Development of a Desktop Application Restaurant Management System

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Abstract

The number of restaurants has grown rapidly around the world, the awareness of managing it efficiently has increased. This necessity yields the idea to invent a restaurant management system (RMS). This RMS will bring several benefits such as greater management of a restaurant, reduced resources cost, raise profit, and time-saving by allowing the admin to manage the restaurant easily through the functionality provided in the system. The provided features include adding, updating, and deleting information, stock calculation and auto re-order stock items, ingredients management, and finance calculation.

Keywords: Restaurant Management System (RMS), Business Solutions, Administration System

1. Introduction

Throughout the years, businesses in various sectors had attempted to reach efficiency and gain the most profit through their efforts. Methods and strategies have been developed to overcome the problem of inefficiency. However, most of the time, the advancement of technology is the solution to those problems in activity and performance done by using the traditional system. Technology has shifted the way various task is executed and decreased the need for people that used to perform the task manually. This situation is likewise applicable to many restaurant owners who have tried to increase sales and satisfy their customers with excellent services.

A restaurant management system was developed to help owners manage personal operations such as customers, employees, ingredients, suppliers, and sales. Restaurant management system (RMS) simplifies the personnel's daily workload and fulfill various task in one integrated system using a software system and databases that keep all the operational and personnel details. RMS offers its benefits by providing functions to organize the details of employees and their payroll, keep track of ingredients based on their category, manage suppliers, keep sales history, retrieve information easily, and calculate profits [1]. Using RMS, restaurants can get the opportunity to speed up operations through the automated system, increase personnel efficiency due to decreased time required for ingredients checking and manual order taking, and lessen labor costs by lowering the number of employees needed. Thus, this project aims to develop a restaurant management system that eases daily operations, enhances performance, and solves the current inefficiency of restaurants across Malaysia. A survey will be distributed among Malaysian restaurant managers and owners to study their opinion and

acceptance of RMS, the current and previous implementation, and their perceived benefits of using RMS. Besides, the survey will also help to understand whether they have sufficient knowledge and resources to run and implement RMS.

2. Existing System

In the existing system, the operational and daily tasks of the staff all need to be done manually. Activities such as keeping details of the employees, suppliers, and inventories are taken by paper and pen which leads to paper wasting and overloaded document. Paper documents can easily get lost or damaged and may be hard to be found when needed. Besides, calculating and updating the ingredients stock manually can be very time-consuming and cause miscalculations. In certain circumstances, a restaurant can be running out of stock and miss the time to re-order the ingredients which can affect the restaurant's profits. Moreover, manually calculating the ingredients stock also require more manpower and increase labor cost. Hence, this proposed desktop-based restaurant management system is developed to overcome those issues that restrain restaurants to achieve efficiency. The system will combine several functional features in an integrated centralized system. The staff and supplier information as well as the detail of all ingredients will be stored inside the database which will ease information retrieval whenever needed. The stock of ingredients will be automatically ordered from the assigned supplier to avoid situations when the restaurant is running out of stock. In addition, the finance calculation of the restaurant will also be performed inside the RMS which involves calculating the employees' payroll, daily sales, overall expenses, and profit. Eventually, the proposed system aims to replace all the tasks that are regularly done manually with an automated system that can accelerate and ease the restaurant's daily operation and administration by executing several processes in one system. Table 1 shows the comparison between the existing and proposed system.

Table 1: Comparison Table of Existing and Proposed System

Features	Proposed system	Table Booking and Restaurant Management System Using Android Application [9]	Foody – Smart Restaurant Management and Ordering System [8]	Food Ordering Application in Restaurant Using Loyalty Program Based on Android [11]
Database record	✓	✓	✓	✓
Ingredients stock calculation and update	✓	✗	✗	✗
Auto finance calculation	✓	✗	✗	✗
Finance calculation	✓	✗	✗	✓
System integrity	✓	✗	✗	✗
Online food ordering	✗	✓	✓	✓
Table reservation	✗	✓	✓	✗
3D menu and real-time map	✗	✗	✓	✗
Sentiment analysis and summarizing	✗	✗	✓	✗
Membership system	✗	✗	✗	✓

3. Prior Work

Various projects and studies related to restaurant management systems have been conducted, aiming to improve efficiency, customer satisfaction, and overall performance. Rainer Alt (2021) emphasizes the importance of supply chain management in restaurants to handle raw materials efficiently and maintain smooth operations [2]. Srikar Macha (2022) develops a web application using modern technologies like MVC and bootstrap to optimize restaurant management [3]. W. B. A. C. Piyatissa (2020) presents an online system for orders and reservations, offering convenience for customers and enhancing customer relationship management [4].

Emel Memis Kocaman (2021) highlights the widespread adoption of RMS in restaurants, positively impacting their operations and service standards, although it comes with significant technical costs [5]. Prudveer Karne (2022) introduces a web-based application to facilitate better communication between customers and staff, improving order management and overall efficiency [6]. Ivan Wanyama (2019) implements a web-based restaurant management system to enhance data organization and decision-making [7].

These projects and studies collectively contribute to the advancement of restaurant management systems, enabling better resource management, improved customer service, and enhanced overall performance in the foodservice industry. As technology continues to play a prominent role in daily life, the ongoing development of innovative restaurant management systems promises to revolutionize the way restaurants operate, making them more efficient, customer-oriented, and adaptable to changing market demands.

4. Method

The methodology selected to develop this project is the Software Development Life Cycle (SDLC) which is a method used to develop software by going through several phases. The five phases of SDLC include planning, requirement of analysis, design, implementation, and testing.

The system consists of 5 tabs which are the employees, ingredients, suppliers, sales, and finance tabs that will be fully controlled by admin. First, in the employees tab admin can add/edit/delete employee details that consist of their personal information such as name, age, gender, etc. Admin can filter and search the employee's table by ID, name, and role. Then, the admin can manage the employee payroll as well as do adjustments for salary deductions and overtime. In the ingredients tab, the admin can add/edit/delete the details of each ingredient such as its name, price, quantity, etc. The ingredients will be grouped based on their category thus admin also can add/edit/delete the ingredients category. There is an ingredients table that the admin can search and filter based on its barcode, name, and supplier name. There will be a low-stock item button provided for the admin to check the low-stock ingredients for them to re-order and purchase the ingredient by filling in the re-stock form. Thirdly, the admin can add/edit/delete supplier details in the suppliers tab which details then will be used to identify which ingredients were produced by which supplier for re-stock purposes. In the sales tab, the admin can add/remove/clear the food item from the order table before adding it to the ongoing orders table. There is a show chart button provided for the admin to view the bar chart of the overall monthly sales of the restaurant. Then, the admin can view the list of ongoing orders, do customer purchases, and add/edit/delete the food menu within this sales tab. Lastly, on the finance tab, the admin can view the list of overall invoices, GRN, and employees' payroll expenses. Admin can likewise add/edit/delete other expenses such as electricity, water, internet, etc. In the income statement tab, all the total income, expenses, and final profit/loss as well as the total number of employees and suppliers can be viewed. Eventually, the admin can log out from the system by clicking on the logout button provided. The flowchart of the proposed system is shown in Fig. 1.

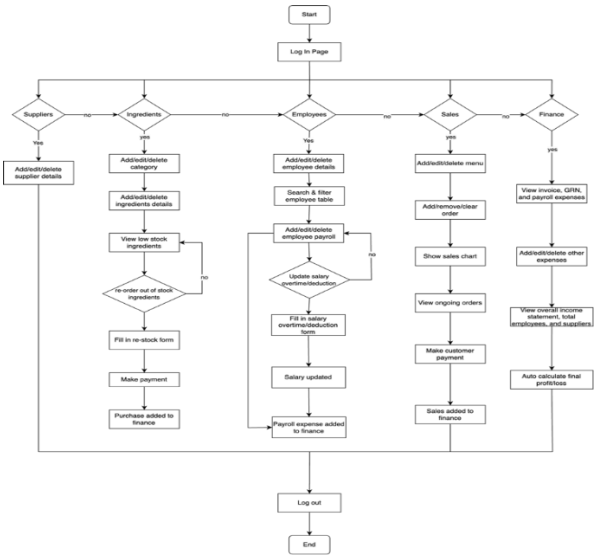

Fig. 1. Restaurant Management System Flowchart

5. Result and discussion

The restaurant management system is implemented using Java with Java Swing library inside Netbeans IDE and MySQL for the database. The system consists of 5 main tabs which are the employees, suppliers, ingredients, sales, and finance tabs. Fig. 2 shows the add employee subtab allows the admin to save, update, and delete employee personal information from database. The admin must fill in all the text field there which includes name, age, phone number, email, and address as well as choose the radio button for gender. Fig. 3 is the Search employee subtab allows admin to view the table of information list of all the registered employees. Admin can search and filter the employee's information based on the employee ID, name, role, or all.

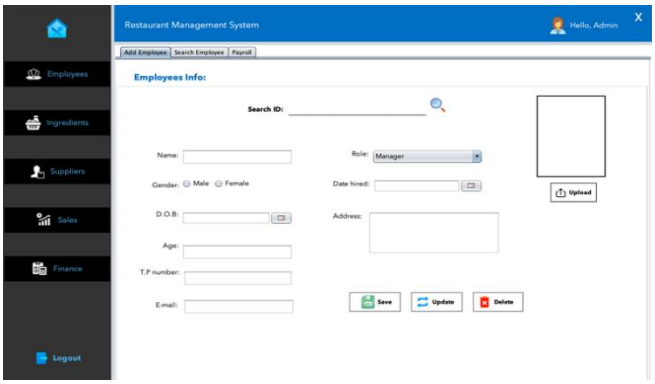

Fig. 2. Add Employee Subtab

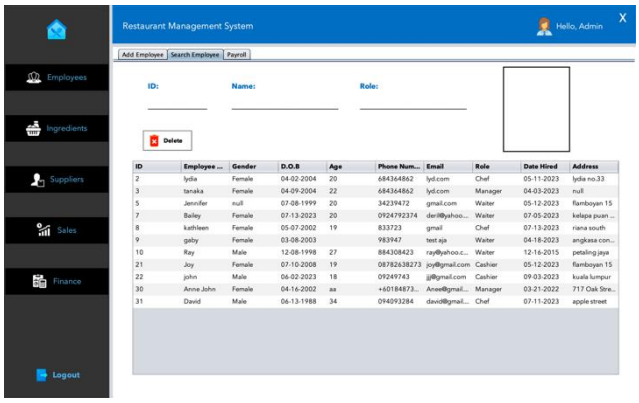

Fig. 3. Search Employee Subtab

Fig. 4 indicates the employee's payroll subtab where the admin can save, update, and delete the employee payroll by searching on the employee ID and clicking on the buttons provided. Besides, admin can alter the employees' payroll by clicking on the deduction or overtime button depends on the employee number of days absence or total overtime work hours.

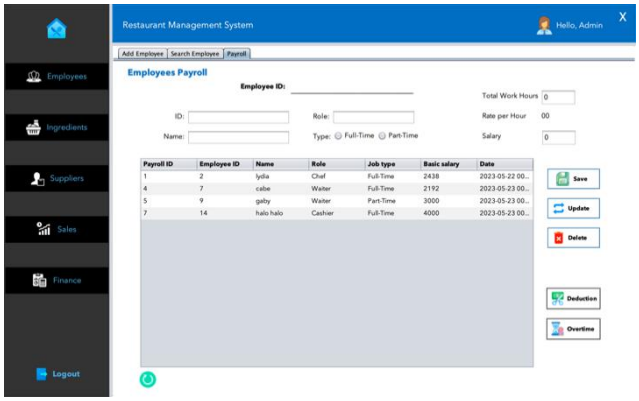

Fig. 4. Payroll Subtab

The add ingredient subtab in Fig. 5 allows the admin to save, update, and delete the ingredients detail from database. The admin must fill in all the text field which includes name, bar code, price, and quantity. The supplier ID and name will automatically appear after the admin select the ingredient's category to show where the supplier of the ingredient.

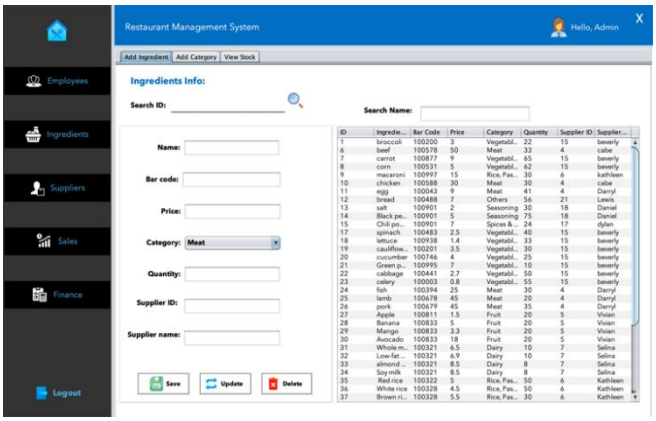

Fig. 5. Add Ingredient Subtab

The add category subtab indicated in Fig. 6 is provided for admin to save, update, and delete the ingredients category. Admin can do that by simply fill in the category name and the supplier ID will be automatically appear when admin select the supplier's name provided in the drop-down menu. Admin can likewise search and filter the category table based on the category name. The low stock item window in Fig. 7 is for admin to check the low stock item and re-order the stock by clicking on the re-order stock button. Fig. 8 shows the re-order stock form that will appear when admin click on the re-order stock button. Admin can simply key in the ingredient ID on the search field. Then, the admin can key in the desired re-stock quantity and the total price will appear.

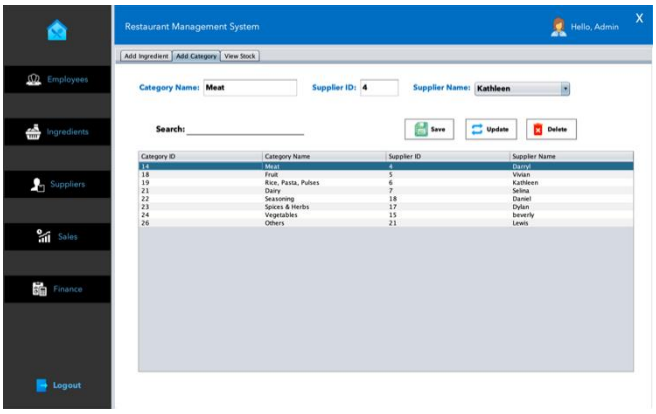

Fig.6. Add Category Subtab

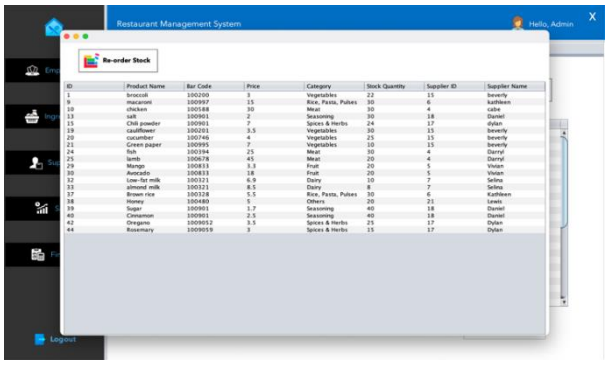

Fig. 7. Low Stock Ingredients Window

Fig. 8. Re-stock Ingredient Form

Fig. 9 shows the supplier tab which is generally used to manage the supplier's data such as their personal information. Admin can save, update, and delete supplier's personal information from database. The admin must fill in all the text field provided which includes name, phone number, email, and address.

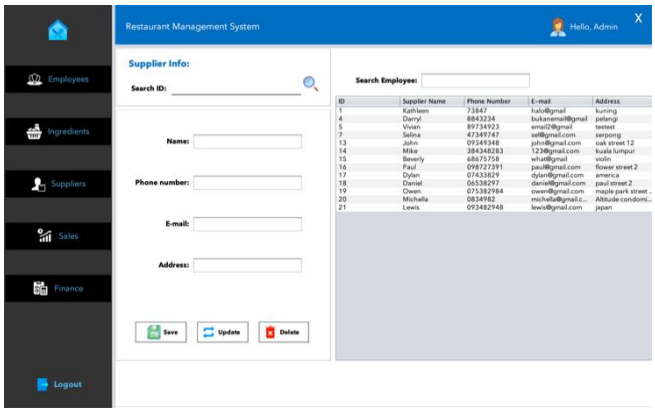

Fig.9.Suppliers Tab

The add order subtab in Fig. 10 is primarily used to add the customer order. When admin key in the menu ID, the food name and its unit price will appear. The total price will be calculated once the admin key in the quantity of the food. The add, remove, and clear button provided there is used to manage the table order. After adding the order, the total amount and quantity of the orders will be calculated and shown under the order table there. The show chart button in Fig. 11 will show the graph of the weekly sales of the restaurant.

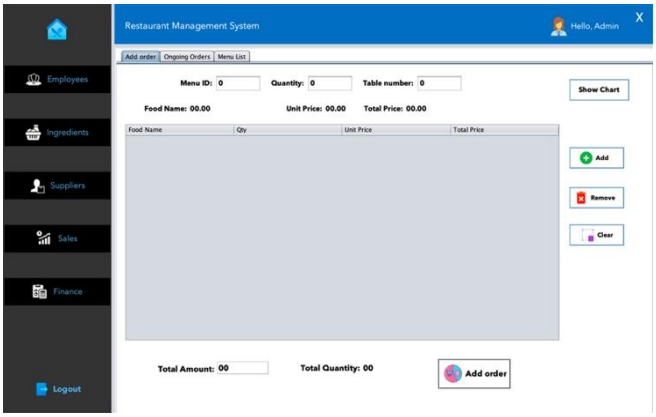

Fig. 10. Add Order Subtab

Fig. 11. Monthly Sales Chart

Fig. 12 exhibits the ongoing orders tab is used to view the ongoing orders and its details. The table number will be used to identify which orders belong to which customer. When the customer wants to pay the bill, admin can click on the pay bill button. The pop-up window as exhibited in Fig. 13 shows the example when admin want to complete the order of customer from table number 3. Admin just need to key in the table number in the search field and the food items from that table will be listed out. Then, the total item and amount of the order will be calculated. After customer finish paying the bill,

admin can click on the add sales button to add the sales data to database.

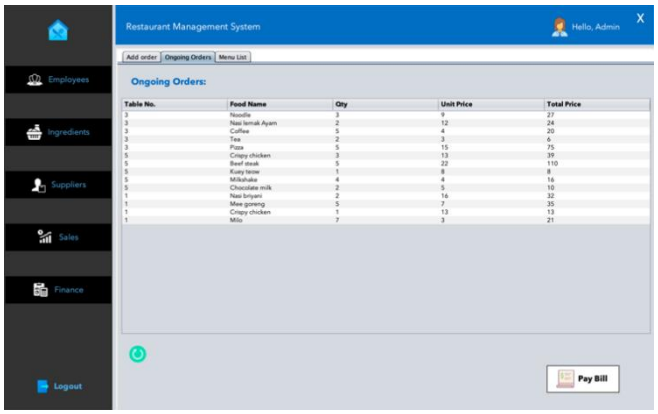

Fig. 12. Ongoing Orders Subtab

Fig.13.Re-stock Ingredient Form

Fig. 14 shows the menu list sub tab where admin can save, update, and delete the restaurant menu item. Admin can just simply type the food name and its price in the text field provided.

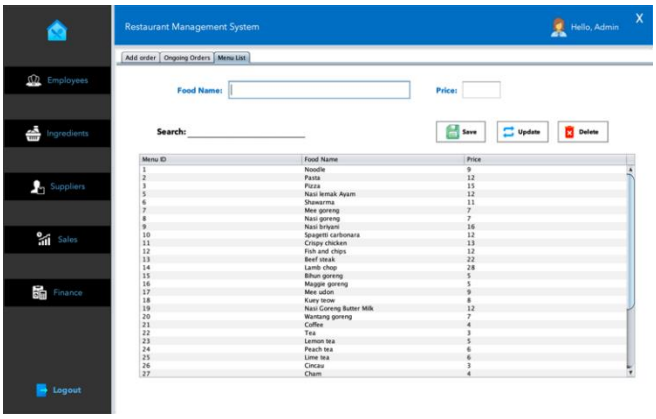

Fig.14. Menu List Subtab

The invoice subtab in Fig. 15 is used to list out all the sales of the restaurant. It includes the sale ID, total item, total amount, and date. Admin can delete the sales when there is a mistake by key in the sale ID or clicking on the list and press on the delete button. The total of sales item and amount will be automatically calculated. The income statement subtab in Fig. 16 is where admin can see the total income, expenses, employees, and suppliers of the restaurant. The profit or loss will be automatically calculated based on the sales and purchase of the restaurant. Lastly, admin can logout from the system by clicking on the logout button provided at the bottom left of the system.

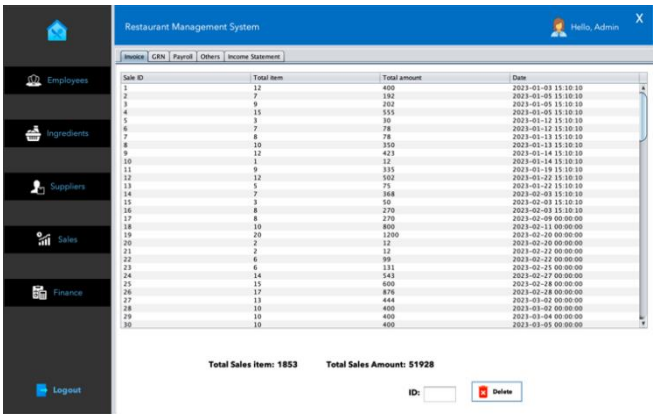

Fig. 15. Invoice Subtab

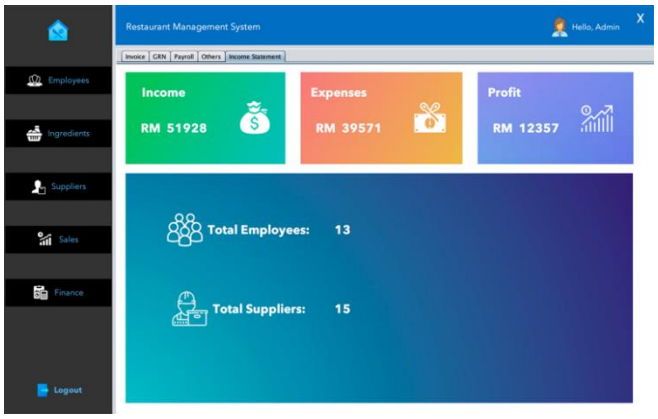

Fig.16.Income Statement Subtab

Based on the survey taken from 30 respondents of restaurant managers or owners, RMS has received positive feedback where all of them agree with the efficiency of using RMS and would like to use the system for their restaurant. Thus, this project can bring the solution to restaurant owners who wants to take the benefits of using RMS. Fig. 17 shows the positive feedback from users.

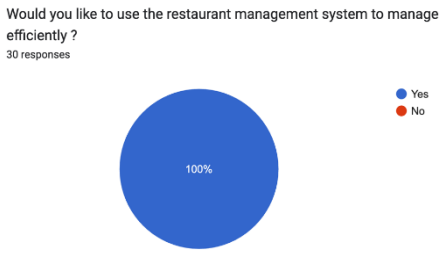

Fig. 17. User Acceptance Test Question on Willingness to Use the RMS

6. Conclusion

The proposed restaurant management system is developed to address the current issues in the existing system and reduce the manual process for restaurant daily operations. The traditional system that nowadays is still implemented in many restaurants is time-wasting, demands a high cost, and often cause human error which as a result cannot promote restaurant to perform in the best efficient way. Thus, the proposed restaurant management system is time-saving and error-free compared to the manual system. It aims to fulfill all the needs of the restaurant owners by developing a desktop application restaurant management system which able to ease the operational management of a restaurant, increase management efficiency, minimize labor and resource costs, and enhance the performance of restaurant management. The system development is based on the SDLC methodology in a determined time and scope. User acceptance test is performed and has received positive feedback from users. Overall, the system is targeted to bring benefits to most restaurants and create efficiency by developing an integrated system that includes several functional features. This system can be enhanced and improved for future development by adding more functional features.

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