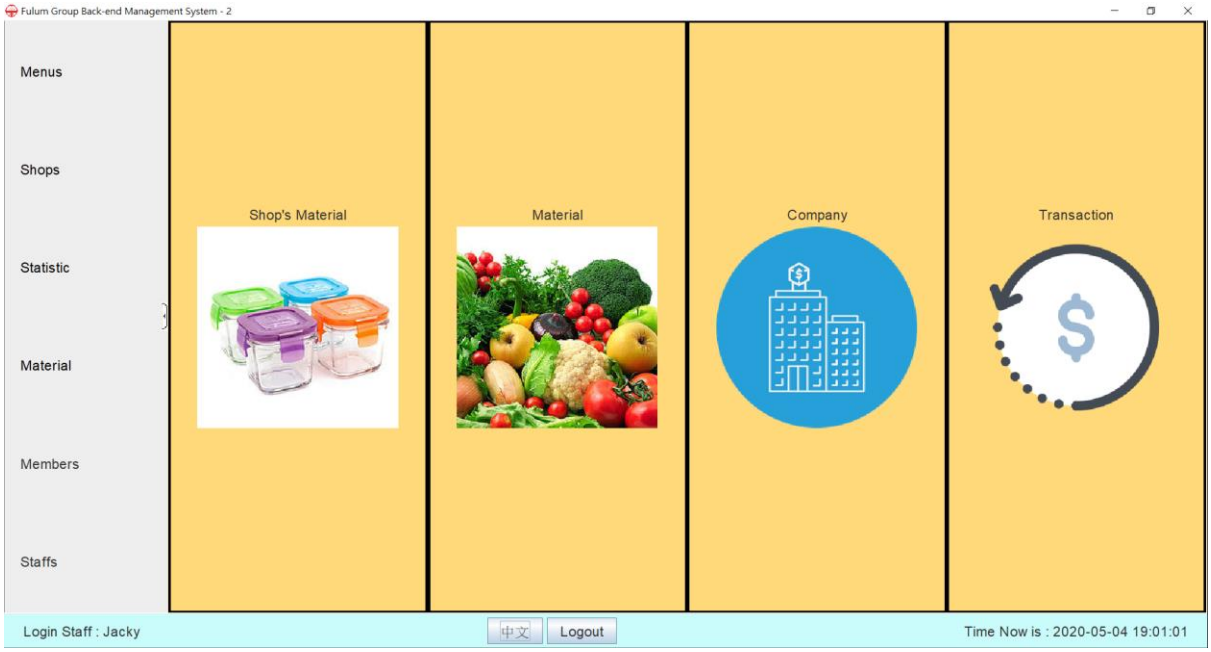
The expenses page will show for the expenses. Staff may able to add, update or delete the data.

Trends Page:



This page shows the trends of each food items. The manager may able to see which food item is the most popular and which isn't. They can easily to change the food item based on this data.

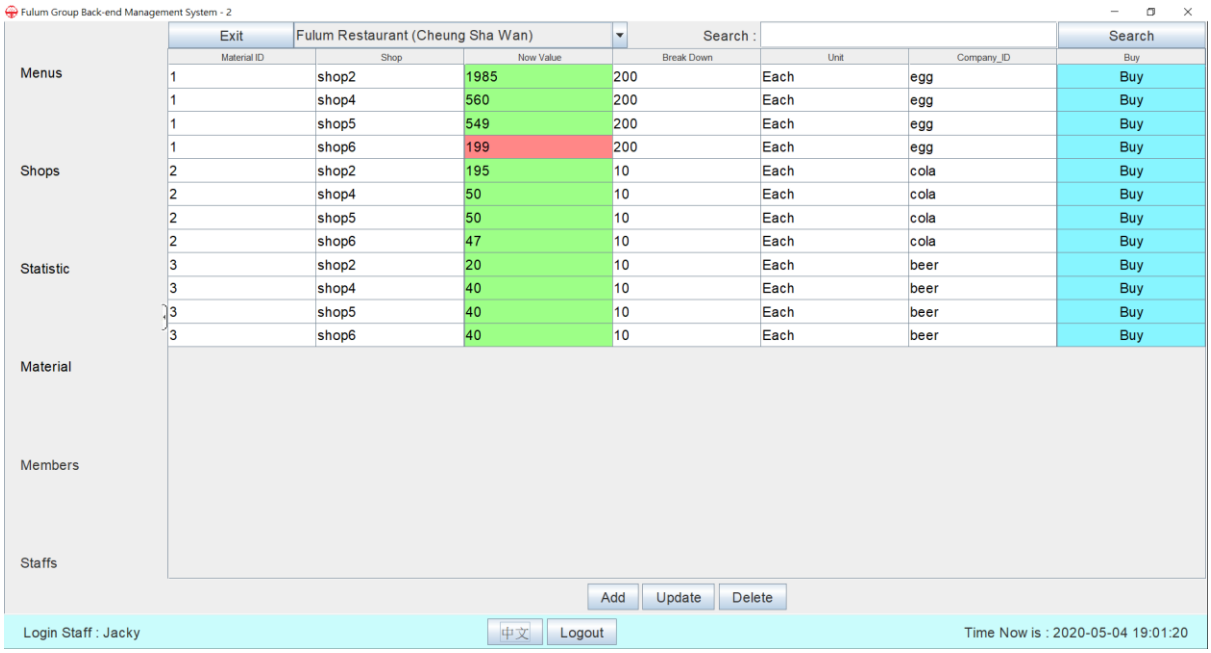
Material Page:



Shop Material Page:

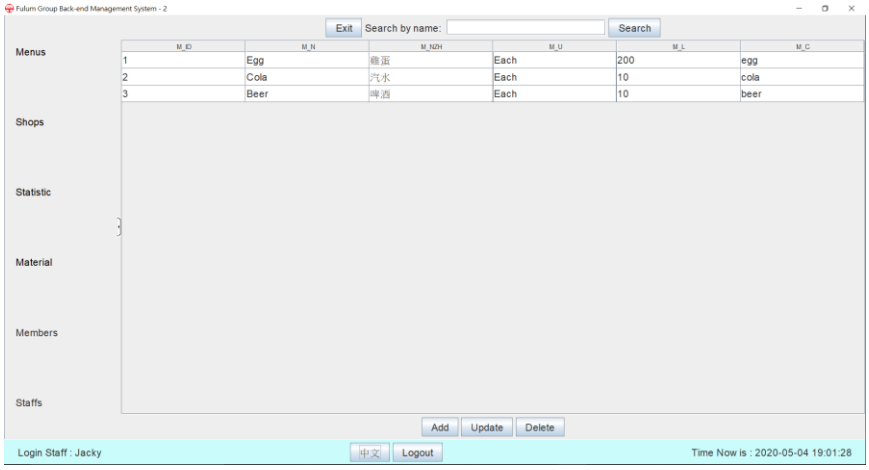
Showing each shop material distribution and quantity. Able to add, update and delete.

Green for quantity more than the break down point and red for lower.



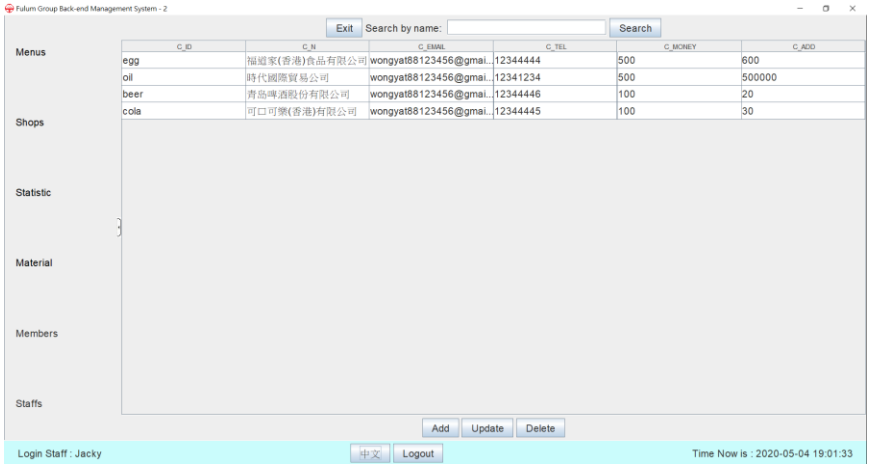
Material Page:

Able to add, update and delete material.



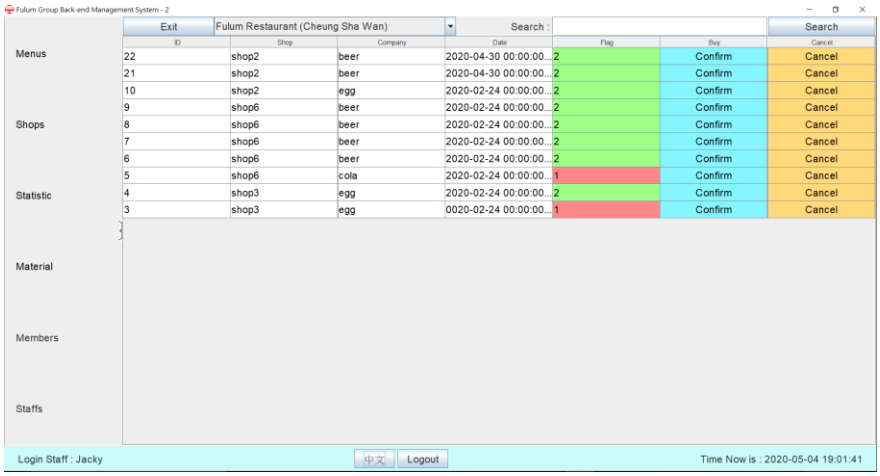
Company page:

Able to add, update or delete supply company details.

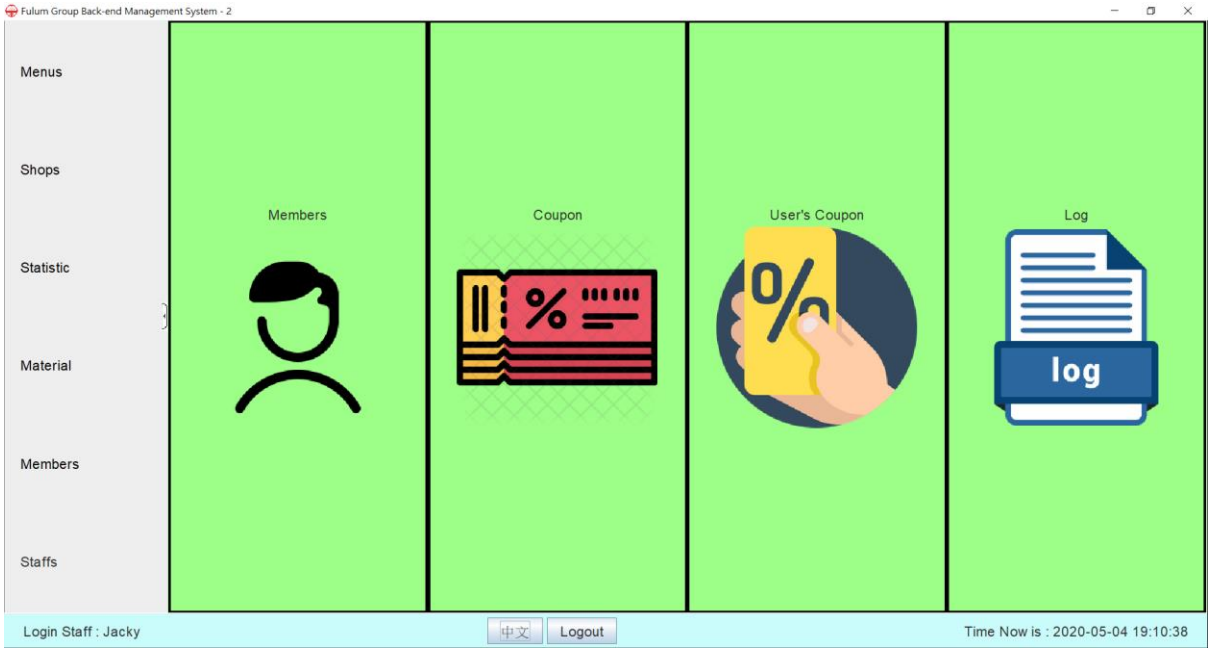


Transaction page:

Record all transaction record between each supply company. Able to add expenses record and add material quantity after confirm the order.

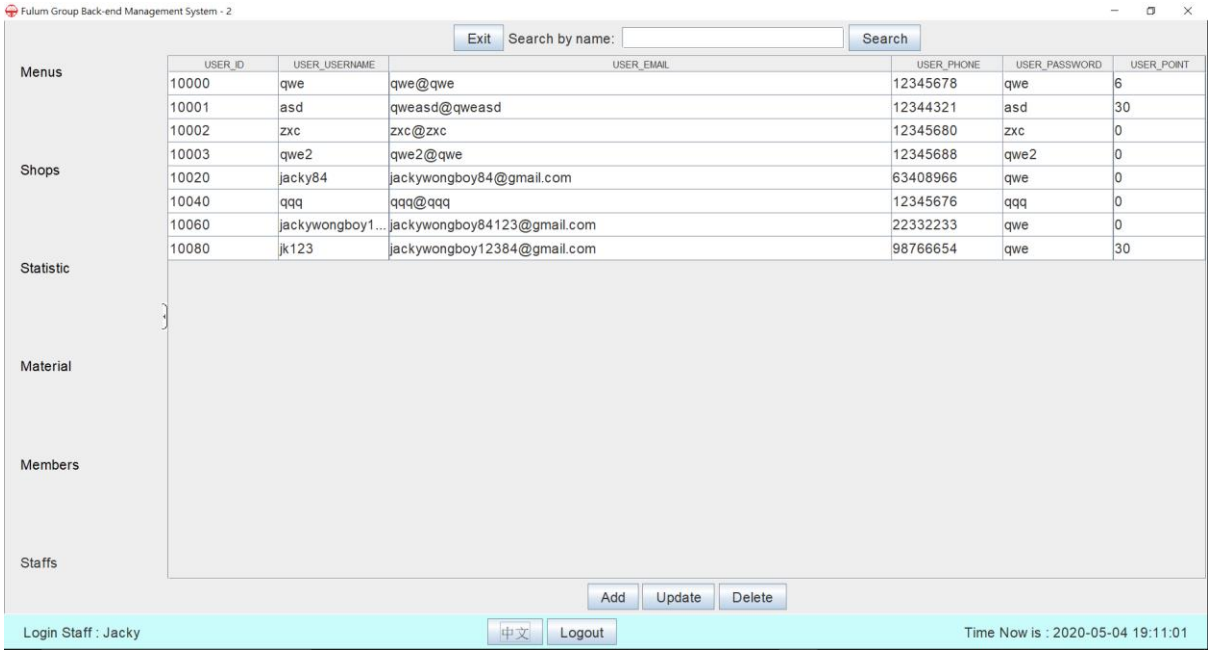


Member Page:



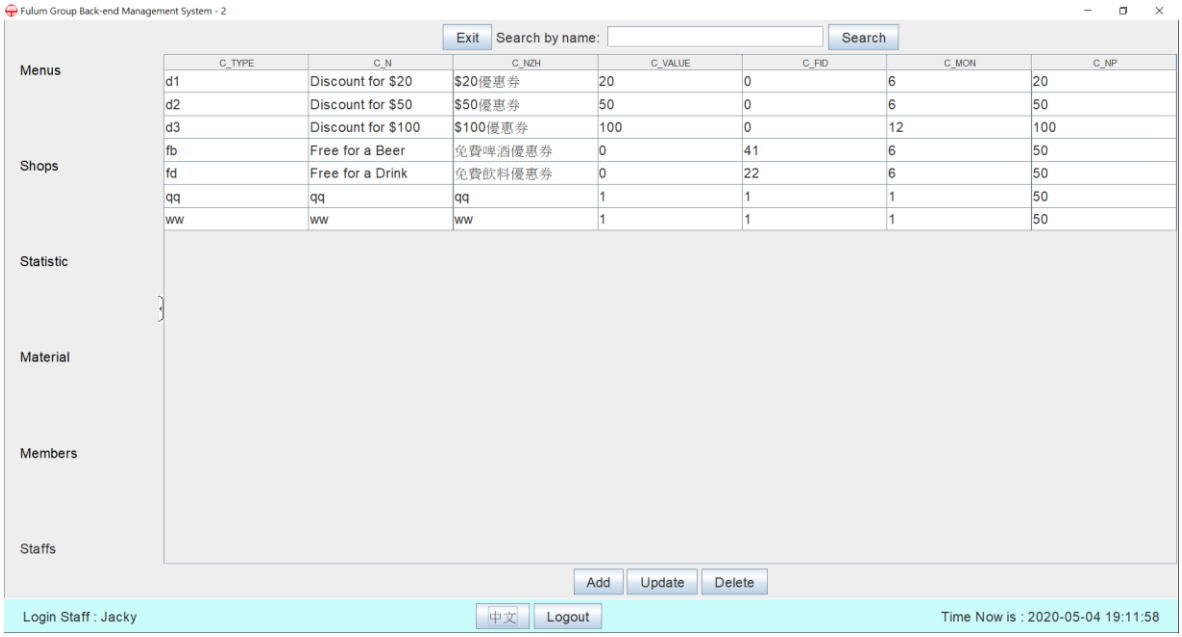
Members Detail page:

Able to check all members account details. Also, able to add, update or delete.



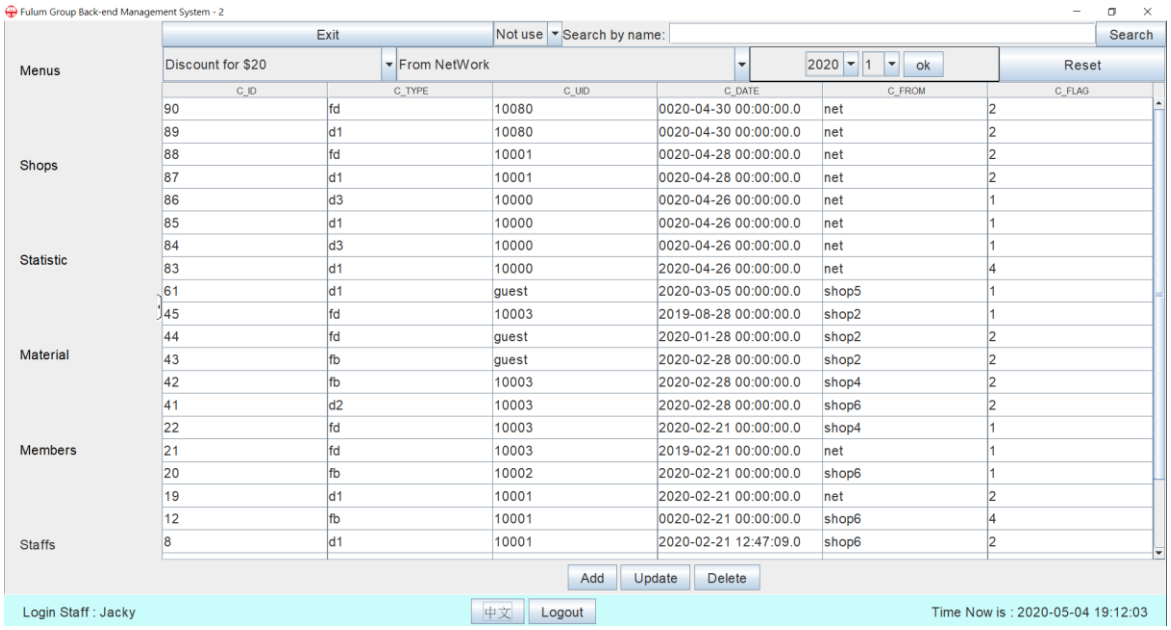
Coupon Page:

Able to add, update and delete coupons.



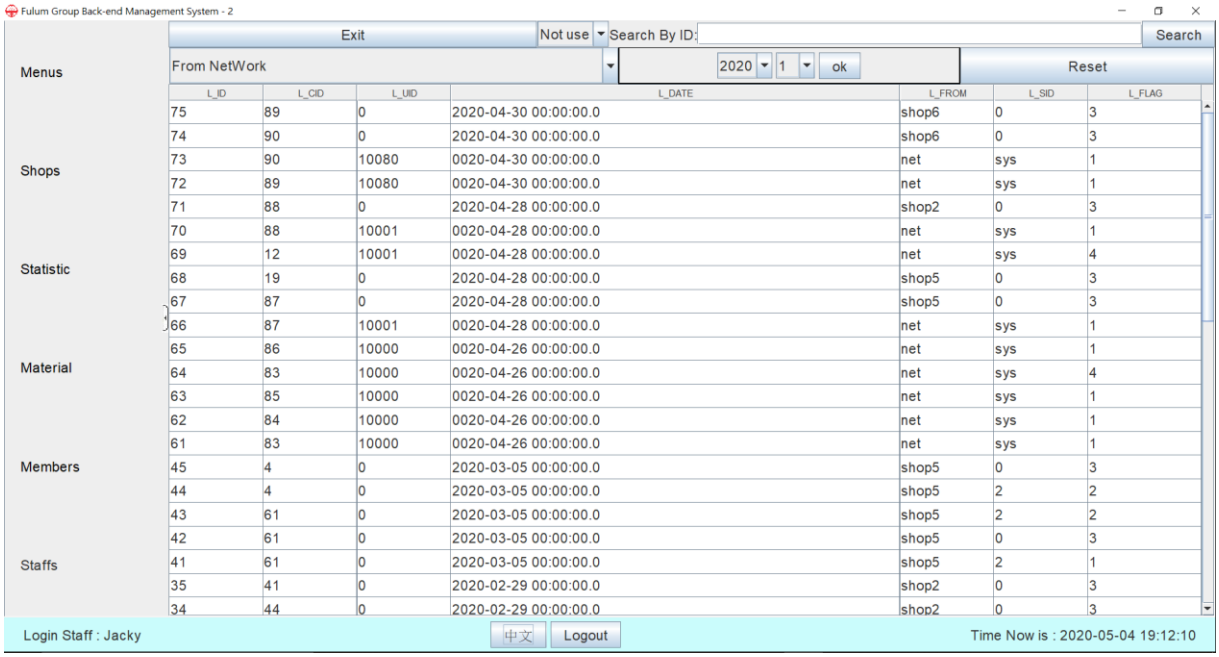
User's Coupon Page:

Able to read each user has what coupons and how the coupons obtain from.



Coupon Log Page:

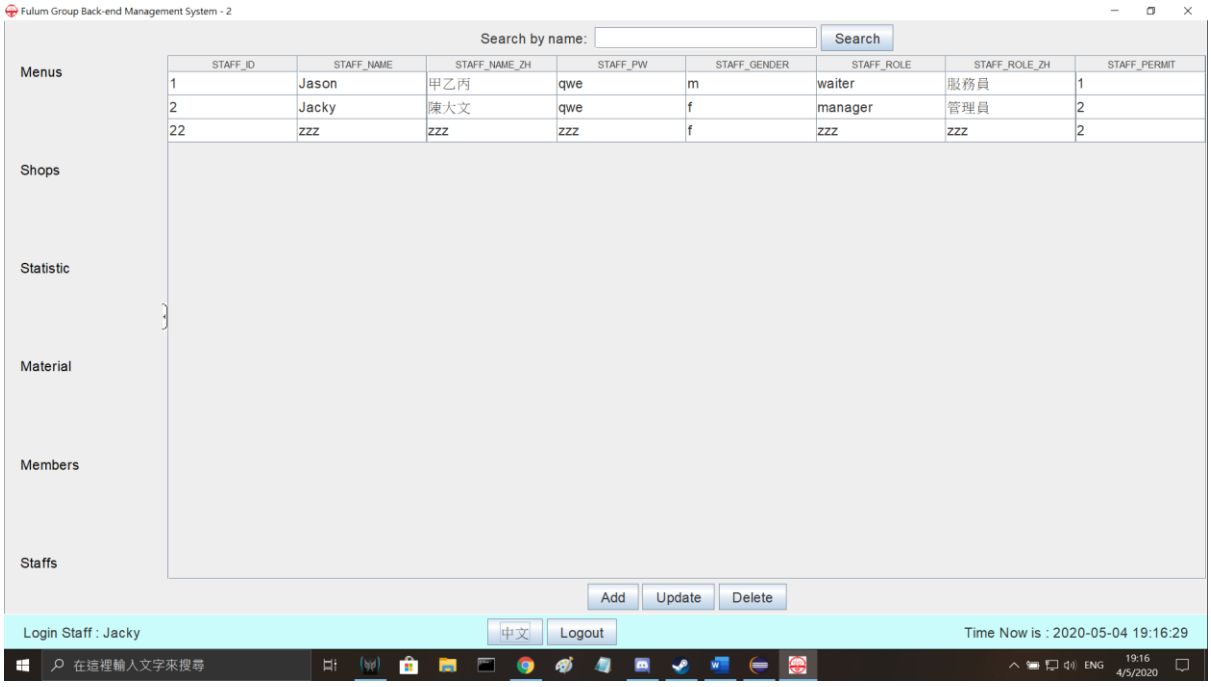
Show all coupon states, including when and where created, used and expired.



L_ID	L_CID	L_UID	L_DATE	L_FROM	L_SID	L_FLAG
75	89	0	2020-04-30 00:00:00.0	shop6	0	3
74	90	0	2020-04-30 00:00:00.0	shop6	0	3
73	90	10080	0020-04-30 00:00:00.0	net	sys	1
72	89	10080	0020-04-30 00:00:00.0	net	sys	1
71	88	0	2020-04-28 00:00:00.0	shop2	0	3
70	88	10001	0020-04-28 00:00:00.0	net	sys	1
69	12	10001	0020-04-28 00:00:00.0	net	sys	4
68	19	0	2020-04-28 00:00:00.0	shop5	0	3
67	87	0	2020-04-28 00:00:00.0	shop5	0	3
66	87	10001	0020-04-28 00:00:00.0	net	sys	1
65	86	10000	0020-04-26 00:00:00.0	net	sys	1
64	83	10000	0020-04-26 00:00:00.0	net	sys	4
63	85	10000	0020-04-26 00:00:00.0	net	sys	1
62	84	10000	0020-04-26 00:00:00.0	net	sys	1
61	83	10000	0020-04-26 00:00:00.0	net	sys	1
45	4	0	2020-03-05 00:00:00.0	shop5	0	3
44	4	0	2020-03-05 00:00:00.0	shop5	2	2
43	61	0	2020-03-05 00:00:00.0	shop5	2	2
42	61	0	2020-03-05 00:00:00.0	shop5	0	3
41	61	0	2020-03-05 00:00:00.0	shop5	2	1
35	41	0	2020-02-29 00:00:00.0	shop2	0	3
34	44	0	2020-02-29 00:00:00.0	shop2	0	3

Staff Management Page:

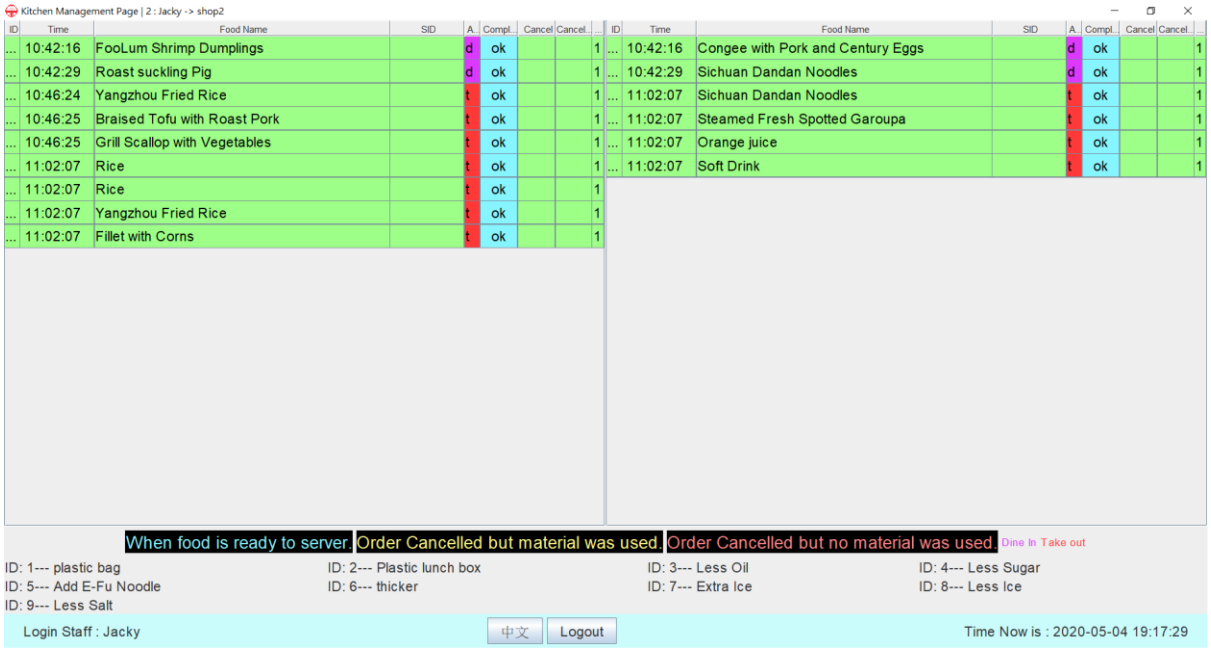
Able to view all the staff details and able to add, update or delete staff details.



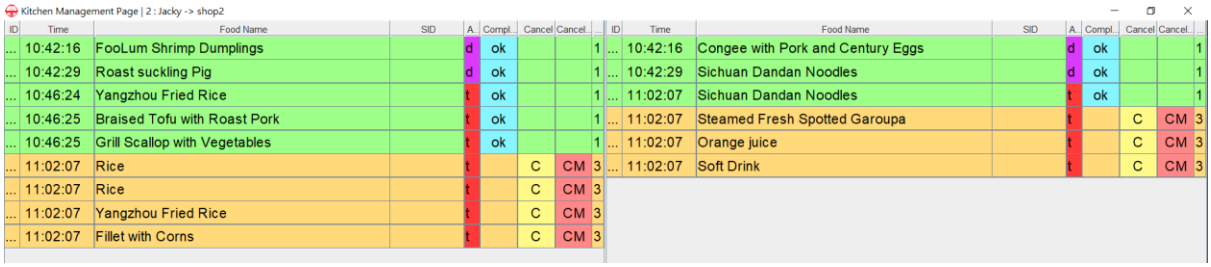
STAFF_ID	STAFF_NAME	STAFF_NAME_ZH	STAFF_PW	STAFF_GENDER	STAFF_ROLE	STAFF_ROLE_ZH	STAFF_PERMIT
1	Jason	甲乙丙	qwe	m	waiter	服務員	1
2	Jacky	陳大文	qwe	f	manager	管理員	2
22	zzz	zzz	zzz	f	zzz	zzz	2

Kitchen Page:

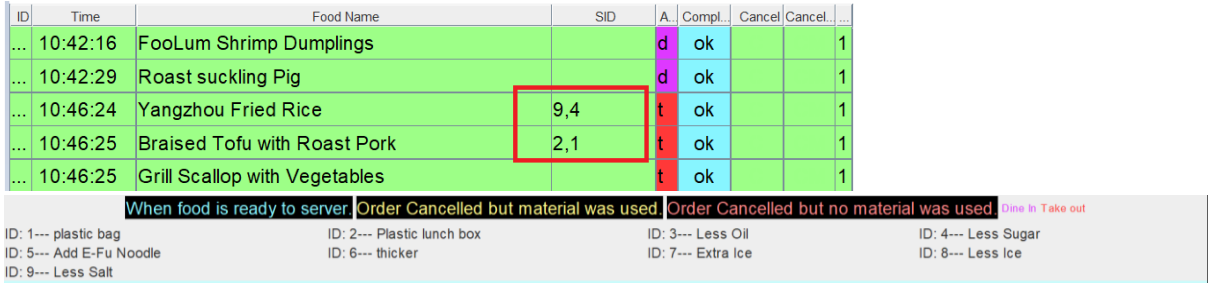
This page able to show all the order made in shop based on the login selection. Green color for non-cancelled order item. d means dine in and t means take out order. Click ok to complete the order items.



Yellow for cancelled order. C for cancel without material and CM for cancel with material. As the order may cancel during cooking period. Some waste may cause. The inventory of this material quantity in this shop will automatically reduce. The reduce quantity may change in the menu order.



Special requirement will show by ID and the cook may reference the special items list at the bottom of the page.

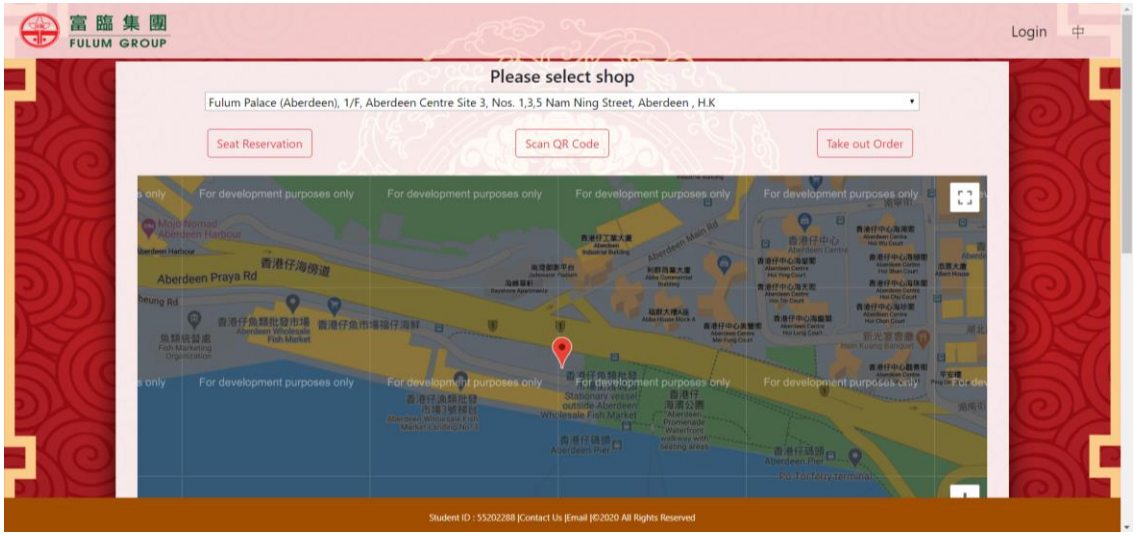


Over view on Flask Front-end Web Application:

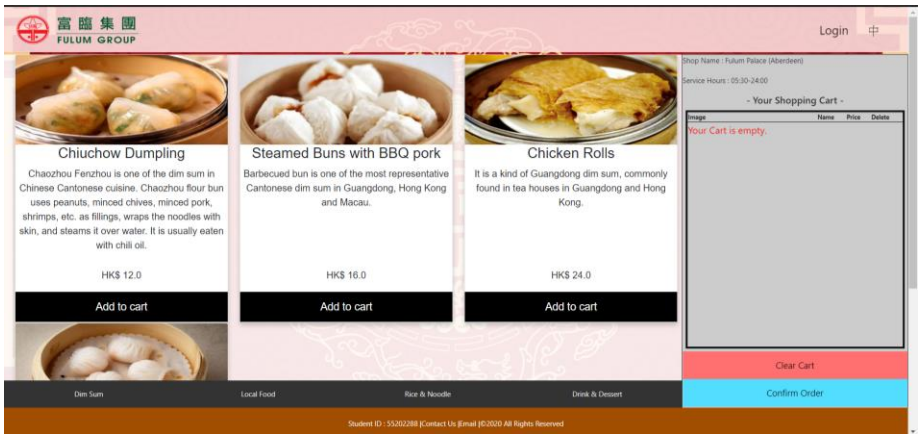
Main Page:

This is the main page. Customers may able to select 5 functions. Two of them are on right top corner. They are Login and Language setting function.

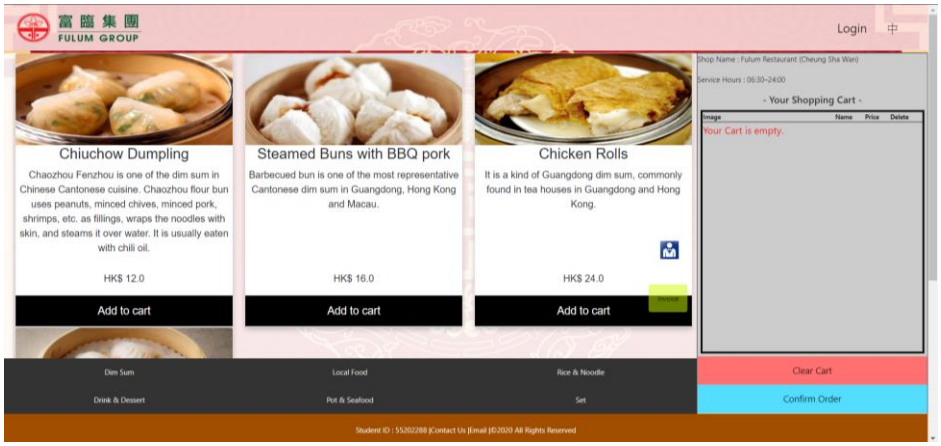
Three functions are in the middle of the page, user may select the shop they target and select the services.



Scan QR Code will use the phone camera to scan. The QR Code will include the information. After that, it will redirect to a menu order page.

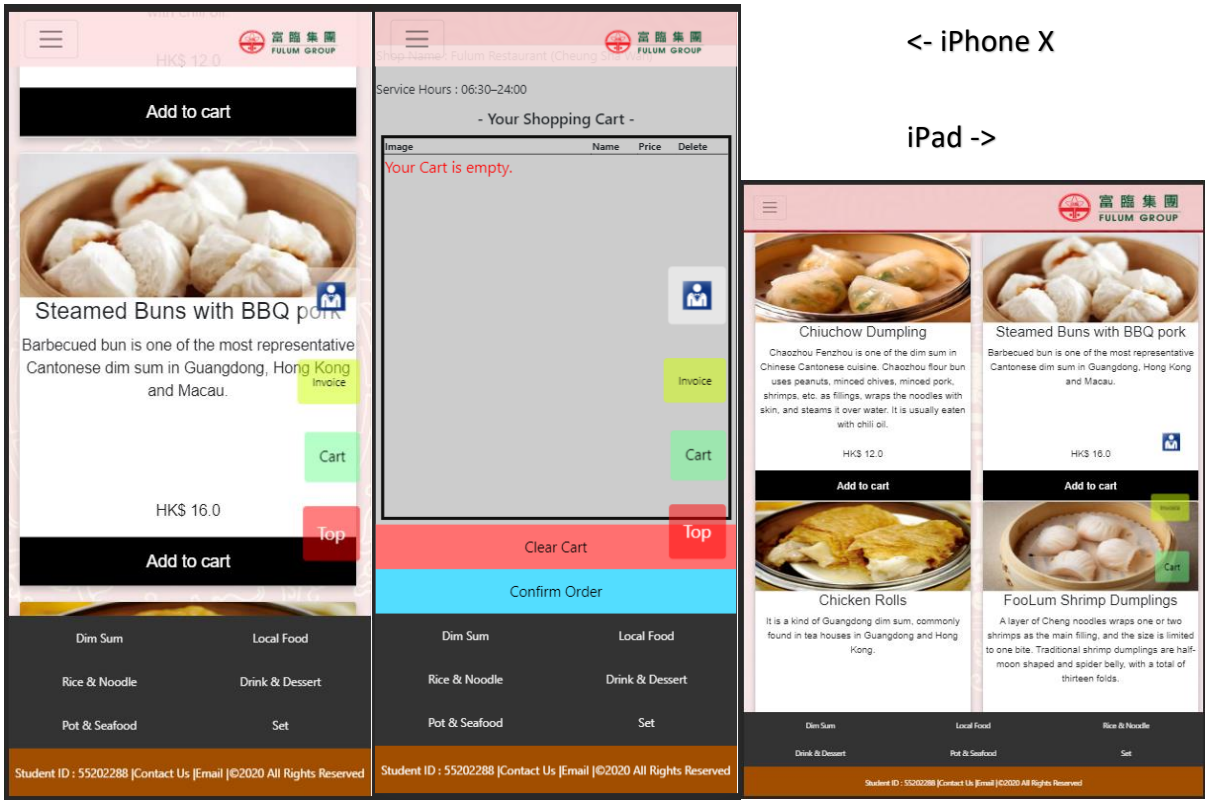


Takeout

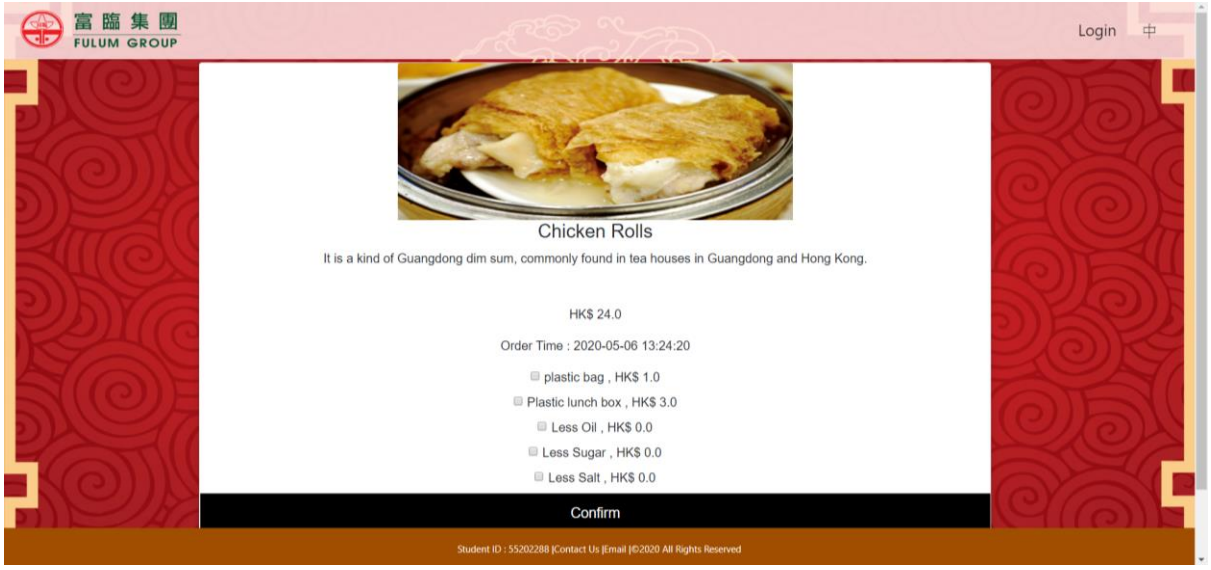


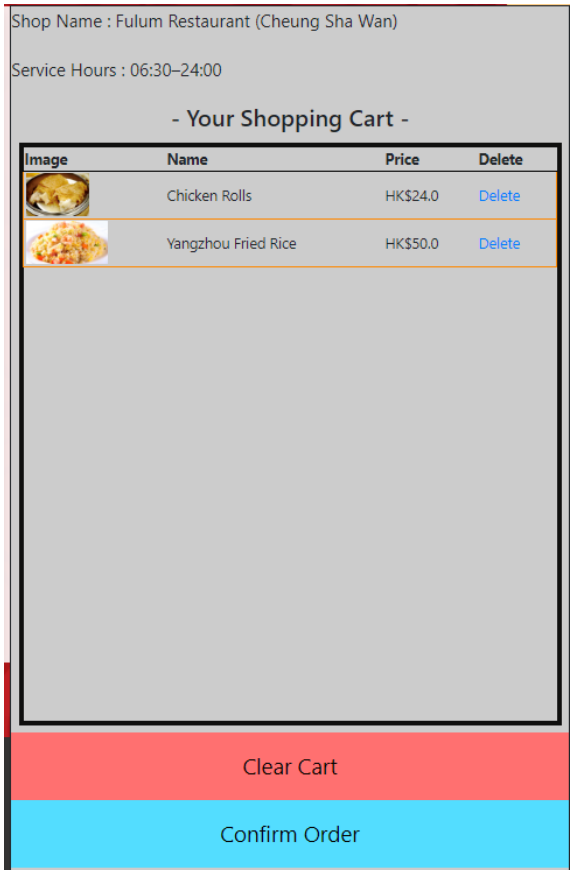
Dine In

The differences between dine in and take out is, dine in may have a full menu selection while takeout don’t have. As you know, some food items may not be able to serve in takeout order, such as pot and seafood.
Also, there are some service button for dine in, such as invoice page and calling waiters.
Both menu pages do are responsive website.



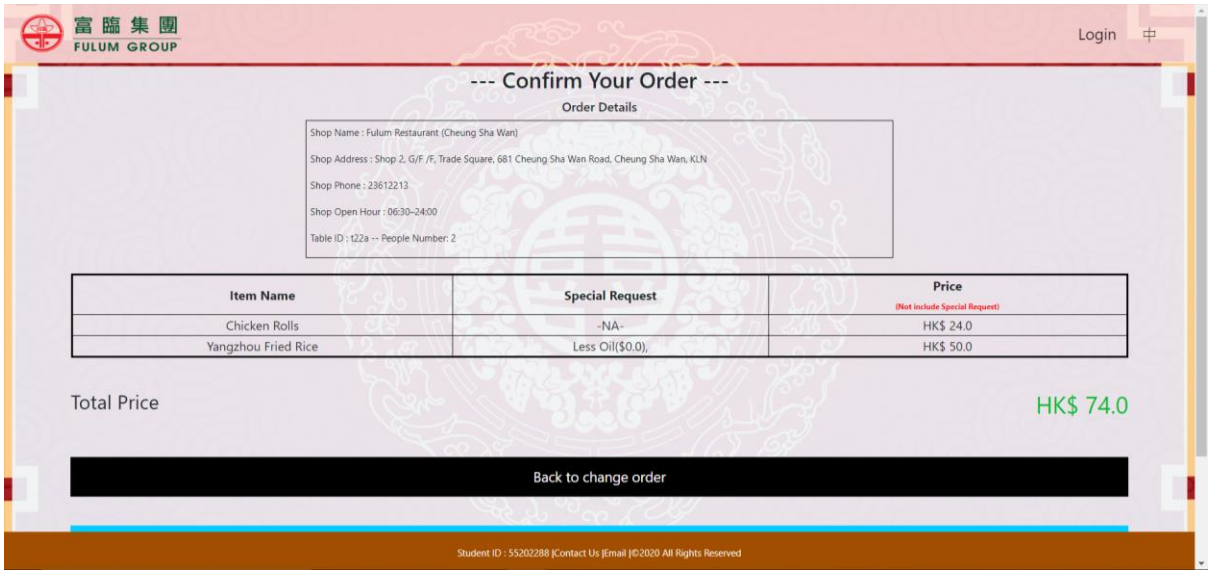
User may select their special request after they click the button ”add to cart”.



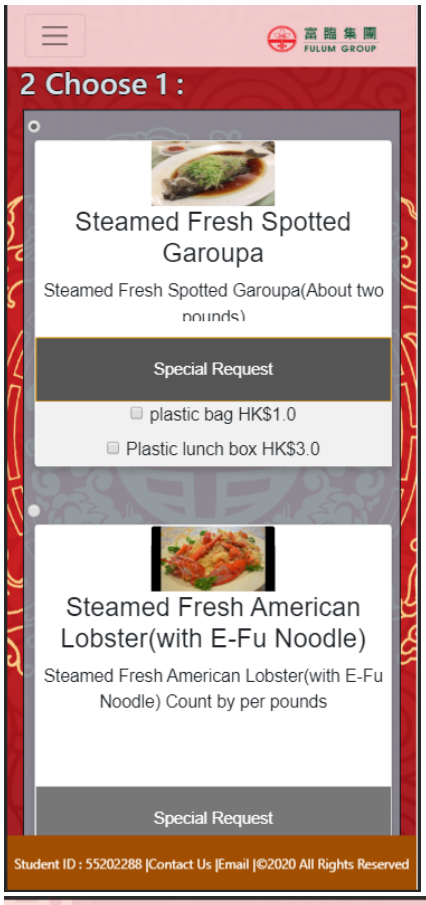


Shopping cart will update.

After confirm will redirect to confirm page. User may confirm their order items.



On select set items:

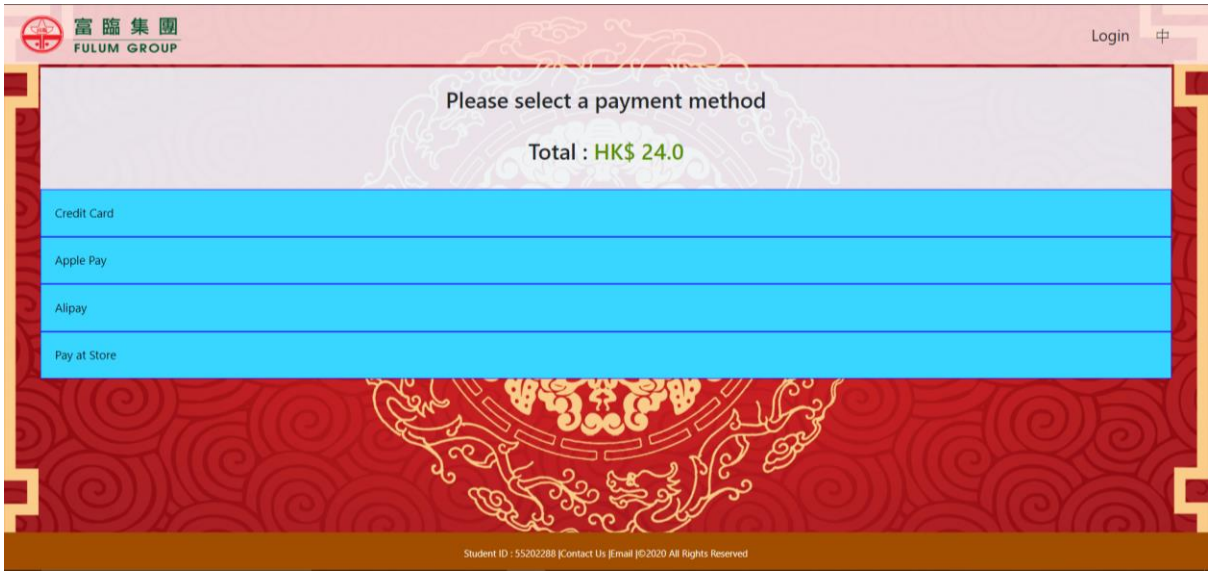


User may able to select different choosable items. Also, they can select their special request by click on the button.

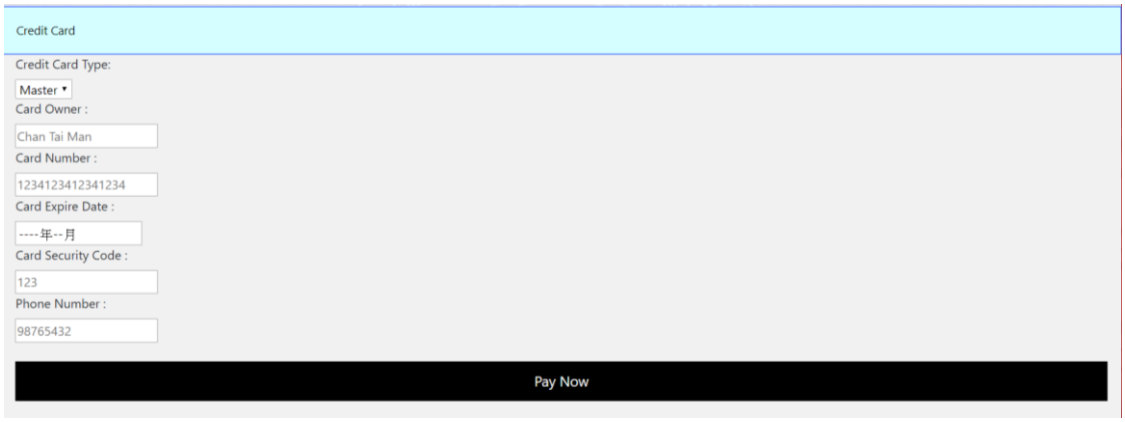
Each requirement will be different based on the food category.

All special requirement and food items in the set will be show clear at the order confirm page.

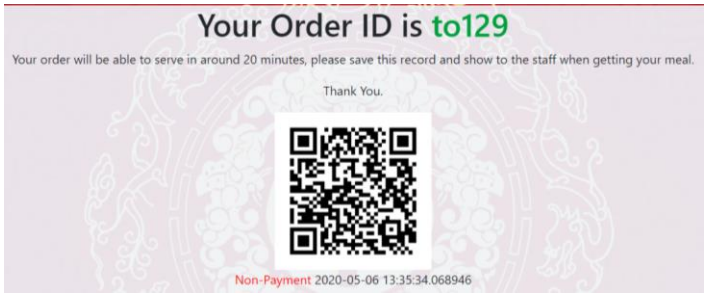
On takeout order, there will be a payment page after confirm the order.



User may select their payment method.



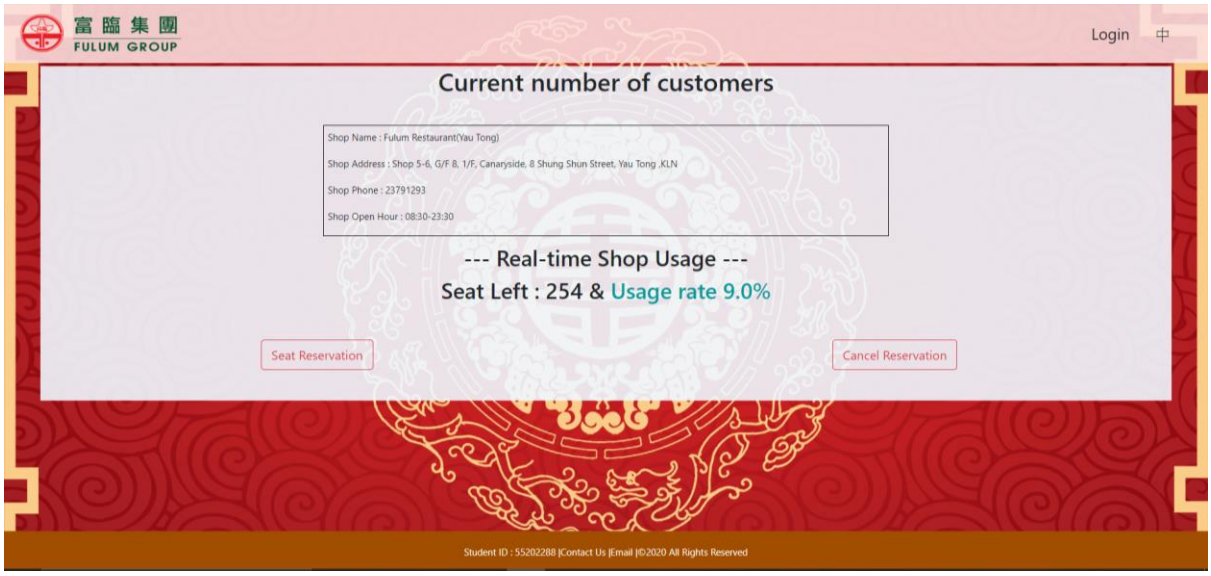
After success paying or pay in shop, your order ID will show out.



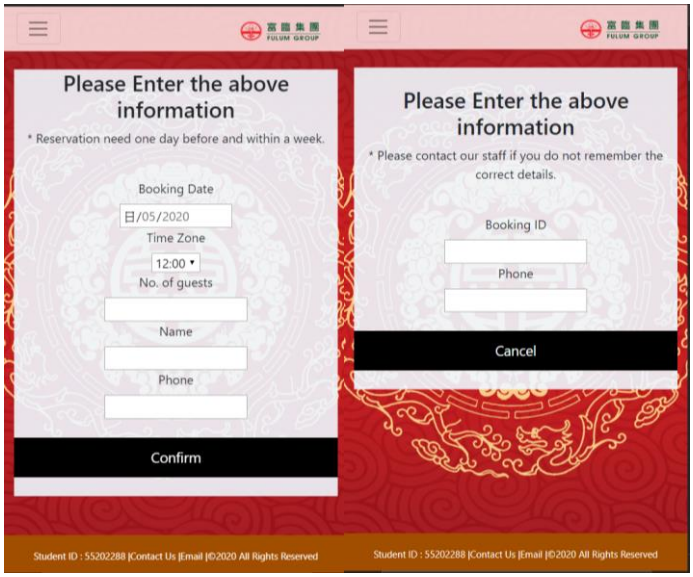
Show the QR Code to the staff and get the order.

Seat reservation page:

After select the target shop, in this page, it will show the usage of the shop. User may able to know will he or she need to wait for a seat.



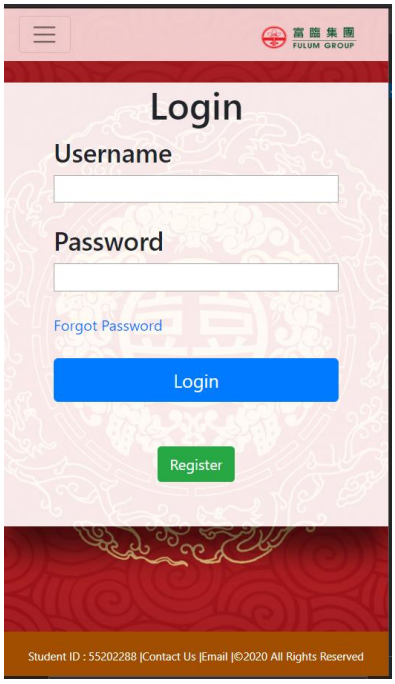
The two buttons below are seat reservation and reservation cancel button.

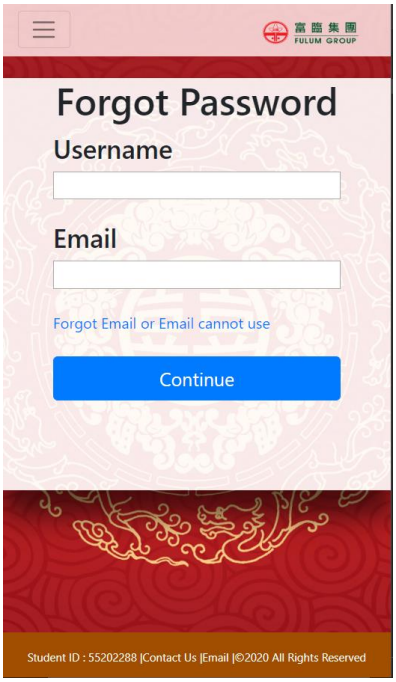


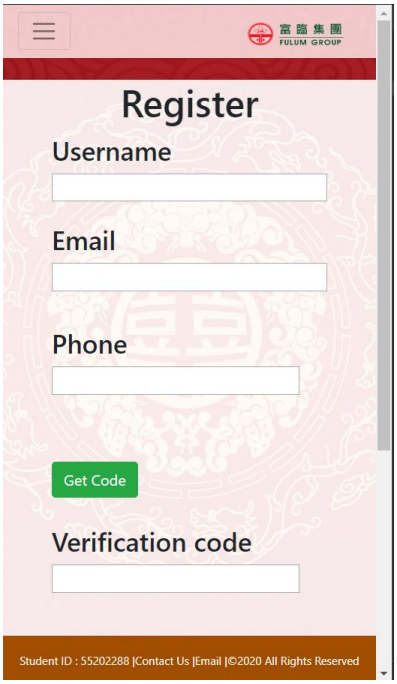
Enter correct information to reservation and cancel the made reservation.

Login Page:

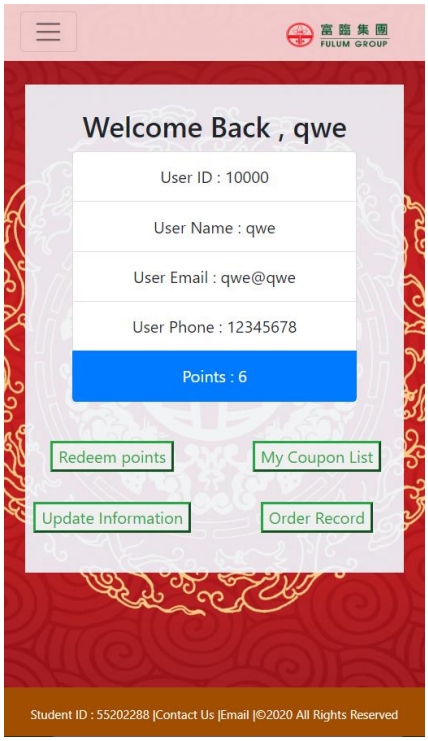
Included forget password and register function. On forgot password, user may receive an email with a code to complete the authenticate step.







User Page:



In user page, user may see their account details. Such as user id, user name etc.

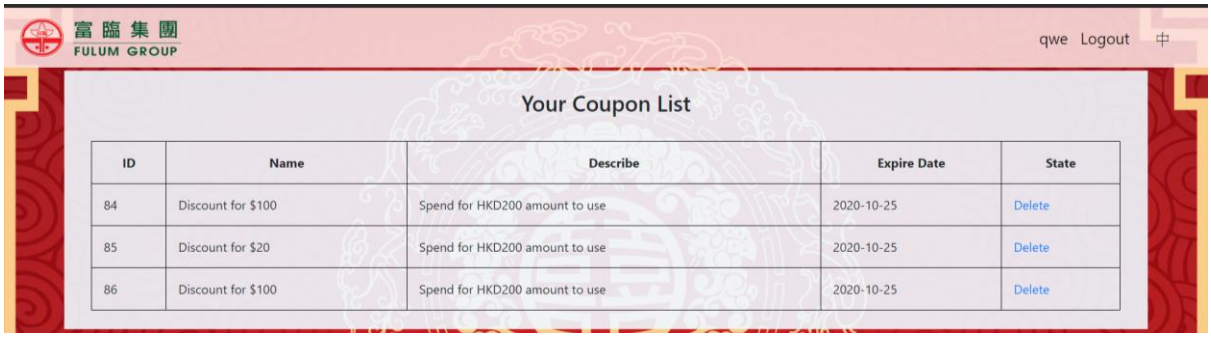
The most important is the Points.

Points may able to redeem coupons.

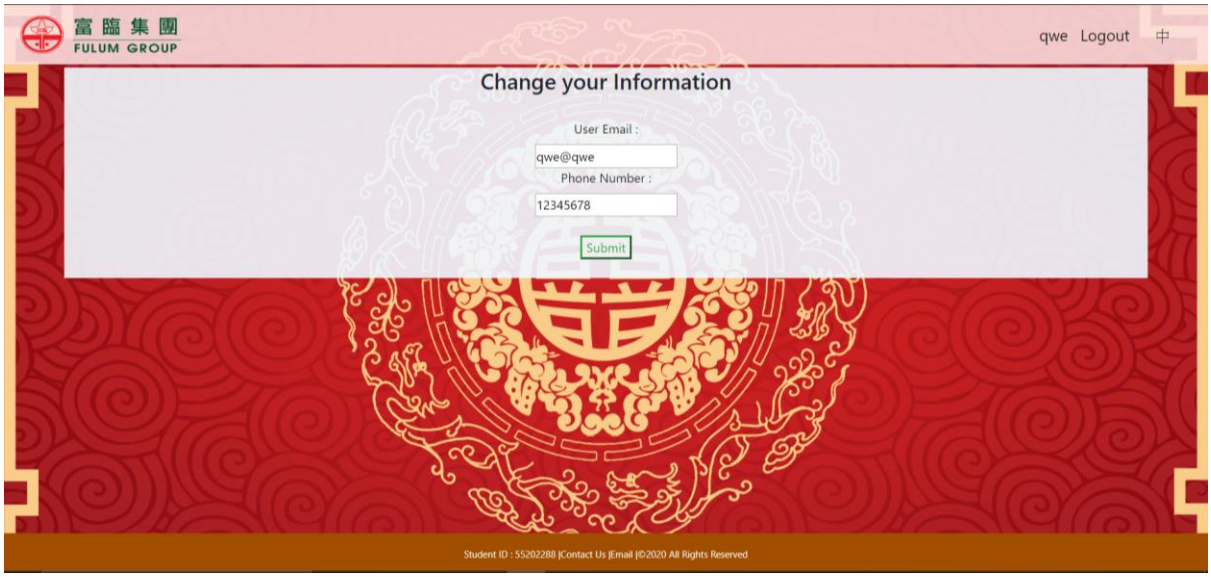
The four functions is redeem coupons, coupon list, update information and order records.

User may select what coupon they want to redeem.

List to show all the coupon user have and the expiry date.
(Expiry date will be calculated by the success redeem date and add the expire month based on coupon type.)

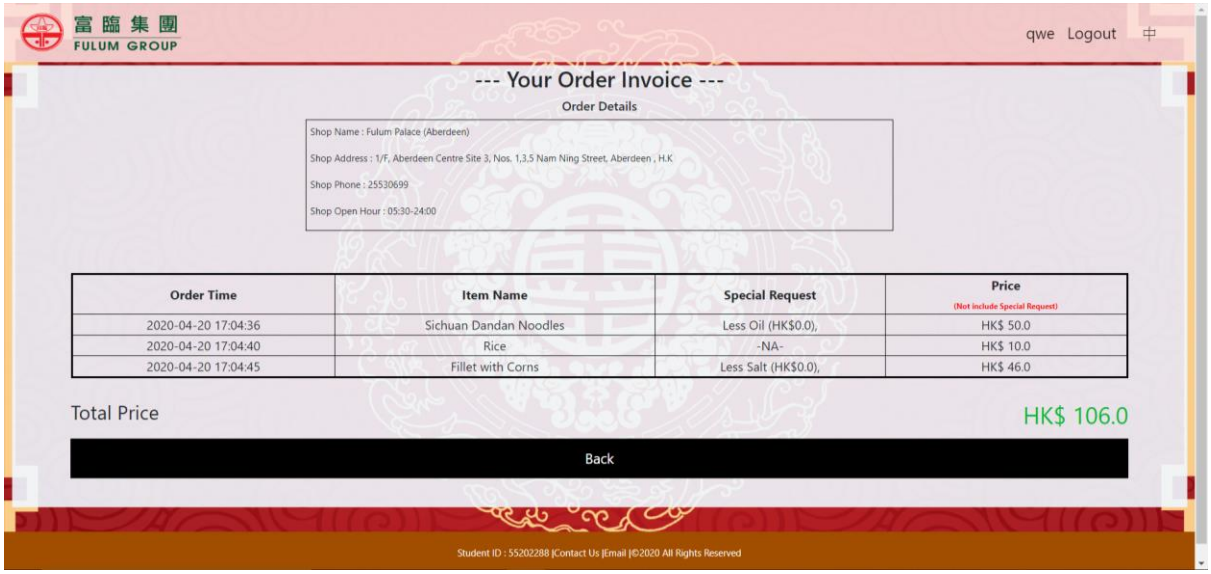


Change detail page.



Order history only record all the online takeout order which user have logged in. It will not record orders which ordered by guests.

After clicking details, user may see the order details and the shop details where he or she ordered.



System Testing

List of Unit Test:

ID	Date	action	Expected Results	Actual Results	state	Comment
Java GUI Application						
1	16/1/2020	Submit empty input	JOptional pane appear with message about telling user to enter information	Same as expected	Pass	
2	17/1/2020	Submit wrong input	JOptional pane appear with message about telling user to enter correct information	Same as expected	Pass	
3	29/1/2020	Add dine in orders	Success update data to database	Same as expected	Pass	
4	10/2/2020	Real-time update for Kicthen Page	Real-time update by appear new record after order page confirm order	Same as expected	Pass	Unstable cause on DataBase data return maybe have a high delay on peak hour.
5	20/2/2020	Management page update food item details	Success update data to database	Same as expected	Pass	
6	21/2/2020	Management page update food item details and send data by JSON to Flask application	JSON format and data correct and flask back stage print out sucess recevice.	Same as expected	Pass	
7	28/2/2020	Socket session recevice JSON, read JSON and update to database and return order ID back to Flask Application	Success update data to database and success to return a order ID to flask.	Same as expected	Pass	
8	3/3/2020	static page sorting	success to show correct data	Same as expected	Pass	
Flask Web application						
1	2/3/2020	Submit empty forms	Ask user to enter information	No form action and require to fill up all information	Pass	
2	4/3/2020	Password is not the same as the confirm password (Register)	Return error "Invalid password and confirm password"	Same as expected	Pass	
3	12/3/2020	Menu list show out with loop by database result	Show expected result same as the database result	Same as expected	Pass	
4	14/3/2020	Adding item to shopping cart	Shopping cart may update with selected item	Same as expected	Pass	
5	20/3/2020	After confirm may able to generate JSON String and send by socket	Show the JSON String at back stage. Correct format and correct data of the JSON String.	Same as expected	Pass	
6	2/4/2020	Send the socket and rececvie by the GUI application	Confirm message print out in GUI back stage	Same as expected	Pass	
7	3/4/2020	Rececive Order ID from GUI application	Print out the correct order ID at back stage	Same as expected	Pass	

User acceptance test:

Scenario 1 – Login on web-based online application:

Tester: 1

1. Click the login button on the right top corner.
2. Click the register button on the button of the login button.
3. Input the information in provide box.
4. After inputted the phone number, press the button” verification code”.
5. Read the message pop up and input the code to provide box.
6. Click “submit” after complete all the boxes.
7. Input username and password in login page.
8. Press the user on the right top corner.
9. Success to login and go to the user page.

Result: Success

Scenario 2

Scan QR Code and order 1 food item and 1 set item with special requests:

Tester: 1

1. Open the phone camera and scan the QR Code.
2. Menu order page pop up.
3. Click on “rice noodle” at the bottom part.
4. Select one food item and press “add to cart”
5. Select some special requests and press confirm
6. Confirm the shopping cart has update the order items
7. Click “set” at the bottom and set page show out.
8. Select one set item and press “add to cart”
9. Set item selection page show out.
10. Select the items and add special request into it.
11. After that, press “Confirm” button
12. Press the confirm order button at the shopping cart.
13. Check the order item record list, is the order item as same as the tester selected.
14. Press confirm order.
15. Press “invoice” button, it should show the correct order items just added.

Result: Success

Scenario 3 – Redeem coupon:
Tester: 1
1. Click the login button on the right top corner.
2. Input username as “qwe” and password “qwe” in login page.
3. Press the user on the right top corner.
4. Press “Redeem coupon”
5. Select one coupon and press “redeem”
6. Press the user on the right top corner.
7. Press “User’s Coupon”
8. Check that is there has the coupon which just redeemed.

Result: Success

Scenario 4 – Add new order in GUI system:
Tester: 1
1. Login the Common staff column by user ID “2” and password “qwe”
2. Press on label “t11” and press “add” on the right-hand side panel
3. Input “2” in the box and press “ok”
4. Confirm the label “t11” change to yellow
5. Confirm the right-hand side table has “t11a” order
6. Repeat step 2 to 3 again
7. Confirm the label “t11” change to red
8. Confirm the right-hand side table has “t11b” order

Result: Success

Conclusion and Recommendations

As the time is short for this project, some functions aren't perfect and some of low priority haven't code for it let. In the further update, more functions may able to add into both systems.

On conclusion of GUI back-end system. The common staff amin page will have UI freezing problem when updating information with the database. Although I already use a background process for it, the other there is no UI freezing problem for other panel, but the table planning and the takeout order list still have the problem. In my options, the UI is still freezing is because the UI updating process is doing with the connection with the database. Which may cause that is the data sending speed not as fast as the system reading speed, so that the system needs to wait for the data and cause the freezing problem. This situation also happens on the kitchen page too. To solve this problem, in the next update, it should let the data collect completed and then update the UI. So that the system no need to wait for the data and should be no freezing UI happen.

On special request item, there are some problem, such as ordering a drink, the user may able to select "less ice" and "extra ice" together. The reason is the special item doesn't have much keys for it to separate from different situation. To solve this problem, I need to upgrade the table of the special items, add new column for keys and separate them by food ID and not only by food category. So that it may have more space to update different special requirement for each food items.
On kitchen page, as I mentation of the freezing UI problem, there are also an improvement that can be done. Is to create more pages for it. Such as separate into tea session, recipe collection and cooking order page. As there are different division of labor in a restaurant, the system should provide more pages for different labors.
On conclusion of web-based online system. Not much problem needs to improve. The highest priority update should be the font size and the image size on presenting on mobile devices. Also, some pages are really well for responsive. The CSS need to change.

Finally, on both applications, there are a main structure problem. It is the modeler, which is packaged inside the application. There may have a security problem as hackers many hack the system and get the database information, such as the username and the password. To avoid the problem, server a needed. In the next update, I should create a server for connecting to the database. And both

applications should connect to the server for database connect. So that the applications will not contain any account information of the database and provide a safer connection by socket with internet. But this need to recoding the whole system as the data receiving method are totally changed and the data transfer are different too. This part may need more time to improve.

Reflection on the Project

On this project, I have search different references on Google Scholar, City u Library, which really help me though in the overall designing and analyzing. I had learnt more different techniques during this project, such as how to create a useful questionnaire and how to spread the questionnaire to other people by different sampling methods. Also, I have learnt more on how to analysis the data from the dataset, such as using IPA to analysis the relationship between service item's importance and perception. But the overall sample size is too small, as only 30 sample sizes after filtering the non-useful one, the result will be having deviation. On the other side, many analysis methods cannot be use because of a small sample size, such as reliability and validity.

And I really want to code a mobile application and not a responsive website. But I tried and learnt for Kotlin and Java for mobile application. The structure and coding are hard for me as I don't think I can learn and handle it with ease in this short period of time. In the future, I hope that I can learn how to code mobile application and able to code for both Android and IOS system. I will continue to study more coding technique to improve my coding skill. Upgrade myself before entering workplace.

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Appendix A: Project Meeting Log

Project ID: ITB-033

ID	Date (DD/MM/YYYY)	Discussion and Action
2	5/9/2019	Short briefing about FYP
3	9/9/2019	Discussion on Project's scope
4	11/9/2019	Discussion on Requirements on System
5	24/10/2019	Discussion on Project's scope
6	20/11/2019	Discussion on Project's scope and methodology
7	13/1/2020	Discussion on Report Structure
8	24/3/2020	Discussion on Report Structure

Appendix B: Questionnaire Simple

Default Question Block

Hi, this is a survey about Hong Kong Chinese Traditional Restaurant online order website. This survey may spend you for 3 minutes.

Did you been eating in Hong Kong Chinese Traditional Restaurant in last 6 month?

- ○ Yes
- ○ No

Which is your age level?

- ○ 0~10
- ○ 11~25
- ○ 26~45
- ○ 46~65
- ○ 66 or more

How many times did you dine in Hong Kong Chinese Traditional Restaurant in last 6 month?

- ○ 1~3
- ○ 4~6
- ○ 7 or more

Please rate the functions of Chinese Traditional Restaurant online order website should have by your own opinions.

	1 (Lowest)	2	3	4	5 (Highest)
1. Responsive Website	○	○	○	○	○
2. Different types of category	○	○	○	○	○
3. Personalized menu options	○	○	○	○	○
4. Look for stores	○	○	○	○	○
5. Order information	○	○	○	○	○
6. Product Images	○	○	○	○	○

	1 (Lowest)	2	3	4	5 (Highest)
7. Product options selection (special requirement)	○	○	○	○	○
8. Edit order	○	○	○	○	○
9. Pre-order functionality	○	○	○	○	○
10. Confirmation Page	○	○	○	○	○
11. Share on Social Media	○	○	○	○	○
12. Login, register function	○	○	○	○	○
13. Profile information	○	○	○	○	○
14. Customer Reviews	○	○	○	○	○
15. Multi-language	○	○	○	○	○
16. Business Location	○	○	○	○	○
17. Photo gallery	○	○	○	○	○
18. Business timing	○	○	○	○	○
19. Payment Gateways	○	○	○	○	○
20. Coupon redemption	○	○	○	○	○
21. Seat reservations	○	○	○	○	○
22. one-touch call for waiters	○	○	○	○	○
23. QR code scanning for local ordering	○	○	○	○	○
24. View restaurant capacity in real-time	○	○	○	○	○
25. Customers Support though Chat by Chatbot or Phone call	○	○	○	○	○
26. Deals, offers and loyalty points	○	○	○	○	○

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