e-Wiring Application for Electrical Wiring Services

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Abstract—**Electrical wiring is the installation of electrical appliances and cabling to enable the distribution of electricity in the building structure. The electrician is the person that provides electrical wiring services and is responsible for electrical wiring installation. The e-Wiring application is a mobile application system developed for electrical wiring services. This application is directed to the client who needs the electrical wiring services and the electricians who offer those services. The difficulty to find the electrical services and the limitations of the electrician's working area are the issues that clients faced. Moreover, the services must be performed by certified electricians to avoid any mishaps. The electricians especially the start-ups, are struggling to promote their services to others, and it is also inefficient to advertise using social media and websites. This project is aimed to develop an e-Wiring application for electrical wiring services based on the user's area. e-Wiring applications are developed by following the Agile methodology which minimized the risk when developing the application and also promotes continuous improvement. Developing this system involves the knowledge of mobile application design, mobile application framework, database design and setup, and server configuration. The system utilized React Native as its application framework used to develop the user interfaces while PHP is used as the server-side scripting language. MySQL is employed as the system database and the application is deployed on the Heroku server. The e-Wiring application delivers functionalities that assist the clients to search for accurate results about the electrician and its services. Furthermore, the application capabilities improved the efficiency of the electrician's tasks and only provide the certified electricians to offer their services.**

Keywords- Wiring; System development; Mobile application

I. INTRODUCTION

The construction of houses in Malaysia is currently being considerably increased due to the demands of housing. Other than construction workers, one of the people involves in the construction of the house is the electrician. The electrician is tasked to install the electrical wiring system in that construction house. Furthermore, they also provide maintenance and repair of the existing electrical infrastructure as a means of safety precautions against electrical components malfunction.

The demands of the electricians are increasing exponentially as the construction of houses escalated. Many educational institutions mainly from the Technical and Vocational Education and Training (TVET) institutions such as Polytechnic have already offered a course in electrical wiring to provide semi-professional workers. Even though the demands are high, but the new graduates which started their own business still must face difficulty in acquiring a client.

Besides, the clients also must face the same difficulty as the method to find electrical wiring services are especially hard and distressing. It is crucial to find one as the installation and maintenance of the electrical appliance are important to provide safety to the house residents. Thus, the e-Wiring application was then proposed to systematically and efficiently solve this problem.

e-Wiring is a mobile application that provides the clients and the electricians a means to search and advertised their services, respectively. Even though there are other platforms such as social media or websites, but e-Wiring is much more organized and time-saving because of its centralized information.

II. LITERATURE REVIEW

Three existing mobile applications are selected for the system analysis which is Trivago, redBus, and Grab. The applications are chosen based on their similarity to the functionalities offered to the users. Their core functions, advantages, and weaknesses are studied and analyzed.

1. Trivago

Trivago is a hotel searching application that used a metasearch engine that compares accommodations prices and offers provided to them by many different online booking sites [1]. Their algorithm considers several relevant factors, such as the user's search criteria and the accuracy of the rates provided to Trivago by the booking sites. The main advantages of

Trivago are that the chances for a hotel to show up in the search are high based on the user's filters that help in advertising. Trivago aggregates hotel data from several sites to give the users more options in selecting the best hotel for their accommodation. The downside of Trivago is that they charge a commission for every referral, CPC that applies to the hotels. For the booking's cancellation, users need to follow the strict terms and conditions that are applied.

2. redBus

redBus is an online bus ticket booking platform that revolutionized the online bus ticketing booking industry by bringing together over 2,000 bus operators covering over 100,000 routes across the globe [2]. The agents, partners, and bus operators must be registered first with redBus before they become associated and conduct the booking activities. One of the advantages of using redBus is that the user can search the buses based on the departure and arrival points and the date of the travel. redBus also implement e-ticket so that the passengers do not need to print the ticket anymore. The major defect of redBus is that when problems occurred such as the internet connection being interrupted during the reservation process, the seat that has been chosen will remain unavailable.

3. Grab

Grab has expanded its services from transportation to food and essential delivery connected to millions of consumers to millions of drivers, merchants, and businesses [3]. Grab search for nearby drivers and check for their availability condition otherwise, it will go to the next round of assignments. The primary advantage of Grab is that guarantees that its drivers are all licensed and insured. The drivers need to follow certain procedures before becoming one of Grab's drivers. The drawback of Grab is that sometimes the drivers are unavailable on location since the drivers have the liberty to work when and where they want to. This behavior can lead to waiting time for the available drivers becoming relatively long.

Trivago, redBus, and Grab have offered great services for their users for all these years. These proven with them have reached millions of users and mobile app downloads. All the services that they provide are for the users to have a great experience when using their services. These services are developed by using several technologies which offer great utilization and security. These technologies that are being used by Trivago, redBus, and Grab systems will be compared to the e-Wiring technologies which are shown in Table 1.

Table 1 Comparison between Trivago, redBus, Grab, and the e-Wiring system.

	Trivago	redBus	Grab	e-Wiring
Database	✓	✓	✓	✓
Web server	✓	✓	✓	✓
Frameworks	✓	✓	✓	✓
Real-time tracking	✗	✓	✓	✗
Ratings/Review	✓	✓	✓	✗
Security	✓	✓	✓	✓

III. METHODOLOGY

Agile software development refers to software development methodologies centered around the idea of iterative development, where requirements and solutions evolve through collaboration between self-organizing cross-functional teams [4]. Though it states that agile methodology is a collaboration between teams, it can be adapted to work with only one developer as it is a requirement for this project. Moreover, the testing of the project is implemented continuously which makes the flaw of the project detected earlier. This continuous delivery that is distributed in incremental units is called iteration [5]. Agile software development of short iterative cycles offers an opportunity for rapid, visible, and motivating software process improvement.

The technology and tools used in the development of the e-Wiring application are React Native framework, PHP programming language, and Heroku web server meanwhile the tools of the development are Android Studio Integrated Development Environment (IDE). React Native is a JavaScript-based mobile application framework that is used to build the application UI. Meanwhile, PHP is a backend scripting language that is used to manage databases, dynamic content, and session tracking which can be integrated with MySQL database.

Heroku is used as the server to deploy the e-Wiring application backend programs which are the PHP files and the MySQL database. All the application coding will be programmed using Visual Studio Code.

The hardware that is used is an Android smartphone that running on at least Android version 8.0 because the lower version is no longer supported by Google which means there are no security updates available. The specifications for the smartphone are at least a quad-core processor of 1.4 GHz and Adreno Series GPU or any that is equal to or above it. The device also needs 2 or 3 GB of RAM and 16 or 32 GB of internal storage and a camera that have at least 12 MP resolution.

The software for the database is MySQL version 8.0 which is the latest version at this time. This new version of MySQL increases its reliability because the meta-data is stored in InnoDB which is a proven transnational storage engine and accelerated the performance and information schema. Next, is the Google Play Store application installed first to install the e-Wiring application. Moreover, it is also used to update the e-Wiring application when there are any additional features or new versions of it. Lastly, GPS is used to access the location of the user when using the e-Wiring application. GPS is already built-in in the smartphone so the users do not need to install it themselves when the only thing they need to do is enable it for the application to be accessed.

IV. SYSTEM DESIGN AND DEVELOPMENT

The user requirement is analyzed to study the user expectations and to provide solutions to the problems they faced. To further describe and examine the user's capabilities when using the systems, it is represented in diagrams which are use case diagrams, sequence diagrams, and activity diagrams.

The use case diagram is used to determine the functionalities of the system that corresponds to its users. The functionalities are derived from the user requirements to provide the capabilities that the user desired from this system. Referring to Figure 1, there are three actors or users of the e-Wiring application which are the client, the electrician, and the administrator. Each of the actors has its use case which represents the tasks that are used to interact with the system.
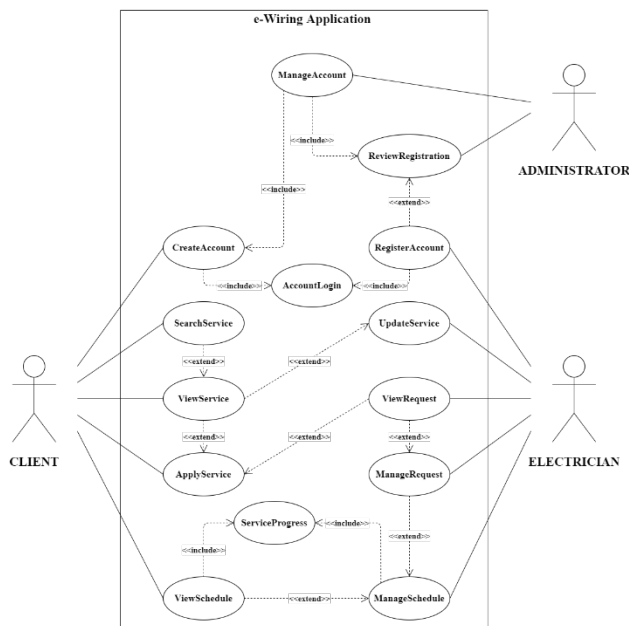

Figure 1 Use case diagram of e-Wiring application

The sequence diagram shows how the interactions of the events that happened in the system. These events occur in particular orders or sequences that describe how they work together in the use cases. For example, Figure 2 depicts the sequence diagram of the client's CreateAccount and AccountLogin use case. The system will check the login status, if it is true then it is redirected to the Client's dashboard else it will redirect the user to the login page. On the login page, the user will be authenticated before being redirected to the Client's dashboard.
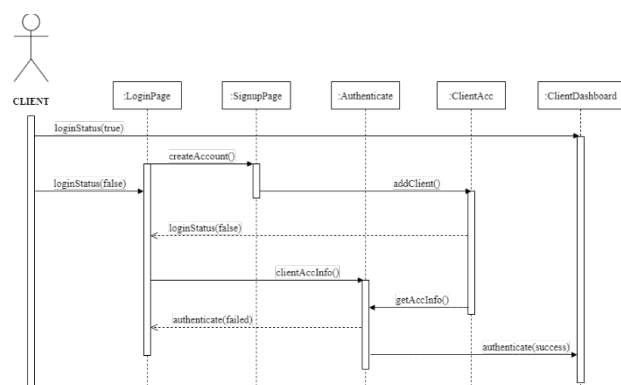

Figure 2 Sequence diagram of client's CreateAccount and AccountLogin use case.

An activity diagram is used to show the flows of action in a system. It is applied as a template for the process states that depict the behavior of the system which consists of activities and transitions. As an example, Figure 3 shows the client's activity diagram which represented the flow of processes for a client when using the system.
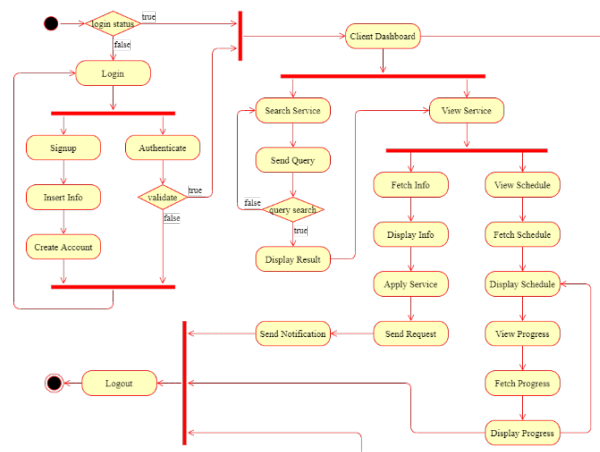

Figure 3 Activity diagram of the client.

Project design depicts the interactions and relations between system components, modules, interfaces, and data. These project visualizations are important when building the e-Wiring application because it shows the data and functions needed to build a fully functional application. This section will discuss the overall system architecture and the OOP class diagram. Figure 4 shows the e-Wiring application's overall system architecture. There are three users, which are an administrator, a client, and an electrician, for the e-Wiring application.
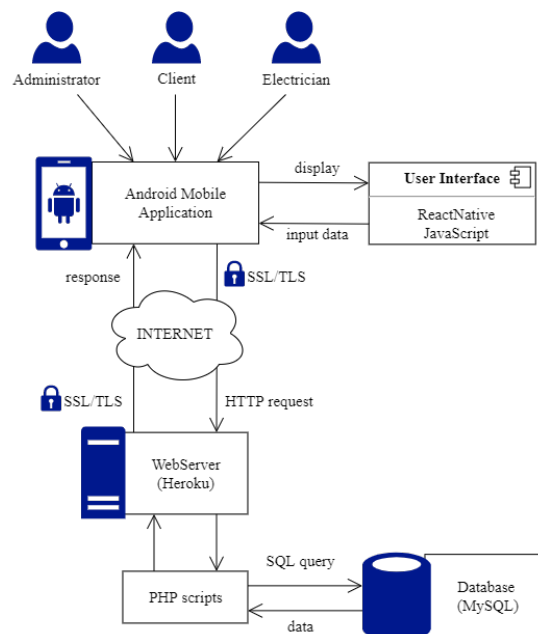

Figure 4 Overall system architecture of e-Wiring application

V. CONCLUSION

The e-Wiring application is developed to expectantly solved the problems that the clients and electricians faced when searching and advertising for electrical wiring services, respectively. However, several flaws are noticed in the application which is the Client's search result did not produce relevant results, slow connectivity with the Heroku's server, and the bugs that are presented in the React Native community packages.

Thus, many improvements can be implemented to the e-Wiring application to enhance efficiency and increase performance. Implementing the search algorithm will increase the efficiency of the searching functions as stated in the section above. To further improve the application capabilities, adding a chat box function can help both the Electrician and the Client communicate with each other. Moreover, enhancing the application UI can increase the user's understanding of the application functions and make it more comfortable to be used.

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