ANDROID-BASED FOOD ORDERING SYSTEM WITH FEEDBACK MECHANISM

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Abstract
Mobile based transactions are among the fastest growing areas in Information Technology today. The growth introduces diverse opportunities more particularly in supply and distribution of goods and services under the wider umbrella of m-commerce for example, restaurant food ordering system.Many consumers would benefit by having a means of making orders using their mobile devices. Restaurant is a place where different people go to eat at different time of the day. Dining in restaurants has become a habit for most people over the years, where you can place order for anything you require. A major problem faced in typical ordering systems in restaurants is that customers queue for long hours in restaurants or wait for a long time so that their food can be prepared. In order to solve this problem, a mobile based solution that is used for food ordering and at the same time enabled feedback mechanism is proposed and developed to make the process of placing orders more efficient for customers, restaurant managers and chefs. The development applied an Object-Oriented Analysis and Design. The tool used for developing the Mobile Application is Android Studio which is one of the approved tools for developing Mobile Application and is also a tool that will make the application run on various android mobile phones. The system was tested by installing the mobile application on 5 users' Android phones in which the system yielded an efficient and effective outcome in the testing and also gave an accurate result that is necessary and useful in consideration for system integration. Through using this solution, customers and restaurant operators can benefit from a seamless ecosystem concerning the processing of orders to restaurants.

Keywords: Food Order, Restaurant, Android, Feedback Mechanism, Object Oriented Design

Introduction

Computers have become part of our daily lives, helping us to access any information we need easily and timely. Indeed, Technology evolution is steadily increasing and is demonstrated by the automation of the most traditional business processing systems. Currently, most organizations cannot survive without the use of technologies like mobile devices, computers and the likes. Information and communication do so as technology advances. There are so many potentials associated with mobile devices (smartphones, tablets and PDA's) application; especially, those that are android based. Google launched Android as an operating system that runs great apps and also gives users the options to choose their devices and carriers. Android is making waves in the mobile device industry because of the additional features it offers and in effect has made smart phone use more popular and more attractive among consumers of mobile devices.

Mobile-based transactions are fast becoming a more convenient means of electronic commerce in this current age of Information Technology. This platform affords numerous opportunities, particularly in supplying and distributing goods and services under the wider umbrella of m-commerce, as many customers benefit from having a means to make orders using their mobile devices at their own convenient time. To this end, the work of Parmjit and Sumit, (2014) presented the rising forms of smartphones which serves as intensified technology giants competition to take over a large share of the mobile platform markets.

Based on survey and considering the existing food ordering systems especially in developing societies, the research work of Munene and Kasamani (2018), reported that paper-based ordering systems are widely used among restaurants in underdeveloped societies. Papers are used to display traditional food menus, take down the order from the customer and store the orders from the customer. The draw backs of a paper-based system are numerous which are highly associated with traditional system. In typical restaurants, most of the meals are prepared and consumed at the premises but there are also several restaurants providing takes out and food ordering service to the various destination of customers. Restaurants are extremely different in appearance and services, including a wide variety of cooking styles and models, ranging from cheap fast food restaurants and café mid-estimated family restaurants, to high- estimated establishment. Owing to the associated challenges to the traditional restaurants services system for example, a lot of time wastages and inconveniences incurred by both ends, an invention of developing an online system mitigates these challenges.

Online food ordering is the process of ordering food via arestaurant's website or mobile application. A customer may choose to order for the food delivery mode via agent or to pick it up by himself. The process consists of a customer selecting their choice of restaurant, scanning menu items, selecting an item and eventually deciding to pick up or deliver by a third party. Payment is then handled by paying through the app or website with a credit card or debit card or in cash at the restaurant at the time of collection. The website and app inform the customer about the quality of the food, the duration of the preparation of the food, and when the food is ready for pick-up or how long it will take for delivery. The need for food consumption cannot be overestimated in any society as that forms primarily sources of energy for humans. This is why Abel and Martin, (2010) accounted in their work that hundreds of thousands of different restaurants in the United State patronize countless numbers of customers on a daily basis.

Therefore, it is unarguably stated that Restaurateurs in developing nations are facing a myriad of barriers in many different restaurant environments, particularly those of small food mart or individual that run businesses. This is why the work of Munene and and Kasamani, (2018) reported in their survey that 50 percent of the customers interviewed preferred if their orders are delivered to them, while 32 percent preferred to pick their orders when they were ready, rather than waiting for long, indefinite hours. In view of foregoing, this research paper is motivated by the need to make services easier for the restaurants and easy access for the customers by allowing the management to receive feedback that will help the business to further improve. Essentially, this paper takes into account feedback mechanism which is on one hand, an identified factor for the growth of the restaurant system and on the other hand, customers enjoying the values of the services. Feedback mechanism is a proposed platform we provided in this application where customers can easily report back to the food vendors on the quality of the services and the food itself, thereby creates a room for improvement.

Related Works

The existing food ordering system is traditionally or manually operated especially in developing societies based on literature. However, as a result of evolving cutting-edge technologies, the system is automated but not without issues or research gap. In order to identify this gap, Munnene and Kasamani, (2018), carried out a study to understand the distribution patterns of customers and vendors and to equally find gaps in m-commerce supply and distribution. Research found that 82 percent of customers position their orders manually and likewise, 85.7 percent of vendors' data are handled by manually on a physical material such as paper and then later move the information to their respective applications or systems. In addition, 90.4 percent of the payments made were cash transactions, despite new payment method in electronic. Hence, necessitated the need for an efficient system.

Similarly, in a recent study carried out by Manan, *et. al.*, (2019) an assessment was performed using a waterfall development method by developing a food system application based on the inventor model of android APP and obtaining the following average scores 2.45, 3.40, 3.35 and 3.07 based on software engineering impact, learning design and visual communication. Also, in line with the literature, Resham *et. al.*, (2014), embarked on survey on the use of technology in hospitality industries and the results shows the numerous wireless technologies that are in use. Some of these inventions allowed partial automation of food ordering processes. They are user friendly, increases restaurant performance and accuracy by saving time, increasing and providing customer feedback. Aishwarya *et al.*, (2017) developed application in which the user just has to download on his/her android smartphone and can easily order food of his/her preference in a few minutes. A wireless food ordering system using android devices based on internet of things (IOT) was presented by to develop a reliable, convenient and accurate food ordering system that will surely satisfied the customer service was considered as a general objective of the study.

Another food ordering mechanism was presented by Auli *et al.*, (2017). The research explored how processes of food ordering using mobile-based technology in restaurants. It designed a system that could speed up the restaurant's ordering and processing of food. The software created an application that replaced the restaurants waiter's use of paper and pen when ordering. Also, in an effort to address the problem of traditional based system, Adivarekar, *et. al.*, (2016) presented a research proposed to solve the current paper-based system because of its inefficiency and unreliability. worked on the four stages of intelligent computing in the food ordering system starting from the analysis of the needs of the system to be built, then designed the system, created the system and carried out the system's evaluation. A high-qualityrecommendation service system that would actively identify customers and their favourite meals and expenditure records was equally proposed by Reddy and Naresh (2014). Thus, an efficient feedback mechanism as a reactionary platform for user is still an issue to contend with. This is in addition to the food ordering system that would be designed taken into account a queuing theory technique. A technique that has the optimum service delivery capacity in order reduces overhead costs such as waiting time as represented in equation1 (Fakokunde, *et. al.*, 2016).

$$\mu = \lambda + \frac{Cw\,\lambda}{Cs} \qquad (1)$$

where
μ = Average service rate
λ = Average arrival rate
Cw = Cost of waiting in the queue.
Cs = Cost of service per unit of time

Materials and Methods

Analysis of the Existing Food Ordering System

The scope of this research work focuses on developing an Android-based order-placement restaurant application for managing the ordering process, which makes the services in the restaurant more effective and more importantly incorporate a feedback mechanism. The system has taken different forms over time, all aimed at trying to make the services in restaurants easier and better. Presently, the existing system still operates based on traditional system where customers go to the restaurant, join a queue, and wait for services to be rendered to them and consequently wasted a lot of productive time. Due to the number of customers that enters restaurant at a particular time or the long list of customers awaiting to be served, errors and confusion might occur especially on the waiter's end, whom is the intermediary between the customers and the kitchen. There is no actual, direct or one-on-one communication between the customers, kitchen and the management of the restaurants.

The Proposed Food Ordering System

The operability of the proposed system would be presented by Figure1 in a conceptual design form as the framework. Similarly, Figures2 and 3 also depicted the functionality mechanism of the proposed system using Use Case and Sequence Diagrams respectively.

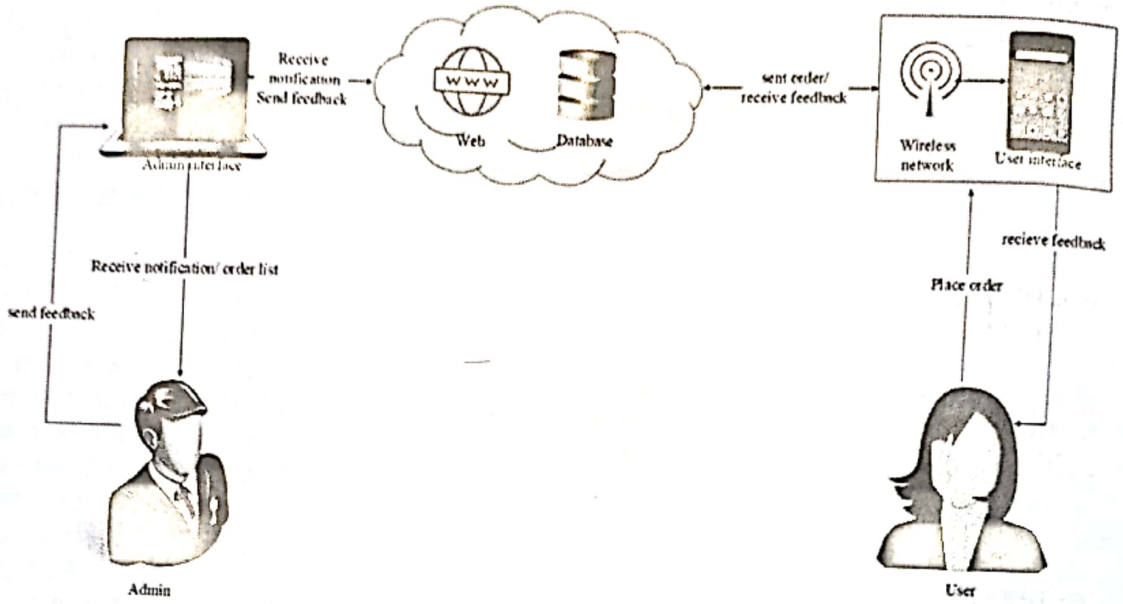

Figure1: System Architectural Overview of the Proposed System

The system Architecture of the proposed system is described as a three-tier design which is explained as follows:

i. The User Tier: The first tier is called user state. At this state, users will launch the application on their phones, register and proceed to the menu page where all the services to be rendered lies, service such as food order or send feedback. The system checks to see if user inputs the necessary requirements and acts upon it.

ii. The Server Tier: The second-tier accounts for the server state. At this stage, the server system will process the service/query sent to it by the user. There's an online database in this tier where everything i.e. the ordered food or feedback will be stored and pending, waiting to be acted upon.

iii. The Admin Tier: The Third Tier is the Admin domain. The administrator can be the Restaurant trusted staff, who would be in charge of receiving sent orders, act on it and send feedbacks. The admin system is a desktop application which will be installed on the admin system, the system receives all the transaction sent by the user from his/her mobile application. The admin is also in charge of updating the system by adding, deleting and other actions required.

Figure 2 shows the use case of the proposed system, and table 3.1 describes the diagram in a documented form.

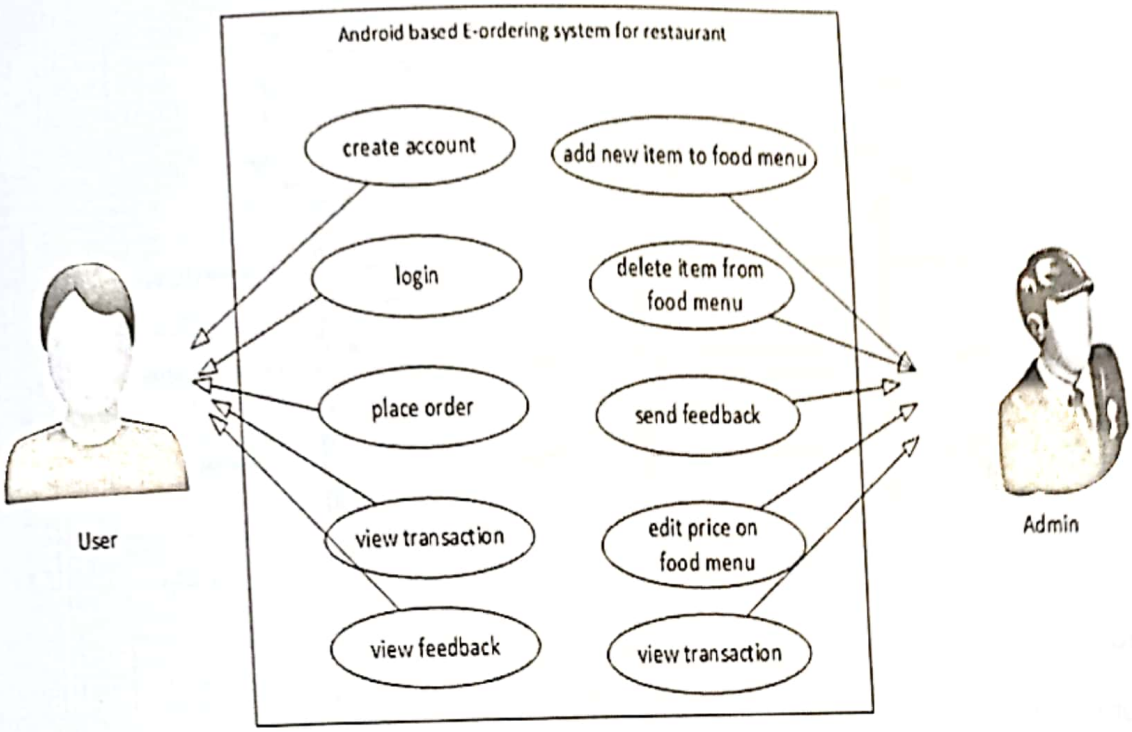

Figure 2: Use Case diagram of the Proposed System

Table1: Use Case Documentation

Use Case Name	Description	Actor Involved
Create account	The user creates an account after launching the application	User
Login	The user logs in the application	User
Place Order	User places order from list of items on the menu	User
View transaction	User views the transaction processes	User
View feedback	The user receives feedback from the restaurant about the order placed	User
Add new item to food menu	The Admin update the food menu by adding new items	Admin
Delete item from food menu	The Admin update the food menu by deleting old items	Admin
Send Feedback	The Admin sends feedback about the process of the order	Admin
Edit price on food menu	Amin edits the price on the food menu	Admin
View transaction	The admin view all the users transaction	Admin

Finally, the sequence diagram as represented in Figure3, shows the structural view of how operation flow in the system.

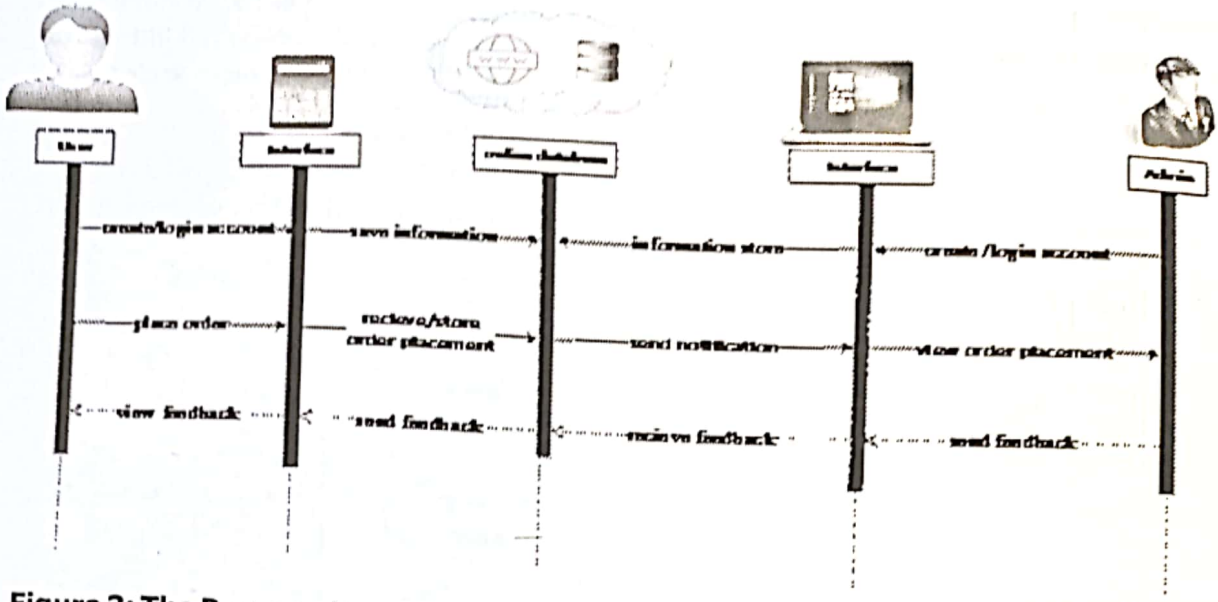

Figure 3: The Proposed Systems' Sequence Diagram

Figure 3 depicts the flow of operation in the system, from the user stage to the admin stage. Application is launched by a user after which the user logs, the user then selects the particular restaurant he/she wishes to order from, then places order. A notification is being sent to the restaurant to show that an order has been placed. The restaurant views the order, process it and send feedback to the customer.

System's Implementation, Results and Discussion

System implementation generally entails the process of assembling the subsystems together to create a new system, and perform test on it to see its result or outcome. JavaFX based Android Studio is used to implement the system. However, it is important to state that the proposed system is implemented based on the Algorithm1. A snapshot or code fragment of the implemented system at the design and runtime phases are presented by Figures4 and 5 respectively.

Step1: customer input order (i) or initiate action
Step2: ifi is available then
Step3: server initiates order received output message
Step4: fori ranges from 1 to n. arrays data structure(breakfast, lunch, dinner)
Step5: customer select payment and delivery modes
Step6: food delivered
Step7: customer initiates appropriate feedback based on step6
Step8: goto step1
Algorithm1: Algorithmic representation of the proposed system

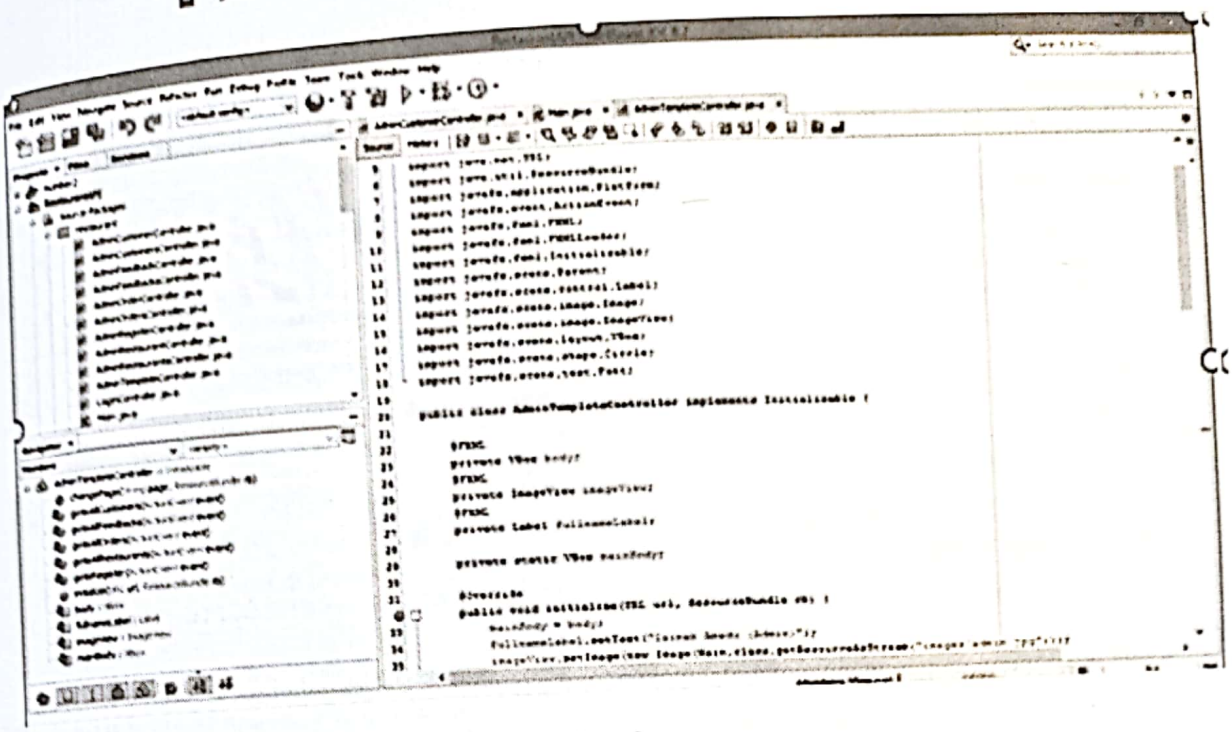

Figure 4: Implemented System at Design Stage

Figure 4 entails some programming codes written in Javafx of android studio, the palette of the right-hand side of the snapshot shows several controllers containing series of codes that tells the system what to design and how to do it.

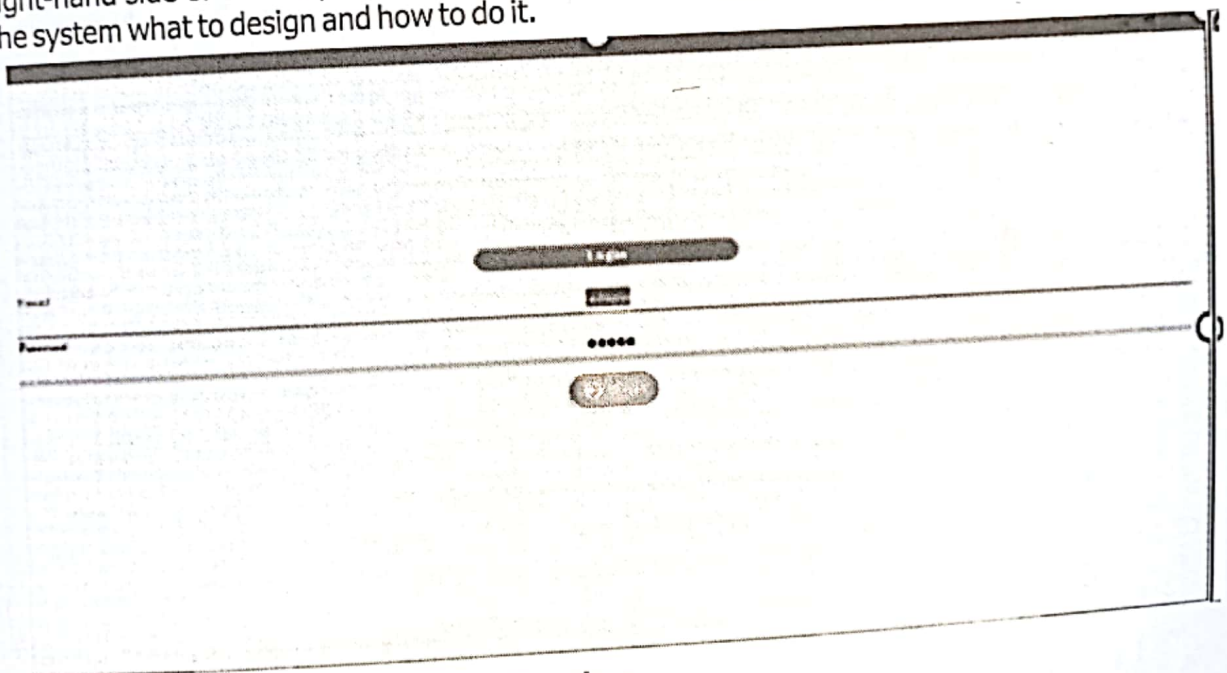

Figure 5:Implemented System at Runtime

The palette present at the right side of the android studio entail different controller written in javafx for the development of the system.

System testing was carried out in this section, it was carried out on the Graphical User Interface of the implemented system. After the user gets the application and launches it successfully, a screen requesting for login details pops up on the face of the screen as shown in Figure6.

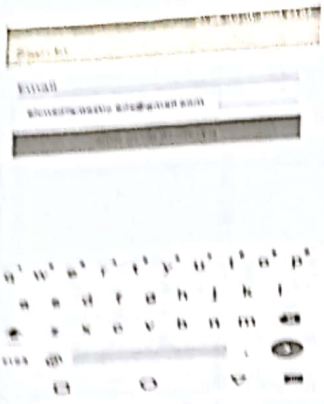

Figure 6: Sign in Page

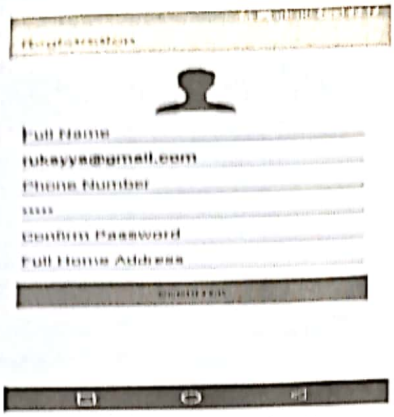

Figure 7: The Registration Form

Figure 8: Filled Registration Form

In this Figure6, sign in can only be achieved if the user already registered upon getting the application. The sign in form has suggest email that is, email that has been used for registration, whereas if the email is not registered in the system, it will take the customer to the registration page as shown in Figure7.Figure7 shows the second page the user comes across upon accessing the android application. The registration form is a kind of form a user need to fill in order to be able to fully access the application. It is only done once, after getting the application.Figure8 shows a filled registration form. Here the registration form collects user's information that will be used to render services to the user by the Restaurant. There are some constraint that were set when designing the system, constraint such as; email must be correct, pictures must be uploaded and no repetition of pin i.e. for user that has registered before.

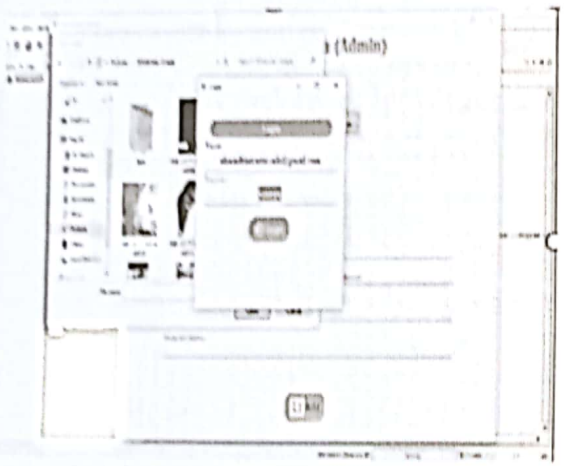

Figure 9: Log in Form for Admin and Restaurant

Figure 10: Viewing of Feedback

Figure9 shows the log in page and form for the Admin and Restaurant which cannot be accessed by any customer. The admin is in charge of registering a particular restaurant, after which the restaurant has its own log in credentials that will be used to view customers order.Figure10 shows how the Admin views the feedback sent by a customer. On the course of the proposed system evaluation, Table2 presented some of the feedback messages initiated by customers to vendors after the receptions of order placement.

Table2: Samples of Feedback Messages

A user ordered for fried rice and chicken but discovered that the rice is too spicy	The OrderID:005 of 15th of August, 2018 is too spicy	Message ID:005 received. Sorry about it. We promised to improved.
A user ordered for Pounded Yam but served with Semovita which was discovered after delivery.	The OrderID:011 of 22nd of March, 2019 is a wrong order served. Please, check your order log.	MessageID:011 received. Sorry about the inconveniences. Server has been ordered to immediately serve the appropriate order
A customer (user) ordered for launch (Pounded Yam with Vegetable soup) but discovered that the soup contains a lot of tiny bones of fish.	Refer to OrderID:017 of 15th of July, 2019; I did not enjoy the meal because of so many tiny bones in the soup.	MessageID:017 received. Sorry about the inconveniences. Training and retraining programs would be organized for the cooks.

The first column of the Table titled "necessitated actions" explained the scenarios or experiences of customer's order that necessitated the feedback messages from user or customer at the second column of the table. That is, user click the feedback button where all orders placed by customers as at that moment of time are displaced with their unique identification numbers (ID). The appropriate ID number is chosen along with date automatically and user type the message. And similarly, as expected reply message would be dropped back to the sender as clearly indicated by column three of Table 2.

Conclusion

Restaurants are one of the favorite hospitality industries where a person, group of persons or family can go to eat most especially lunch or dinner. In restaurant, a lot of man power is required in order to manage it effectively. Such as attending to customers inquiry, ordering food, making dishes. These services are carried out to meet with the goal of the restaurant to maximize profits and also satisfying their customer needs. The main drawback of the traditional system is, error or mixed up order, long queue of customers waiting to be served, the waiter will also get tired most especially when too many customers show up at the same time, time and resources such as papers waiters use in writing down orders. The focus of this research work is to develop an Android application for ordering food with feedback enable mechanism. An ordering system is referred to as a set of detail method that is being used in handling the ordering process in a restaurant. A good number of restaurant industries has been shut down or ran out of business due to the aforementioned drawbacks.

In view of the earlier mentioned drawbacks, the proposed system implored an Object-Oriented Analysis and Design. Android Studio, a mobile application software is used which is one of the approved tools for developing Mobile Application and is also a tool that will make the application run on various android mobile phones. The system was tested by installing the mobile application on 5 users' Android phones in which the system yielded an efficient and effective outcome in the testing and also gave an accurate result that is necessary and useful in consideration for system integration. Through using this solution, customers and restaurant operators can benefit from a seamless ecosystem concerning the processing of orders to restaurants.

The analysis carried out on the existing systems and the newly designed and implemented restaurant ordering application in this project work indicates that ordering food from a restaurant using the Android Application is easy and more effective and also saves time and cost due to its portability compared to going to the restaurant and making order. However, not without gap for interested researchers in the future to fill. For example, to identify a cohesive software engineering method as a guiding principle to develop the proposed system. Also, in the future we hope to incorporate the proposed system with intelligent algorithms that recommend meal or food for special customers that are guided with nutritional values or balance diets.

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