



An Intelligent Public Transport Tracking and Real-Time Monitoring System Using GPS and IoT

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ABSTRACT

Since the rise of information technology, manual has turned out to be exercise in futility and vitality particularly in the created nations. In Malaysia, fundamentally the manual system is as yet working and it must be progressed. The fundamental purpose behind not building up a robotized system is expected the absence of learning and inventiveness in information technology field. The essential point to carry out this venture is to make and plan basically by building a Bus booking system of Android Application for the organization in Malaysia, keeping in mind the end goal to exchange all their manual undertakings or routine operations into computerized system, which will enable the organization to serve its clients up to their ideal fulfillment. It is a typical thing that information technology has changed numerous manual operations to mechanized and individuals are getting a charge out of it much better than the manual system. The proposed system will serve and remain as a worldwide system communication arrangement of the organization with clients. The system allows users to book ticket on their fingertips without getting stress or going to the counter to purchase a ticket. Once you register by filling in all the necessary information you become a user by having all the access to use the system. The system has so many functionality such as - the bottom shows on application by knowing the routes, knowing the price and discount also displaying when booking, payment also is been provided all in the system. The system contains admin part which takes all the responsibility for updating most the information need for the benefit of the customers and also allow users to know all the information where each bus is going to and also by knowing the destination. The system also shows on how to get to each stop, and give users the fares for each route and also is tricky based on the location that is been provided for a user's.

Keywords: Bus Ticketing System, Electronic Ticketing System Mobile Application Development, Online Reservation System, Routes Plan, Price and Discount enable.



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I. INTRODUCTION

Transportation in Malaysia began to create amid British pilgrim lead, and the nation's vehicle system is currently assorted and created, according to Anon, (2014). Malaysia's street system is

broad, covering 144,403 km, including 1,821 km of roads. The principle expressway of the nation stretches out more than 800 km, achieving the Thai outskirts from Singapore. The system of streets in Peninsular Malaysia is of high caliber, while the street framework in East Malaysia is not too created. The principle methods of transport in Peninsular Malaysia incorporate transports, trains, autos and to a degree, business go on planes. The railroad framework is state-run, and covers an aggregate of 1,849 km. Well known inside the urban communities is Light Rapid Transit, which decreases the movement stack on different frameworks, and is viewed as sheltered, agreeable and solid.

1.1. Background Study

On this day with the use of technology always advancing in our daily life, people tend to use technology more than the way they study in various aspects. Innovation is a fundamental piece of our lives today and few can envision living without. We accomplished a great deal with the assistance of innovation, for instance we have the likelihood to travel, stay in contact with companions on the opposite side of the earth and cure numerous ailments. It implies more flexibility and decisions for individuals however in the meantime we need to consider the social lopsidedness, weapons of mass pulverization and regular asset consumption, according to Jane Godall (2014). Furthermore we know that choices one individual takes are not really useful for the general public overall. This infers to make innovation as positive as workable for humankind and nature over the long haul. The innovation we make now makes the future and it ought to be for the general population and make things simpler and not more entangled.

1.2. Problem Statement

A problem statement always expresses the words that will be used to keep the effort on tracking things out to represent a solvable problem with the existing system (Linus, 2014). Below are the problems with the current system.

- Systems that are used by the staff at the counter currently are an internal system and just used to sell the bus ticket at the counter. Customer has to go to the counter to buy bus ticket or ask for bus schedule.
- Furthermore, customers need to pay cash when they buy the bus ticket and sometimes need to queue up long time to get the bus ticket. Besides that, customers are also not allowed to buy bus ticket through telephone and the bus company's telephones are always busy line.
- Operation times of the bus station to book ticket are limited to the office hours only.
- People need to go to the bus station or terminal to book the ticket.

1.3. Aim and objective of the project

The fundamental aim to carry out this project is to create and design an Android Mobile

Application of Online Bus Booking System; in order to transfer all their routine operations into an Application, which will allow serving customers up to their optimum satisfaction. The proposed system will serve and stand as a global network interaction Application for Malaysia.

The objectives of this project are as follows:

To investigate and analyze the problems on the existing systems and provide a solution to the customer and management by having under stable system that individual will enable to operate within short period of time.

To identify the relevant features of various components and methods needed for the Android Mobile Application of Online Bus Booking System and also to give power of choice to consumers to choose which bus operator's services to use based on standard rating derived from consumer polling, traffic summonses obtained, and sales performance.

To assist bus operators' operations and marketing decision through timely decision making via Management Information System through the deployment of an Android Mobile Application of Online Bus Booking System.

Some basic components of an Android Mobile Application of Online Bus Booking System that provides enhanced service to the bus operators and customers consist of:

Capture of customer information such as name, address, phone number and e-mail.

- ✓ Price list.
- ✓ Bus operators ranking.
- ✓ Seating chart.
- ✓ Loyalty Points/Redemption.
- ✓ Search engine.
- ✓ Payment information/credit card authorization.
- ✓ Organization's advertisement/slogan, phone number, fax number, and address.

1.4. Rationale

In this period or era technology has turned out to be most determined instrument of every single human movement monetary, politically and social as indicated by Smith and Jack (2013) which unite the world more nearer by giving the world correspondence foundations to get together with human need. Be that as it may, technology assumes an essential part in business which helps in compelling and productive running of business by give all vital administration which are done manual to be change into robotized system. Besides, the system supersedes the general elements of manual system which runs exercises all the more adequately. These days all organizations are carryout online for simple access and for agreeable administration to clients or clients of the system.

2.0 LITERETURE REVIEW

As indicated by Boote, D and Beile, P (2014), literature review is an overview of insightful articles, diaries, journals, books and different sources that are relevant to specific chose zone of study, giving a description, abstract, rundown and basic and in addition top to bottom assessment of each related work. The reason for the writing audit is to put work in its unique circumstance and to offer an outline of huge writing distributed on a theme for better comprehension of the point.

Thus this chapter will give description, summary, basic and top to bottom investigation of what other research did in this field from distributed articles, books and different assets, and in addition benchmarking comparable system that was created in light of the related research subject. Additionally the devices and procedures like SDLC and Fact discovering strategy and also programming dialect and database to be utilized, the approach and prerequisite strategies for the advancement of the system will be completely distinguished inside this section according to Dogac, A., and Turner, A. (2013).

2.1. Review of Existing System

Existing system is totally on book and thus a great amount of manual work has to be done and the amount of manual work increases exponentially with increase in services that will require a lot of working staff and extra attention on all the records, says Meeker, M. (2015). In existing system, there are various problems like keeping records of items, seats available, prices of per/seat and fixing bill generation on each bill and also finding out details regarding any information is very difficult, as the user has to go through all the books manually and search for the records by

spending much of time by doing that according to Jakubauskas, G. (2010). Major problem was lack of security because someone can easily come and take up all the paper work that is been kept in file and go with. With this existing low priority in terms of exchanging of data within short period of time, given the scale of their operation, the majority of them do not offer computerized ticketing or reservations most of them are using counter to go and purchase tickets. The end result; a losing proposition for the bus operators, the agents and the customers who often end up seat less and the system has limitations in much cases there is no provision of returning tickets. And usually there is no published fares and the customers will end up paying what the agent demand for the ticket amount and also there is no standard system that will number the seat in the sense that customers are not assured of the seat preference.

2.2. The Existing System

1. **Katsana Tracking Devices** are made in Europe, withstanding strict European directions to guarantee that their clients have the best quality apparatus in the market. Katsana is Transit Application. They are a solid, affectionate group with in total more than 25 years of involvement in web improvement, social stage and adaptable applications According to Anon, (2014). The application gives a stage to different stakeholder's in a substantial endeavor to work together and share data for enhanced administration and administration ability. Through cutting edge APIs, the framework is fit for interfacing with outer frameworks like planning framework, resource control framework, and corporate money related/stock framework.

The key elements of Katsana Platform are:

- ✓ See the area of followed vehicles on a private guide.
 - ✓ See the speed, greatest speed, vehicle data and driver data of the vehicle.
 - ✓ Capacity to audit travelled course for now, yesterday, this week, and the whole month.
 - ✓ Capacity to refresh vehicle data and transfer photographs of the vehicle for documentation reason and care.
 - ✓ Deal with different vehicles crosswise over different divisions by means of client get to level elements.
 - ✓ Multi-gadget support from PC to cell phones, to tablets.
 - ✓ Capacity to automate report generation.
2. As one of the prestigious selection of GPS following framework supplier in Malaysia, Debezt gives beat scored quality as far as items and furthermore benefits According to Shiver (2015). It offers individual GPS tracker, vehicle GPS tracker, transport tracker, auto tracker and lorry tracker. With great open transportation, individuals will pick not to drive. This will help make this nation a greener place with less activity clog. Transports GPS trackers can be found in Debezt GPS are known for their GPS trackers in Malaysia. In the event that the transport takes another course or halted because of a few conditions, travelers will likewise be informed on the new assessed time landing. With the following framework, you can sit tight for that specific transport or to take another which will likewise convey you to your goal with a shorter holding up time. From the framework, they can recover the assessed time landing report and timeliness report so that the transportation administration can be progressed.
 3. **As Global Business Travel (GBT)** continues to use the American Express brand; we are committed to upholding the American Express reputation According to Shelly & Rosenblatt, (2014). Global Business Travel provides end-to-end corporate travel and meetings program management for companies of all sizes and across all industries through best-in-class booking

technology, smart analytics, worldwide strategic partnerships, and exceptional care. Their customers benefit from our purchasing power to access negotiated rates and our innovations that boost compliance, simplify reporting and help take the stress out of business travel. It all adds up to a bigger return on business travel and meetings investment and a better bottom line.

2.3. Comparisons between Existing Systems

After going on research and testing all the systems by getting their evaluation, the authors will now view and compare the systems in a tabula form by making it easier to understand between the existing systems. The authors is going to make three (3) comparison of an ongoing existing system in order to understand more about their features. The existing systems are: Global Business Travel (GBT), Katsana and Debezt.

Table: 2.1 Comparison table

FEATURES	TRANSIT APP (Katsana)	ARRIVAL APP (Debezt)	TRANSIT/ARRIVAL (GBT)
Payment Option	No	No	Yes
GPS	Yes	Yes	Yes
Book a Cab Feature	Yes	No	No
Real Time Tracking	No	Yes	No
Help Option	Yes	Yes	Yes
Platform	IOS & Android	IOS & Android	Web based
Route History	No	Yes	No

3.0. RESEARCH METHODOLOGY

3.1 Research Design

Methodology is a branch of knowledge that works with the general principles or truism of the integration or generation of new knowledge (McGrego and Murnane, 2013). It could also be defined as a system of methods used in a particular area of study. In addition, the fact finding technique that we use, will be discussed in this chapter, the authors will give concrete reason of all the choices made in the suggested technique to be used in this project.

3.2 Research Methods

Research methods, is a scientific inquiry with the goal of learning new facts, testing and gaining new ideas. It is a systematic collection of analysis and understanding of data to generate new information and answer certain questions or fix certain problems according to Degu, G. and Yigzaw, T. (2014). There are various types of research methodologies but the most common methods that the authors are going to use are qualitative and quantitative.

3.3 Qualitative Research

Qualitative Research is fundamentally exploratory research says Slevitch, (2014). It is utilized to pick up a comprehension of basic reasons, suppositions, and inspirations. It gives bits of knowledge into the issue or creates thoughts or theories for potential quantitative research.

3.4 Quantitative Research

Quantitative Research is utilized to evaluate the issue by method for producing numerical information or information that can be changed into useable insights. According to Mack don

(2014), it is utilized to evaluate mentalities, conclusions, practices, and other characterized factors and sum up results from a bigger example populace.

3.5 Overview method of collecting data techniques

Table: 3.1 overview of method

Technique	Key Facts
Interviews	Interviews can be conducted through phone call. Questions should be focused clear open ended responses. [2] Interviews are mainly qualitative in nature
Questionnaires and Survey	Results are generally easier to analyze. Posttest can be compared and analyzed. Responses can be analyzed with quantitative methods by assigning numerical values.
	It allows for the study of the dynamics of a situation,
Observation	frequency counts of target behaviors. Good source in providing additional information about a particular assembly

Selected Research Methodology (with justification)

For the research methodology, the author has decided to use a combination of both methods (quantitative and qualitative). This is because, as much as he needs good statistical analysis for this project, he also needs to get in-depth information from certain members of the public. The qualitative method does not require the author to depend on any instrument or device, just his own skills. For the qualitative, he will be interviewing 1 or 2 staffs at other bus pleases. And for the quantitative he will be using questionnaires with the scale of 50-100 ranging from strongly agree to strongly disagree.

3.1 Selected Software Development Methodology

For a successful development of any system, there must be a set of methods, principles, procedures and techniques that must be undergo by the developer/analyst which will help the analyst to understand. According to Martin, James (2014), Rapid Application Development (RAD) is the ways to deal with programming advancement put less accentuation on arranging and more accentuation on process. Rather than the waterfall demonstrate, which calls for thoroughly characterized particular to be built up before entering the improvement stage, RAD approaches accentuate flexibility and the need of altering prerequisites in light of information picked up as the venture advances. Models are frequently utilized as a part of expansion to or once in a while even set up of outline determinations. RAD has advantage of putting software into working earlier than any other approach, not necessarily need testing because of user involvement (user understand the system during the development process). But RAD required a highly skilled system analysts, also RAD requires lager percent of stakeholder' time.

3.2 Questionnaires

This is a fact finding technique used for gathering broad information from large group of potential users, it's often consist of set of written questions. Questionnaire is to select individuals whom the questionnaire will be distributed to. Those individuals should be selected from those who are using the system or related to the system. In this report students are the users of the system and

therefore the questionnaire will be given to 40 students however, it vital to know that not all distributed questionnaire got completed.

3.3 Designing the questionnaire

In this step the actual questionnaire questions are to be clearly written. The questions can be open-ended with no limitation to response or close end-ended with limitation to answers. Close ended questions tend to be most commonly used and similarly close-ended questions will be used in this report. The question can be in Softcopy (online) or hardcopy (printed), for this report softcopy is used (that is the questionnaire is published online). The nature of the questions is shown below:

- ✓ Gender; Male or Female
- ✓ Age, starting from 15 – 20. 36 years and above.
- ✓ Are you a smart phone user?
- ✓ What kind of smart phone you are using.
- ✓ Is it a friendly user?
- ✓ For how long have you been using smart phone?
- ✓ Have you ever used any booking Application system?
- ✓ What kind of booking Application system you use?
- ✓ Does the booking Application saves your time and energy?
- ✓ Have you encounter any problem with the booking Application you used?
- ✓ What kind of problem you encounter with the booking Application?
- ✓ How do you rate the efficiency of the existing system?
- ✓ What are your suggestions on how to better the existing application?

IV. RESULT AND DISCUSSION

In this chapter authors show all their ability and kernel in fully way that they implement the system and also shows and explain it in graphical user interface (GUI) by seeing it real within the form of screenshots. In this chapter also the authors show all the functional part of the system in screenshots that can be seen.

4.0 Analysis

Analysis is the process of breaking a complex topic or substance into smaller parts in order to gain a better understanding of it. The analysis divided into different form such as demographic data, current situation, and user acceptance model.

Demographic Data

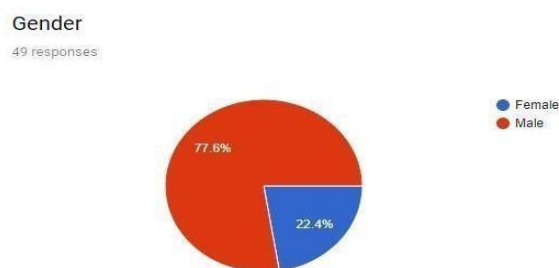


Figure 4.1 Gender

The first question on this questionnaire knows the age range of the respondent and by the users. According to the author findings, 77.6% of individuals that filled the questionnaire are Male and 22.4% go to Female. So Male is more using the system than the Female.

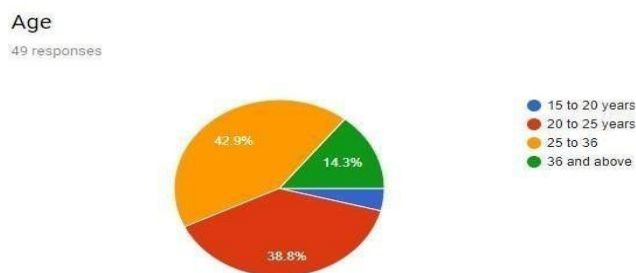


Figure 4.2 Ages

Here is the second part of my questionnaire that is been distributed out and get back the feedback by knowing the age range of responders. According to the author findings, 42.9% are those that fall in the range age of 25 to 36 of age, then follow by 38.8% that fall on 20 to 25 of age, the next is 14.3% which fall at the range of 36 years and above, the last was 4% which fall at the range of 15 to 20 years of the age. Base on this report, author distributes about 70 questionnaires and gets all this feedback from responders.

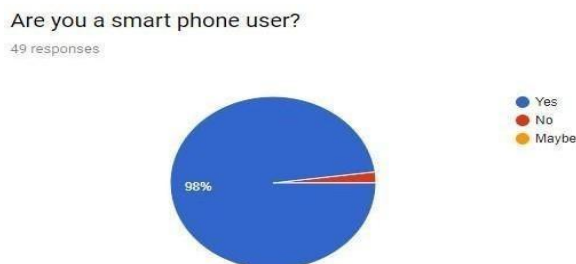


Figure 4.3 Smart phones User

On this part of the questionnaire, author wants to know the population of people that are using smart phones around. And by the used of this chart as you are seeing, much people are using smart

phones because of the generation that takes 98% of the population questionnaire that is been distributed and people that are not using smart phones are just 2% of the population. Smart phones now become our daily activities, people now they can't leave without smart phones because of the technology era we are today.

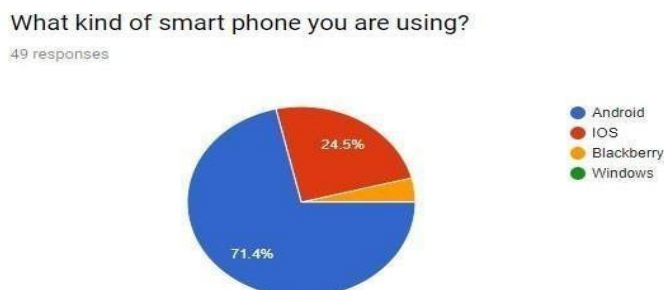


Figure 4.4 Different Smart Phones

This is another part of the questionnaire that the author will know the kind of smart phones people or respondents are using must, but base on the questionnaire that is been distributed as you can see on the chart people tend to use Android must in terms of cost and friendly using. On the feedback

report, Android has about 71.4%, IOS having 24.5% and Blackberry is 4.1%. As you can see people is user more Android phone than any other phone base on the report.

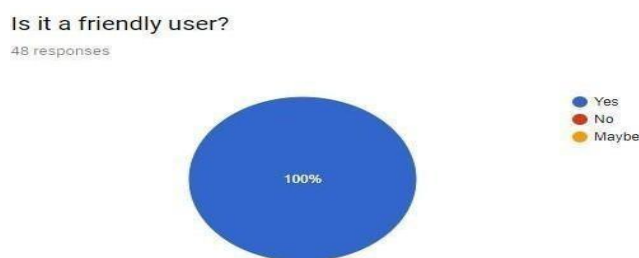


Figure 4.5 Friendly user

On this part author get to know wader the Android that people mostly used base on the responds for the questionnaire that is been distributed and the feedback above. On the above feedback people mostly used Android than any others and on this respond to audience show all their resins that Android smart phone is friendly user because on the chart it takes 100% from responders.

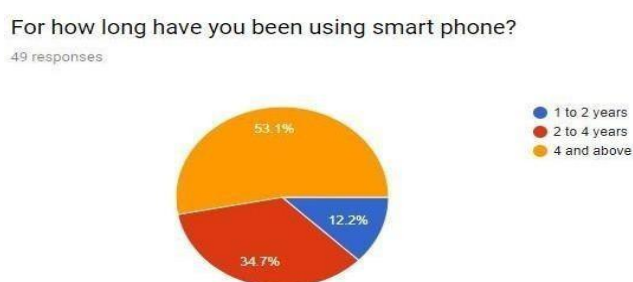


Figure 4.6 How Long Using Smart Phone

This part of the questionnaire that the author been distributed really wants to know the years that people or respondents have been using the smart and the experience they have using smart phones. Base on the report from responder shows that people are using smart phones for 4years and above because it show 53.1% of responders. On the other hand also people used smart phones for 2 to 4years base on the chart you see above it takes 34.7%. Also people that used smart phones for 1 to 2years are minority, because it takes only 12.2%

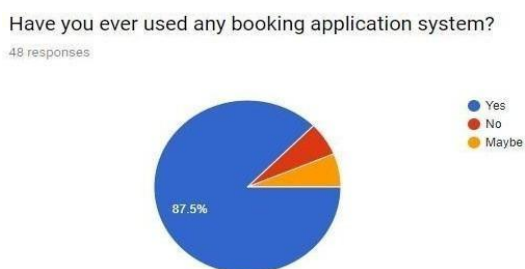
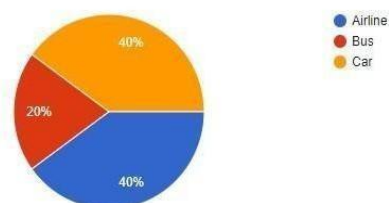


Figure 4.7 Have You Used Booking Application

On this part of the questionnaire author get to know wader people or responder have ever used any booking application in their life. The author has 48 responses of the people that used booking application among the 70 questionnaire that is been distributed out. Among the 48 responders 87.5% have used booking application system and 12.5% they didn't used or contemplating wader they used or not.

What kind of booking application system you used?

45 responses

**Figure 4.8 What Booking System You Used**

Base on this part of questionnaire author get to know what kind of booking application people or audience are more familiar with. On the chart above shows to author that responders get more familiar with Airline and car because Airline takes about 40% and Car takes also 40%, while Bus takes only 20% among the 45 responders that used booking system. Regardless to this report shows to author that Bus booking application is not been provided in most places or region.

Does the booking application system saves time?

47 responses

**Figure 4.9 Does the Booking Application save time**

Another part of the analysis, author want to really know wader the booking application system that audience used in figure above really save time or not because we am going to compare it with some analog booking system that is been existing. On this cart above shows that booking application save a lot of time to the users or audience because it take 93% among the 47 responders, while the people that have not used or contemplating takes 6.4% of the record.

Have you encounter any problem with the booking application system you used?

46 responses

**Figure 4.10 Have a user getting Problem with the Existing System**

This is another part that the author asking wader the booking system that the audience said they have used on the chart above have encounter any issues or problem with. On the chart above show to author that respondent have problem with the booking system that they have used because it take 58.7% among the 46 responses, while 23.9% has no problem with the system and 17.4% maybe they have problem with the system.

What kind of problem you encounter with the booking application system?

38 responses



Figure 4.11 what kind of problem user encounter

On this part of the research author wants to know wader the users are getting problem with the existing system or not but base on the report that author receive from audience shows that people are encountering problem. Firstly users are having problems with the booking application they used with the payment method because it shows 47.4% of users are having issues with the payment method and 28.9% are having issues with route, while 23.7% are having problem with no amount displaying before booking.

How do you rate the efficiency of the existing system?

46 responses

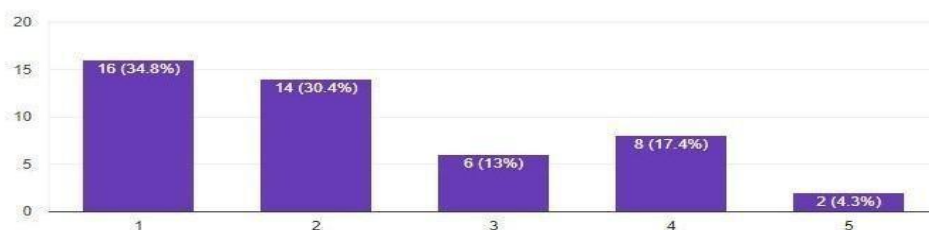


Figure 4.12 Rating efficiency with existing system

For the last part of the questionnaire author wants to know the efficiency for the existing from the audience on how they rate the existing system and how to improve the new system. Base on the report author have gather among the 46 responses, 34.8% rated, 30.4%, 17.4%, 13% and 4.3%. Among the rated existing system as you can see on the chart, user needs more features to add for the new system because an existing system has low priority from the users.

5.0 System Implementation

An implementation is an acknowledgment of a specialized particular or calculation as a program, programming segment, or other PC framework through PC programs and arrangement according to Laudon, K., & Laudon, J. (2014). Numerous executions may exist for a given detail or standard. For instance, web programs contain executions of World Wide Web Consortium prescribed particulars, and programming advancement instruments contain usage of programming dialects.

5.1 Tools and Justification

S/NO	TOOLS	JUSTIFICATION
1.	Java	Java is a strange state, dynamic, pitifully wrote, model based, multiworldview, and deciphered programming dialect.
2.	Android Studio	Android studio It is the official condition for android application improvement. It is extremely easy to understand and has a simplified capacity which proves to be useful amid the framework execution.
3.	Dreamweaver	Dreamweaver is a web growth environment, the developer used the tool to design web pages which were to be linked some of the application by using android studio.

4.	PHP	PHP is a server side scripting dialect composed principally for web development yet in addition utilized as a universally useful programming language.
5.	IDE	Integrated Development Environment (IDE) is a software application that gives far reaching offices to PC software engineers for programming improvement.
6.	MySQL	MySQL is an open source social database administration framework (RDBMS). MySQL is a focal segment of the LAMP open source web application programming stack (and other "AMP" stacks).

Table: 4.1 Tools and Justification

5.2 User Design Interface

An interface is a common limit crosswise over which at least two separate segments of a PC framework trade data. The trade can be between programming, PC equipment, fringe gadgets, people and mixes of these. Some PC equipment gadgets, for example, a touch screen, can both send and get information through the interface, while others, for example, a mouse or receiver may just give an interface to send information to a given framework. In this part authors will provide all his screenshot for the new system that he invented as you can see below.

1. Interface Design

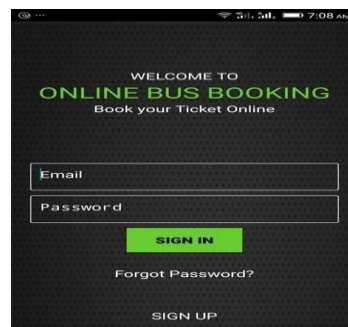


Figure 4.1 Interface design

This is the first screenshot for the interface of the system that the authors has built for the new system provided. Interface shows or lead the users on how to proceed to the next level by accessing the system as everyone can see the interface with some functional bottom on it.

2. Signup

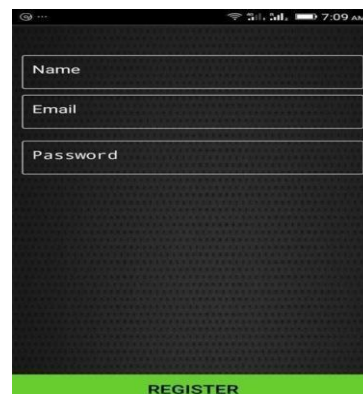


Figure 4.2 signup page

This is the second part of the system that the authors built for the new system. In this part of the system, user mostly registers first before having access for the system because of the security factors.

3. Login



Figure 4.3 Login interface design

In this part of the system, authors provided the login page for the users after filling the entire necessary question on signing up the page successfully. Login page is the page users always apply to have access to their information been provided when signing up in the application.

4. Forgot Password

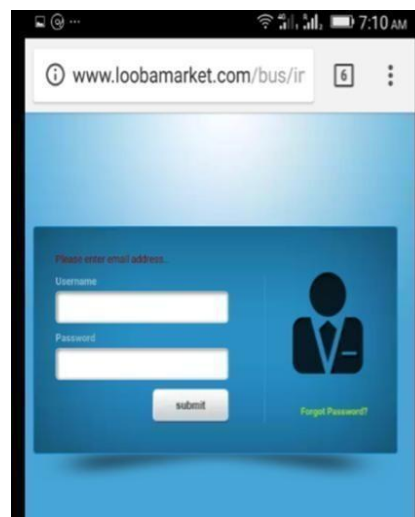


Figure 4.4 Forgot password interface design

Here is another part of the implementation called forgot password. This part is very important for the users, when they forget their password; they can easily re trip it back within short period of time. Forgot password is the bottom found on the interface of the implementation part created special for users that forgot their password, when a user click the forgot password it will automatically links it to the Google and re trip the password back to him/her email that has been registered with the application.

5. Available Cities



Figure 4.5 Available cities interface design

In this figure, authors have provided places that are available for the users, from which they can select and have their trip. As you can see above, the authors provided buses for each location that will be convenient to the users.

6. Selected City



Figure 4.6 Selected cities interface design

Here is the selected city that the user selects for her/him to have their trip. As you can see above the user selected the city that he wants to visit and the amount is displaying for him to know what is paying for unlike the manual system that agent can change his own amount for his personal interest.

7. Additional Information for the selected city



Figure 4.7 Additional Information interface design

With this part many activities is been provided for users after selecting the location or cities they want to visit as provide in figure above. As you can see on this part so many functional bottoms is provided when the user is processing for the booking such as contact number, Email, online browsing, TV channel and feedback on what users are experiences with the services that is being provided.

8. Booking



Figure 4.8 Booking interface design

In this part of the screenshot shown above, user is proceeding to his payment by filling up all the necessary information provided on the page before booking. As you can see some information need to be filled up like one way and check two ways for the trip and how many people the user is going to book. After filling in all the information, message will directly be sent to the user Email that he/she applied with for the booking reservation.

9. Payment method



Figure 4.9 Payment method interface design

In this part when users fill in the entire requirement for the booking, then pressing the bottom of booking it will lead users to this place and select the bank that users use.

5.1 Conclusion

Bus reservation system comprises of an online bus booking software which is designed with the main intension of generating an automated system for ticketing purchase, with the help of an online booking system which would be easy to use. An online bus reservation system for your mobile application would help in an easy management of reservation, ticket availability and data of the client who are using online bus reservation service. The customized features that a travel management company can add to a bus reservation system includes route scheduling, display the data in regards to availability of the seats, availability of the seat map for the travelers and the option for the travelers to select their seat from the seat map.

With the number of travelers increasing with each passing years, the demand for a well-equipped bus service has increased. Bus travel has gained a very eminent position when it comes to travelling within the country. Bus reservation system has become an important part of the travel technology and travel portal development initiatives. Travel portal development companies are working towards the development of bus reservation system and mobile apps, which are userfriendly for the travelers and a source of revenue generation for the travel management companies. Our responsive bus booking system with mobile apps (Android), is specially customized for travel management companies, destination management companies, travel aggregators, business 2 business (B2B), business 2 customer's (B2C) travel agencies and tour operators to cater global customers.

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