

Bill and Reading Bus Ticket App

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Abstract— This study aimed to develop a Bill and Reading Bus Ticket App. The system was developed for the benefit of Bus conductors specifically in ticketing to the commuters using a mobile app and send records to its data center. The ticket can be electronically produced by using the android mobile app and Bluetooth thermal printer. Its features allow users to store and manage location details and fare rate. The system can provide report according to its conductor and bus. The system has three (3) user types, the Administrator, the Conductor and the Inspector. The researcher utilized the System Prototyping Methodology in designing the system.

The researcher used Apache Cordova for android developing, C#.net for desktop server developing, SQLITE(Local Database) and XAMMP MySql(Database Server) as the backend in developing.

After the development, the system was evaluated using International Organization for Standardization/International Electrotechnical Commission (ISO / IEC) 25010:2011 standard for the evaluation of software quality in terms of product quality and quality in use.

The evaluators were composing of five (5) Drivers; Four (4) IT experts, and Ten (10) Conductors.

The result likewise revealed that the product quality of the system in the evaluation of the system's functional suitability with the description meaning of "effective". As to performance efficiency, usability, security, maintainability and portability of the developed system, the overall results showed which has a descriptive meaning of "very effective". Finally, the system's quality in use of evaluation result was excellent as to its effectiveness, efficiency, satisfaction, freedom from risk and context coverage.

Keywords: Bill and Reading, Bus Ticket, Mobile App.

I. INTRODUCTION

Bus transportation has been classified as an essential mode of travelling but in the current flow of Bus Transit operators are currently used to manual ticketing in issuing tickets to passenger.

Manually issuing of tickets is a very tough where the bus conductor uses a punch ticket system that can cause inaccurate ticketing punch that could result in inaccurate fare calculation.

With is, Manual Ticketing is prone to human errors and is time-consuming.

Other problem in the manual ticketing is that the inspector will manually check the conductor's ticket in if they are doing it right.

There are current solutions to this problem, and one of which is the smart card system. However, the disadvantage with this technology is that they are easily to be lost or forgotten and the level of security is poor. Also, smartcards, use more waiting line in the ticketing area and show no record of daily income.

So, the solution to this problem is the "Bill and Reading Bus Ticket App" which can issue ticket electronically and automatically save the daily transactions on the database where it can provide accurate and efficient records.

II. RELATED WORKS

In the study of Ahmed, K.A & Azman, T., (2015) [1], accessed on the website www.researchgate.net, entitled:

"MOBILE – BASED BUS TICKETING SYSTEM IN IRAQ" The use of bus in traveling is a large growing business in Iraq and other countries. Hence, bus ticketing system deals with maintenance records of each passenger who had reserved a seat for a journey. Moreover, the ticketing system includes maintenance of schedule, fare and details of each bus traveling. However, there are many bus operations, which were operated manually. The manual or traditional system takes a lot of time and causes many errors of the operation. Due to this, lot of problems occur and they were facing many disputes with customers and each branch works separately. To solve the above problem, and further maintaining records of items, seat availability for customers, and the price of per seat, bill generation and with the emergence of mobile devices are rapidly increasing among users, bus travel companies a chance to improve their business' performance by adopted mobile-based application. A prototype of mobile bus ticketing system (MBTS) is developed by using agile software development approach and Unified Modeling Language (UML) for designing the MBTS. The prototype is evaluated on it usability to ensure the successful implementation of the MBTS in the real environment.

This system relates to the study because it also uses a ticketing system via mobile app.

The log-in user is also required first before accessing the system. It means that the users must enter first his unique username and password in order to access the system depending on its role. The same concept to the system that the role of an admin can manage the bus location/route and user

account. Managing the users in the system helps the researcher during the design process and project implementation

Based on <https://iopscience.iop.org>, Oudah [2]. A (2016) presented an invention entitled: "RFID-BASED AUTOMATIC BUS TICKETING: FEATURES AND TRENDS". Recent advancements in various technologies have made remarkable developments in various fields for public welfare and public transport is one such area. In the near future public bus transport system with advanced technologies like Radio Frequency Identification Device (RFID), GSM, GPS, ZigBee and RF modules will gain spotlight due to their advantage of higher convenience and greater life standards as compared to the conventional bus systems. In this paper, a comprehensive review of all several proposed bus ticketing and bus information methods has been presented in detail. The study brings out improved solution in terms of cost, convenience, user satisfaction and future implementation. The choice of working modules and their efficient performance has been discussed along with the highlighted importance of the need of technology for welfare of common public and visually impaired.

This system relates to the study because of the ticketing-based produce electronically and automatically calculate the fare base on the starting and ending point destination of the passenger.

In the study of Alam, J.B. et. al., (2021) [3] based on <https://ieeexplore.ieee.org>, entitled "Automatic Bus Ticketing System Bangladesh". With continued economic growth and development Dhaka the capital of Bangladesh is starting to experience massive traffic congestion. This is causing extreme frustration to the people of Dhaka city. These results the passengers to wait for their buses for a very long time, added to that, the ticketing procedure is also lengthy. This paper proposes a new system that will use RFID based smart cards to digitalize our travelling facility by replacing conventional paper ticketing system. The smart card is held over the RFID reader at the entrance and also at exit and the corresponding fare due to the distance travelled is deducted from the passenger's account. All the calculations are done by the use of rotary encoder and Arduino. The system aims to increase customer convenience and eventually replaces paper tickets in transportation system.

The present study relates to the current system because it uses also a ticketing system that aims to increase passengers' convenience and users in terms of ticketing.

In the study of Sharmila, V. et al., (2019) [4] entitled "Digitized Bus Ticketing Framework". Smart Card technology is used to getting the ticket by withdrawing money from passenger's e-wallet inside the smart card instead of transaction of direct money, loss of coin change is prevented. The smart card is scanned using the app by the conductor and after entry of passenger details the device will generate the tickets and money will be directly debited from

their E-wallets. This technology is processed by the module in which the fare calculations are programmed. In addition to this a new feature is added that is if the passenger doesn't buy the tickets within a specific time a beep sound will be emitted and the particular person must buy the tickets. By this many frauds can be stopped.

The above cited study relates to the current system because it also uses an automatic fare calculation in issuing bus tickets. After the conductor input the location (starting and endpoint destination), the system will generate the bus tickets and directly give to the passengers.

Another study presented at <https://ieeexplore.ieee.org> was the invention Telluri, P. et al., (2019) [5] entitled "Automated Bus Ticketing System Using RFID". This paper exhibits a computerized transport ticketing for the Public Transport System utilizing RFID (Radio Frequency Identification Device) labels. Sooner or later, transport framework with cutting edge advancements like RFID, GSM and GPS will pick up spotlight because of their favorable position of higher comfort and more noteworthy life guidelines when contrasted with the customary transport frameworks. In the proposed framework, the passenger is identified automatically and the fare based on the distance travelled is deducted automatically, the use of RFID tags along with GPS is used to make the identification of passenger and the fare more accurate. The traditional paper-based tickets can be replaced by the RFID system as they are reusable and provide higher accuracy and hence they are much better. This replaces the existing paper-based bus ticketing system and also prevents corruption/unaccounted money. RFID tags are being used as tickets which are reusable and deducted the fare based on the distance travelled using GPS system by the user. This system minimizes human errors and effort.

In this study, the current system relates to the automatic calculation of fare and generating reports of the collections. Wherein the tally of the tickets and collection will be accurate by the help of the system. It will allow the users to easily manage the ticketing system and less human errors.

III. METHODOLOGY

Project Description

The Bill and Reading Bus Ticket App is a program that will issue ticket to the commuters using a mobile app and send records to its data center. This allows the users to login using their username and password. Also, it allows users to store and manage location details and fare rate. The system can provide report according to its conductor and bus. Also, the system uses a Bluetooth printer for the issuing of tickets.

The researcher uses Apache Cordova for android developing, C#.net for desktop server developing, SQLITE(Local Database) and XAMPP MySql (Database Server) as the backend in developing. The system can run from Android 6.0 to Android 10.0 with at least 2.00 GB memory capacity, processor 1.3GHz (Dual Core) CPU speed

and a Bluetooth connection.

The system has three (3) user types, the Administrator, the Conductor and the Inspector. The Administrator manages the overall function of the system including manage user's account and generating reports. The Conductor will be the one who will use the android app to be issuing the tickets to the passengers. And the inspector to view the income of the conductor.

System Development Process

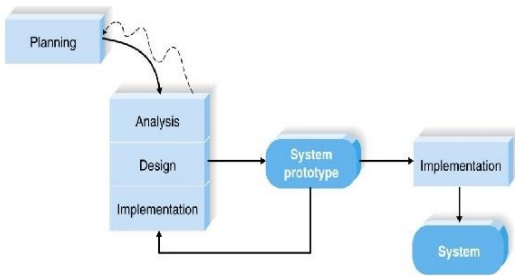


Figure 1. System Prototyping Methodology by Allan Dennis

Figure 1, shows from the beginning of the research up to the last process. System Prototyping (SP) model distributes the analysis, design, build and test phases into a series of short, iterative development cycle. SP makes heavy use of prototyping to make sure interested parties have a clear picture of all aspects of the system.

System Prototyping is easy to use. As a methodology, the diagram shows the step by step procedure so that the problems that might occur can be polished by reviewing every step. In SP, the functions are developed as the prototype is being integrated to make the complete process quicker it makes it easier to incorporate and understand the changes within the development. Dennis, Allan (2018) [6].

Use Case Diagram

This study uses Use Case Diagram to describe how the Admin and conductor can interact within the system in a Bill and Reading Bus Ticket. It describes and signifies an interaction over time that has meaning for the end user (person, machine or other system).

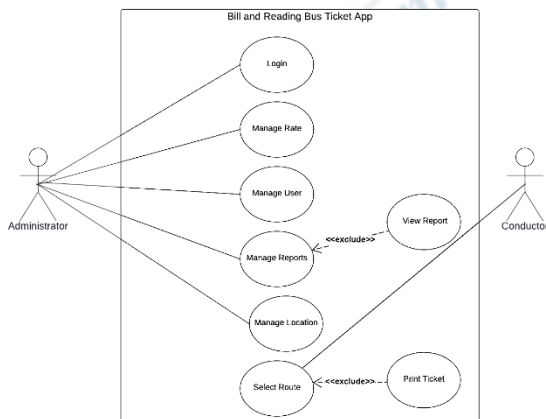


Figure 2. The Usecase Diagram

The Use Case Diagram in Figure 2 shows the User (Admin and Conductor) should login in order to access the system. It shows that the admin manages the Rate of the ticket for fare calculations. Under the Manage User Account, the admin can add, edit, and delete users' account. In Manage Reports the admin can view the overall or summary reports of the conductors, while the conductor can only view the report. Whereas, in Manage Location, the admin can add, edit, delete the locations needed for calculation of fare. Lastly the conductor selects route or location in order to print ticket.

Deployment Diagram

Deployment Diagram are used to visualize the topology of the physical components of a system where the software components are deployed. Deployment diagrams on the other hand, are used to describe the hardware components where software components are deployed.

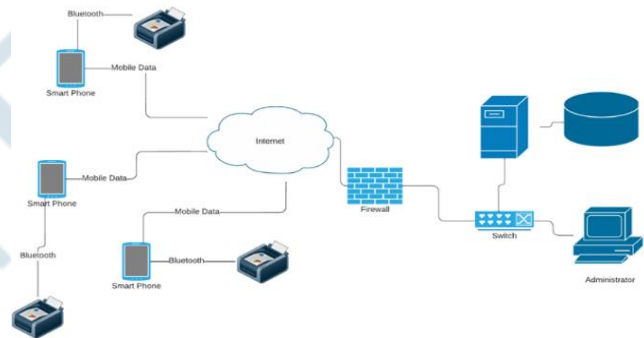


Figure 3. Deployment Diagram of the Bill and Reading Bus Ticket App

The Deployment diagram in Figure 3 shows the infrastructure of the system. The system can be accessed using Phone for the ticketing application and uses Bluetooth Thermal Printer for tickets printing. The system can be accessed by a Desktop Computer through Local Area Network (LAN) or Internet for the server side.

Project Evaluation

The system was evaluated by thirty (30) respondents to verify its conformance to ISO/IEC 25010:2011. This model was adopted for the evaluation of the potential user of the control system. The evaluation was done with the use of questionnaire, anchored by the ISO 25010:2011 as to product quality and quality in use. In particular, it uses the functional suitability, performance efficiency, usability, security, maintainability, portability.

The researcher used the five-point Likert Scale as the basis for evaluators in rating the system. The Likert Scale is an ordered, one-dimensional scale from which respondents choose one option that best aligns with their view. As in all scaling methods, the first step is to define what are to be measured. Because this is a one-dimensional scaling method, it is assumed that the concept you want to measure is one-dimensional in nature.

The system was rated based on ISO/IEC 25010:2011, standard evaluation of product quality and quality in use. The prototype was also evaluated in terms of aforementioned criteria.

Table 1.

Likert Scale Rating

Rating	Description
4.21-5.00	Very Effective
3.41-4.20	Effective
2.61-3.40	Fairly Effective
1.81-2.60	Less Effective
1.00-1.80	Poorly Effective

The evaluation criteria of the software for the proposed system will be rated based on ISO 25010:2011 product quality model, considering the criteria such as functional suitability, performance efficiency, usability, security, maintainability, portability.

Each criterion has to be evaluated as “very effective”, “effective”, “fairly effective”, “less effective”, and “poorly effective”. For statistical purposes, numerical weights are respectively assigned.

IV. RESULTS AND DISCUSSIONS

Technical Features of the System

The development of the Bill and Reading Bus Ticket App with the following features motivates the researcher to do the following:

1. How to develop a mobile app that can Manage location route and details;
2. How to development a system that can
 - a. Store, update, and remove a ticket rate
 - b. Generate reports on a specific conductor
 - c. Issue ticket using a Bluetooth printer
3. How to evaluate the in terms of Product quality and quality in use using ISO 25010:2011.

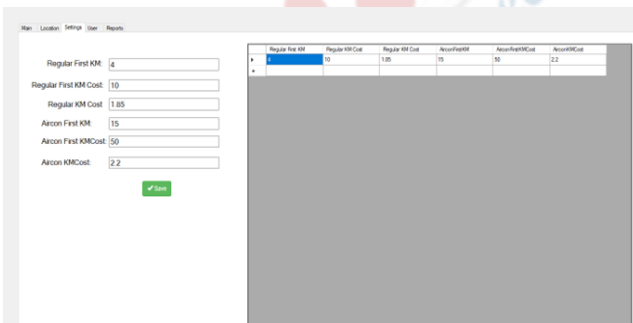


Figure 4. The Screenshot of Admin’s Managing Location or Route

Figure 4, In this window the system allows the admin to manage location or route such as view, search, add, delete locations.

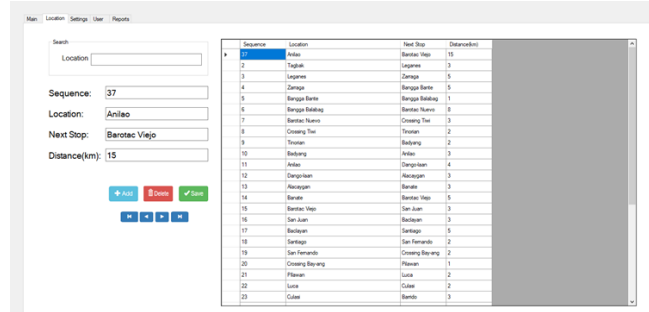


Figure 5. The Screenshot of Admin’s managing Ticket’s Rate

Figure 5, The figure shows the system allow the admin to manage the ticket’s rate such as saving. This is an important setting to be used for the calculation of fare in ticketing android app.

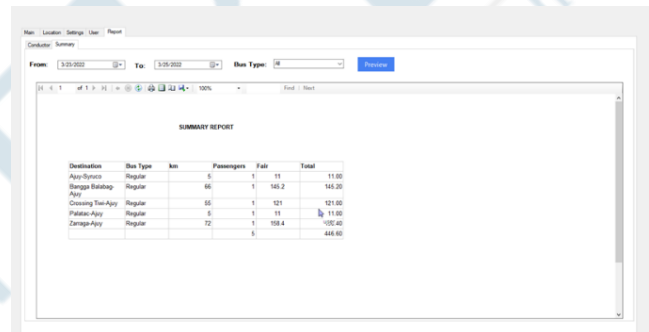


Figure 6. The Screenshot of Admin’s managing Report for Overall or Summary Report

Figure 6. The figure showing that the admin can easily view, produce a summary report of the Bus based on the date selection and bus type. The report shows overall information such as destination of the bus, bus type, total passengers, kilometers travel, fare and Total Collections. From this window the admin can also print the records of the overall or summary report.

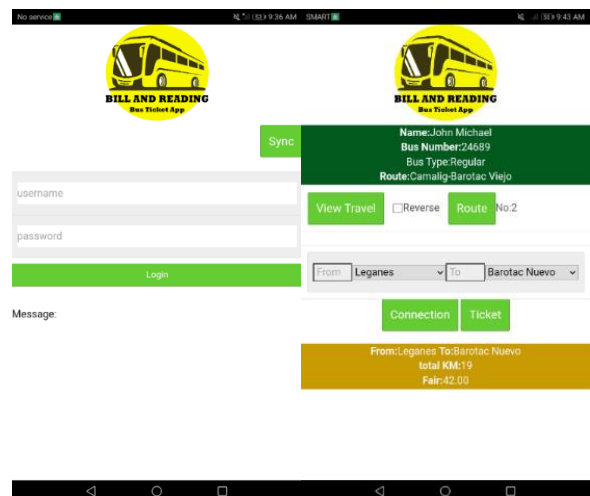


Figure 7 & 8. The Screenshot of Bus Conductor Log in and Issuing Tickets

Figure 7 & 8, the Bus Conductor Login Display allows the Bus Conductor to enter his/her username and password, once it is correct, the system allows the Bus Conductor to manage it. Upon Login, Issuing of Tickets will display and the app will allow the bus conductor to use the functions such as view Route travel, Route Travel and issuing tickets. The “View Travel” or the Route Travel is a button that will the bus conductor to view his recent tickets transaction.



Figure 9. The Screenshot of Bus Conductor Viewing Route Travel

Figure 9, In this figure shows that the bus conductor can view his recent transactions base on the route travel number. Destination, Kilometers, Passengers, Fare, and Total Collections is shown.



Figure 10. The Screenshot of Official Printed Ticket

Figure 10, The figure shows the sample output of the ticket printed from the app to thermal printer.

Table 2.

Variables	Mean	Description
Functional Suitability	4.17	Effective
Performance Efficiency	4.24	Very Effective
Usability	4.26	Very Effective
Security	4.24	Very Effective
Maintainability	4.4	Very Effective
Portability	4.39	Very Effective
Mean	4.28	Very Effective

Table 2. Software’s overall result of the Bill and Reading Bus Ticket App

The results of the evaluation of the system for the Bill and Reading Buss Ticketing System shows that it has an overall mean of 4.28 which means that the developed system is excellent in its functionality, reliability, usability, efficiency, maintainability and portability.

V. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

On the bases of the preceding findings, the following conclusions were drawn:

The system met its objectives in terms of managing location r route;

1. The system can calculate fare and on destination and print immediately an official printed ticket.
2. The system successfully records the billing and collections based on the route travel and generate overall reports.
3. The developed system/software had complied with the requirements ISO/IEC 25010:2011.

Recommendations

In the light of the foregoing results and conclusions, the following recommendations are hereby suggested:

1. The system should be real-time synchronization of the data between the Mobile app and the data center.
2. Mass production of this application for the bus industries.
3. The developed system and gadget may be used as reference for future research endeavors.

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