

# Restaurant Pre-Ordering System: An Approach to Channeling Dynamic Business Creativity

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## Abstract

Technological advancement has led to the incorporation of information systems onto human daily life activities. Computer systems have helped improve the modern human lifestyle by simplifying and easing the execution of activities like writing a letter, watching a movie, and even grocery shopping. Nowadays, change has been seen on the ways of ordering at restaurants from the conventional paper orders to online ordering through the Internet. Therefore, in effort to enhance and optimize the current ordering mechanism, we develop a restaurant pre-ordering system that allows customers to order in advance prior to arriving physically at selected restaurants. This will help reduce the waiting time needed for the preparation of meals and help improve the table turnover rates at restaurants. Besides that, we also provide assistance for tourists and travelers in search for local delicacies during their travel to our country. The fact that not many tourists have decent understanding of our national language, Bahasa Malaysia makes the searching for local food a rather difficult thing to do. Therefore, by having a smart search function which allows searching through image and speech, this system can greatly elevate the difficulties and troubles faced by tourists and travelers during their search for local food here in Malaysia.

**Keywords:** pre-order; restaurant industry; web-based system;

## INTRODUCTION

The activity of ordering a meal at restaurants has evolved and changed drastically since the incorporation of information technology into human life [1]. Conventionally, the process of ordering begins only when a customer is physically present at a restaurant. The customer is first led by a waiter to a table and presented with the restaurant menu containing all the foods and beverages available. The waiter then moves away to attend other matters while giving some time for the customer to read the menu. After the customer has decided on which item to order, the waiter will be called to have the order taken, typically by writing on a piece of paper, before being passed to the kitchen workers for preparation of the selected meal.

The customer then waits for a period of time before the meal is cooked and ready to be served. The customer finishes the meal and finally proceeds to the counter for payment officially ending the process of a meal order from its placement to its fulfillment. The conventional way of ordering causes many disadvantages to a restaurant on aspects like labor workforce, table turnover time, and customer satisfaction, just to name a few [2,3]. Besides, a common problem faced by tourists and travelers during their visits to foreign countries is the inability to converse in the local native language of the country being visited thus making it difficult for them to look for local delicacies [4]. Moreover, the widely-used search function using English keywords may be less usable for tourists and travelers who are not decent practitioners of the language [5]. Therefore, this system aims to address these problems by developing a solution system that will help improve the efficiency and productivity of ordering operations at restaurants.

## LITERATURE REVIEW

### A. *The change of meal ordering landscape in restaurant industry*

The utilization of mobile application in restaurant industry nowadays has been tremendously generous both for the customers and restaurateurs. For customers, the landscape hampered before them offers huge saving in terms of time, effort and even cost when making order online. Same goes to the restaurateurs when the presence of mobile application has been such a great complementary to the business and help increasing their sales and revenues [6]. The systems that are currently available in the market have its own unique distinct features though most of them share a common set of functions.

### B. *Gloriafood*

Gloriafood [7] is a company which provides customizable online ordering systems to restaurant owners. The ordering system consists of a webpage where customers can view the restaurant's menu and place an order. The restaurant owners

can view the orders placed by customers, update the online menu, and also generate reports on sales order. Access on this system can be done using web browsers on computers and also mobile applications. However, this system lacks of the feature to reserve tables by customers who would like to dine in. This system supports only ordering and without the guarantee that a table will be available when the customer arrives. Besides, this system is available only for individual restaurants, meaning that if a customer wishes to order in another restaurant, he or she would need to download another extra app to make an order.

### C. *OpenTable*

OpenTable [8] is an online website that provides the service of table reservation to users. Participating restaurants will be listed on the webpage for users to select and the information displayed consists of restaurant details, operating hours, location, menu and reviews from customers. Users can then proceed to reserve a table in the selected restaurant by entering details like number of patrons, date and time. The reservation will be processed and the user will be notified of the confirmed reservation. Unfortunately, this system lacks of the function to place orders. Users who reserve a table can only place an order when they arrive physically at the restaurant on the reserved date and time.

### D. *Allset*

Allset [9] is a hybrid of ordering system and table reservation system. Allset allows people to book, order, and pay for their meals before arrival. Users could enjoy wait-free dining experience at restaurants as a table would be readily available for them upon their arrival and the ordered meal would have been prepared and ready to be served. This feature has made Allset one of the biggest players in the industry, with business expanding across the globe. The system also provides the common feature of having web and mobile applications for restaurant owners to manage the orders and tables and as for customers to view menu and place orders. However, as perfect as it may seem, there is a lack of usability for customers on this system due to the absence of a search function that facilitates searching of restaurants by tourists or visitors who are not familiar with the location of visit.

## METHODOLOGY

This pre-ordering system is designed to provide enhanced functions from the systems analyzed above with additional features. The main purpose of this system is to allow customers to order in advance prior to their arrival selected

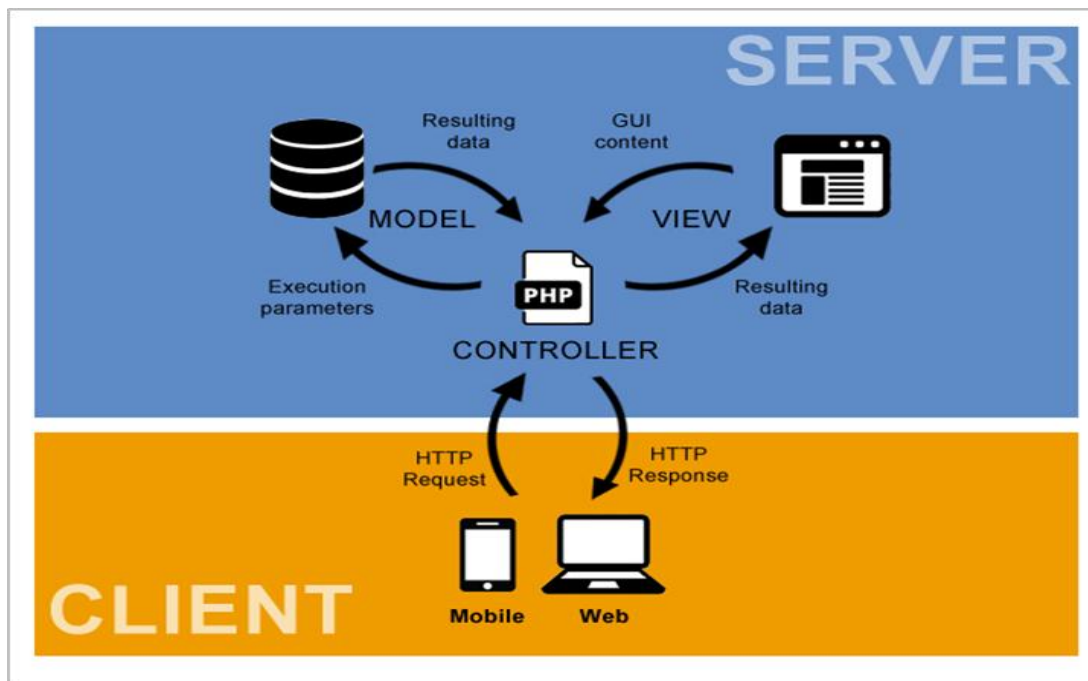
restaurants. Besides, this system also provides crucial information on the availability of seats in real time for better decision on choice of restaurant. Users can select whether to have the order for takeaway or dine-in which leads to reservation of tables. Another unique feature of this system is the search function which allows users to find for desired food using images and speech. A user can upload an image of the food or take a photo of it and upload it to the system in which the image will then be processed using semantic analysis to identify the context of the image and query a search on the database of participating restaurants to find restaurants that serve the particular food searched. This is useful for tourists and travelers who may have difficulty in understanding the local language but craves for local delicacies without knowing the name of the food. Meanwhile, the search function using speech enables users to find food items by simply speaking into the mobile app using their preferred language. As for restaurant owners, this system will enable update of menu, retrieval of orders from customers as well as table management where reservations made by customers will be reflected on the layout of tables and can be modified or updated according to the restaurant manager's decision

### A. *System Architecture*

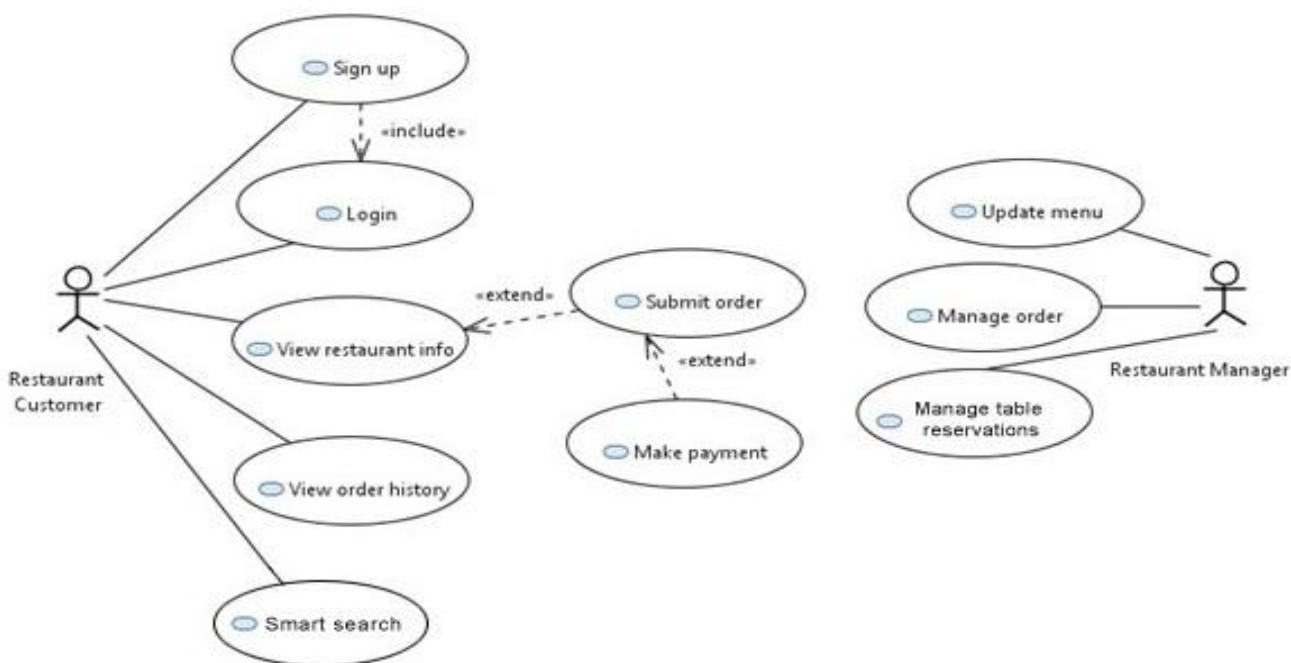
This system is designed to be accessible through the Internet and supports remote access from multiple numbers of users. Therefore, the most appropriate and suitable architecture for this system is the client-server architecture, as shown in Fig. 1. This architecture consists of a server side which hosts the business logics and processing, and also a client side which accesses and communicates with the server.

This system adapts the model-view-controller (MVC) design pattern by dividing the system into three main parts. One part is called the controller which controls the interaction between the system and its clients. A client invokes the controller by sending HTTP requests on certain actions to be performed. In this case, the controller is a series of PHP files that contain business and application logic. The controller will then send execution parameters such as SQL queries to the model part of the system which in this case is the database containing all the system's data. Then, the resulting data will be sent back to the controller before passing to the view part of the system which is responsible for generating user interfaces and displays information from the resulting data. Finally, the controller sends back the result of the performed action back to the client as a HTTP response.

On the other hand, Fig. 2 shows the use case diagram for the overall functions of Restaurant Pre-Ordering System.



**Figure 1:** System Architecture and Design Pattern.



**Figure 2:** Use Case Diagram for Restaurant Pre-Ordering System.

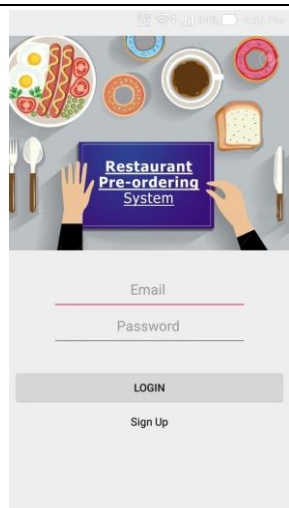
**RESULTS AND DISCUSSIONS**

The mobile client for this system is operated on an Android device and is designed to be used by restaurant customers to perform actions like browsing restaurants, making pre-orders, search for menu items and other functions. The mobile client is an application written in Android native code and in order to use it, the application has to be first installed on a device. This

application best supports Android KitKat but can still be used for versions lower it. The requirements for this application to work are Internet access and permission to read memory contents as well as permission to set notifications. Fig. 3 explain the flow of using the mobile client from login, sign up, browsing restaurants, viewing menu, submitting an order, viewing order history and searching for menu items.

**Sign Up**

The first interface of the mobile application is a form for users to login. If the user does not have an account, he or she can sign up for one by pressing the ‘Sign Up’ button on the bottom of the page.



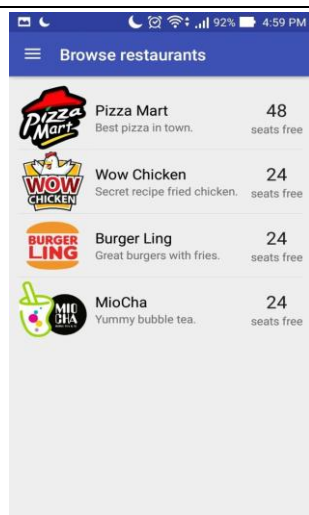
**Login**

Users can login by entering email and password. Upon successful login, users will be directed to the homepage of the application. Otherwise, in an event where the user fails to login, there will be an error message displayed, stating the failure.



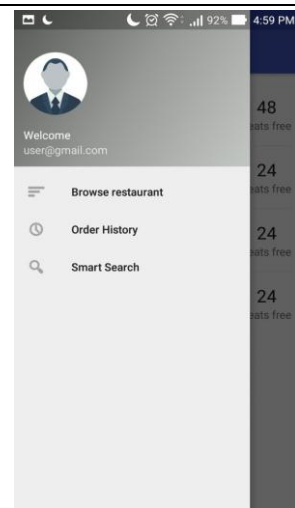
**Homepage**

The homepage displays a list of participating restaurants in this system along with information like restaurant’s logo, name, brief description and number of seats currently free. The button on the top left corner opens up a side menu for further actions on this application. Users can click on any of the restaurants which will open up the menu page of the selected restaurant.



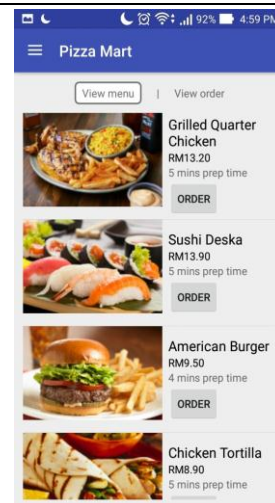
**Side menu**

The side menu contains three buttons that are; ‘Browse restaurant’ which links to the homepage of the application, ‘Order History’ which displays the list of orders previously made by the user, and ‘Smart Search’ which allows users to search using image or speech for the desired menu item.



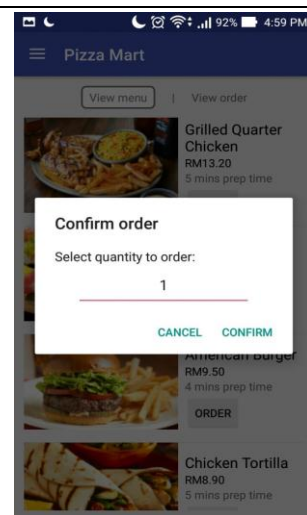
**Restaurant Menu**

The restaurant menu page displays a list of items along with information like image, name, price, preparation time and also a button to order. There is a ‘View menu’ button which displays the menu page and a ‘View order’ button which displays the list of items in the current order of the user.



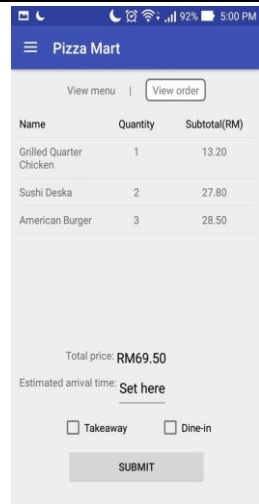
**Order Confirmation**

When a user clicks on the order button of a menu item, there will be a confirmation dialog displayed for the user to enter the quantity of item to order. Upon selecting the amount of item to order, the user can click on the confirm button to add the item to the current order.



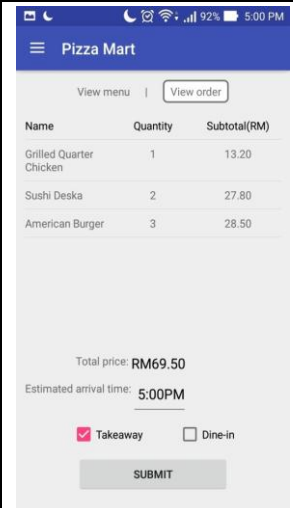
**View Order**

Users can view the current order by clicking on the ‘View order’ button which will open up the list of items ordered. Information like name, quantity, subtotal and overall total will be displayed. There will also be a button for users to set the estimated arrival time at the restaurant and also options for takeaway or dine-in.



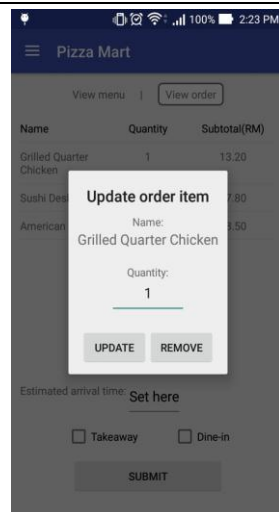
**Option to dine in**

Users also need to select whether to take away or dine-in for the order.



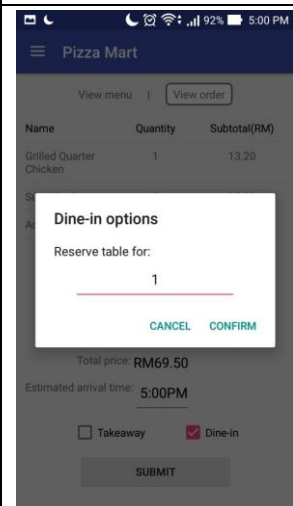
**Update Order**

Users can update the quantity of an item or remove it from the order by clicking on the selected order item. Upon updating a menu item, the subtotal price and the overall total price will be automatically updated as well.



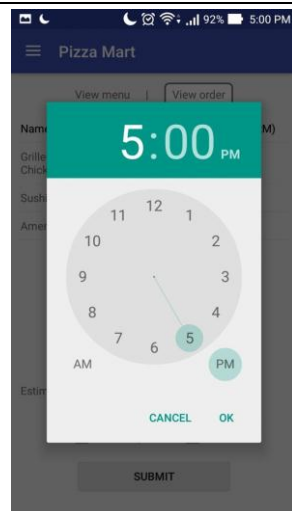
**Option to take away**

If user selects to dine-in, there will be a message requesting number of diners.



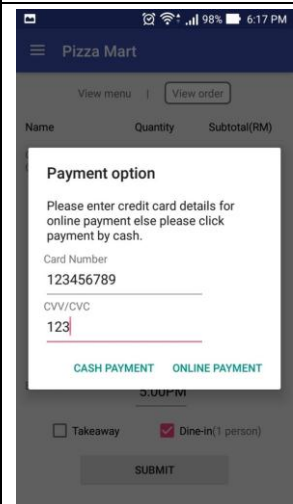
**Setting estimated arrival time**

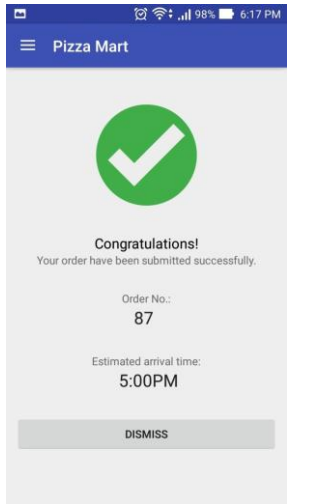
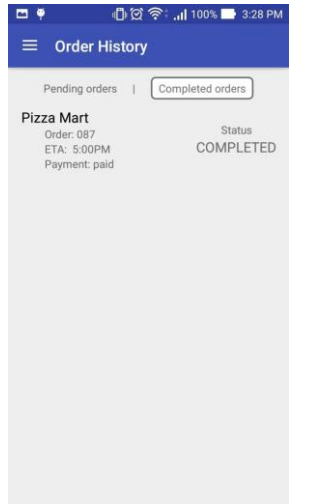
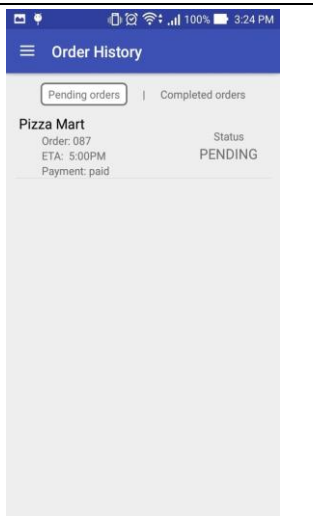
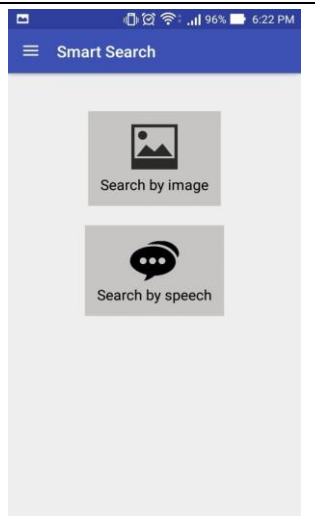
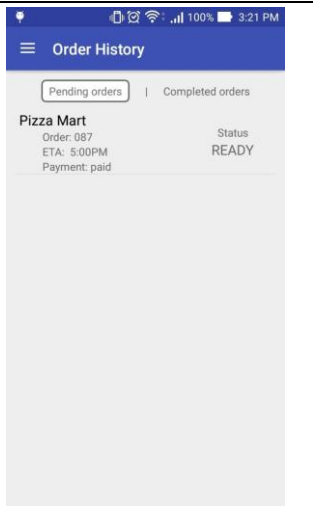
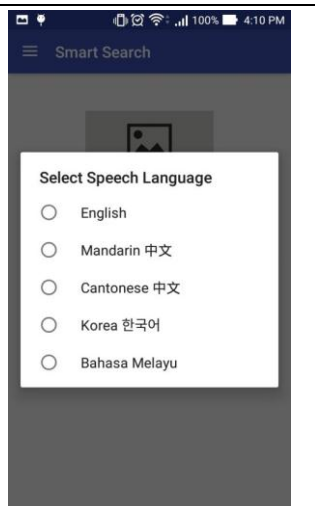
Before submitting an order, users need to set the estimated arrival time so that the restaurant can make necessary adjustments and preparations in ensuring the order is ready by the time the customer arrives.



**Payment Option**

When the user has set the estimated arrival time and chose an option whether to take away or dine-in, he or she can press the submit button which opens up the dialog for payment option. Users can choose to pay by cash or pay through online banking in which users can enter the credit card number and CVV/CVC of the card.



<p><b><u>Successful order submission</u></b></p> <p>Upon successful submission of order, the order number will be showed and also the estimated arrival time set by the customer.</p>		<p>When the customer has arrived at the restaurant, the order will be marked completed and users can view it from the 'Completed orders' page.</p>	
<p><b><u>Order History</u></b></p> <p>This 'Pending orders' page displays the list of orders which are submitted but yet to be completed. There will be information restaurant name, order number, estimated time of arrival, payment status and also status of the order.</p>		<p><b><u>Smart Search</u></b></p> <p>This page allows users to search for menu items using image or speech. The search by image function is designed to allow search during situations where users have an image of the food but do not know what the name of the food is. Meanwhile, the search by speech function is mainly targeted to help tourists and travelers search for items by speaking the name of the dish using their native language.</p>	
<p>If the order has been prepared by the restaurant, the status of the order will show 'READY' meaning that the order is ready to be served when the customer arrives at the restaurant.</p>		<p>If user clicks on the 'Search by speech' button, there will be a dialog prompting users to select the speech language. The supported languages for this function are English, Mandarin, Cantonese, Korean and Bahasa Melayu.</p>	

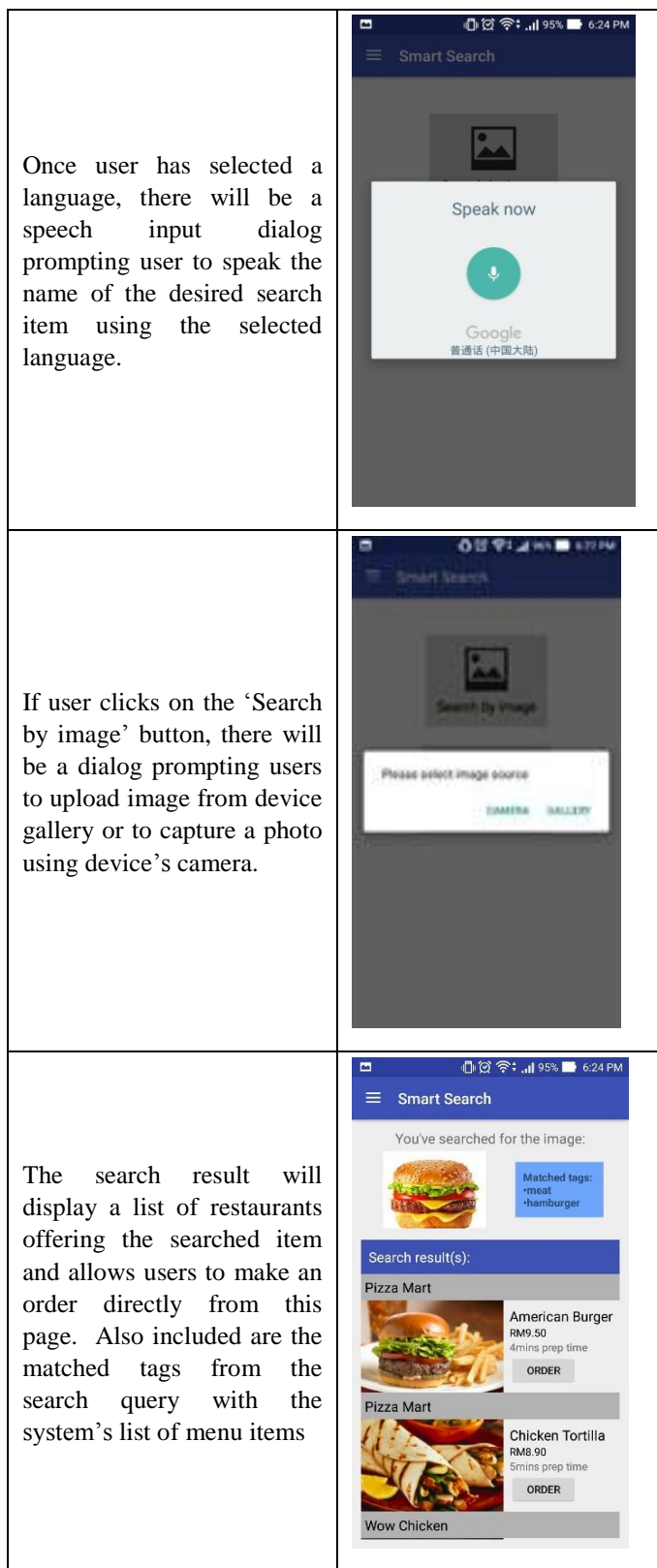


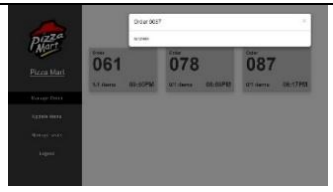


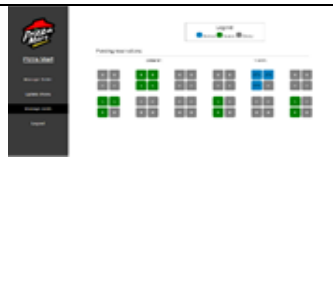

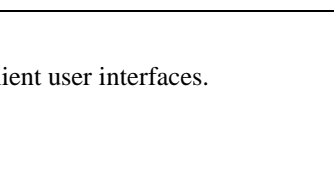
Figure 3: Flow of the system.

**User Interface for Web Client**

The web client of this system can be accessed using any web browser that supports JavaScript. The users of the web client are restaurant managers where they will perform actions like

viewing orders, updating menus and managing seats. The following are user interfaces for web client.

<p><b>Login</b></p> <p>Users have to login in order to use the system. There will not be an option for sign up as this has to be done through intervention from system administrators as part of the business limitations imposed on this work. Once the credentials are entered, users can login by pressing the green 'Submit button'.</p>	
<p><b>Manage Order</b></p> <p>The homepage of this web client is the 'Manage Order' page which lists the orders made by customers using the mobile application. Every order will have information like order number, number of order items, and the time when the order is placed. The 'new' button displays pending orders while the 'completed' button displays completed orders. The side menu shows functions for; 'Manage Order', 'Update Menu', 'Manage seats' and 'Logout'. Also displayed are the restaurant's logo and the restaurant's name.</p>	
<p>Upon clicking on an order, a dialog will be displayed containing information on that order like list of order items, quantity, price, option to mark the item as 'completed', total price, estimated arrival time as set by the customer, estimated preparation time of the order, option to mark the order as paid or unpaid, and also the dining</p>	

<p>option set by customer. Once an order is marked as 'paid' and every item is completed, the manager can submit the order as a completed order.</p>	
<p>When the order is successfully submitted as a completed order, there will be a message to notify the manager.</p>	
<p><b>Update menu</b>                  This page displays all the items in the restaurant's menu. There are two buttons; 'Add' to add a new item to the menu and 'Remove' to remove an item from the menu.</p>	
<p>When user clicks on an image of the menu item, a dialog will be displayed containing information like name, price, description, image, estimated preparation time and tags. This information can be updated on the dialog and saved on the system.</p>	
<p><b>Manage seats</b>                  This page displays the seats layout of the restaurant with color indications; grey for empty seats, green for occupied seats and blue for booked seats.</p>	
<p>When the user clicks on a seat, there will a dialog displayed with information like order which has the seat booked, estimated arrival time of booking customer and the option to change seat status to empty, booked or occupied.</p>	

This system is initially initiated and designed as an enhancement to existing ordering systems. The innovative features that are presented in this system are:

1) *Information on availability of seats in restaurants in real time*

Before users choose to visit a restaurant, they will be able to know whether there are seats and tables available for them when they arrive. This can help prevent the situation whereby a customer visits a restaurant only to find out that the restaurant is fully occupied with no free seats left thus wasting not only time but also effort for the travel.

2) *Search function using image*

Tourists and travelers who visit Malaysia would want to try local delicacies like nasi lemak, cendol and roti canai. But, with little knowledge on the Malay language, it would be difficult for them to search for such items using keywords. Therefore, in a scenario whereby a tourist or traveler happens to have a photo of the delicacy, he or she can search for restaurants offering that food by uploading the photo to this system to perform a search.

3) *Search function using speech*

This function is also dedicated to tourists and travelers because a large number of them are from countries which practice only their national language like Japan, Korea and China. Many of them have poor command of English and therefore, searching for food using keywords would be difficult and troublesome. With the ability to search using speech, users can speak into the application using their desired language and search for restaurants offering the desired food. This will enhance the usability of search functions.

The impact of mobile application is not only for user but also for business. According to the study carried out by [10], the growing popularity among the consumers and the restaurateurs in online ordering is primarily driven by factors such as ease, speed, accuracy and increased in revenue. This system has been intended to serve each of these factors. Ease of use, the reduce in time spent for ordering, the precision of order made and received as well as potential for revenue increase when many aspects are now less consumed such as labor. More importantly, this system has successfully enhanced two vital facets of online ordering discussed in [11] which are perceived customer control and perceived customer convenience. Perceived customer control basically addresses the control that the customers have over the pace of their transaction and to limit the amount of personal interaction with employee. We enhanced this facet by allowing customers to choose their payment and option whether to dine in or take away their order. Our well-designed system also making sure that every order received will be prepared accurately and ready when promised. Virtual ordering carts, confirmation texts, progress reports, and delivery time estimation were also provided by this system which can help reassure customers

Figure 4: Web client user interfaces.



that their order is in process and secure. Perceived convenience on the other hand, refers to both access and transaction convenience. These two elements are regarded as key ingredients to attract online and offline customers to use the system. As depicted in the screenshots in previous section, this system was carefully designed to allow smooth sailing ordering experience among the customers and the restaurateurs.

## CONCLUSION

The undertaking of this system has open new frontiers on how an ordering system can be enhanced to provide better usability for both customers and restaurateurs through the use of mobile application. The implementation of this system for public use will certainly bring its benefits. Customers would be able to pre-order at restaurants saving precious time from needing to wait for the preparation of meals. Restaurateurs can have better table turnover rate and better management of table reservations. Tourists and travelers could make use of the search using image and search using speech function to easily seek for food items offered by restaurants. All these are in hope to enhance the hospitality experience of restaurant industries.

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