

“TrainGo App” - Mobile based Train Ticketing System for Railway Department in Sri Lanka

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Abstract: The Railway Department in Sri Lanka uses a traditional method to issue tickets to their passengers through counters who use short distance travel. Because of that passengers have to wait a long time in the queue to get their ticket and there is a possibility of miss the train. Hence, most of the passengers have a bad impression of train service in Sri Lanka.

The purpose of the system is to provide better service to the passengers by enhancing the ticket issuing process and improving good impression about the railway service in Sri Lanka

“TrainGo” mobile-based train ticketing system uses a QR Code scanning mechanism to reserve and purchase tickets.

The mobile-based train ticketing system provides a better service to the passengers by enhancing the ticket issuing process. Dynamic QR codes, E-Wallet system, Ticket booking system, Report generating system, and Admin backend panel are the main processes of the mobile-based train ticketing system. The QR Codes for the stations are generated by the devices dynamically based on the station and date.

The React framework, the Vue-electron framework, and node.js were used to develop the “TrainGO” app. Couch DB and the Pouch DB were used as the databases for the development purpose. Marvel App was used to design the App

It was identified a few similar types of systems in other countries during the

literature review, but those systems were not used technology which uses in the “TrainGo” app. Hence, the “TrainGo” app uses unique technology.

Key Words: Mobile App, Railway Ticketing System

Introduction

At present, the bus and trains are the two (2) main public transportation modes in Sri Lanka. According to the Transport Department over 90% of people in our country use one of these transportation methods to fulfill their daily transportation needs. Sri Lankan Railway Department uses a traditional method to issue tickets to their passengers on short-distance travel. Because of that passengers have to wait a long time in the queue to get their ticket and there is a possibility of miss the train. Hence, most of the passengers have a bad impression of the railway service in Sri Lanka.

The objective of developing the system is to provide better service to the passengers by enhancing the ticket issuing process and improving good impression about the railway service in Sri Lanka. Train Passengers, Ticket Checking Guards, and Station Masters are the main users of the app. The mobile-based train ticketing system provides a new ticket purchasing method using QR codes, ticket reservation system, payment through an E-Wallet system, Report generating system, and Admin backend panel for the backend purposes.

Literature Review

It was identified a few similar types of systems in other countries during the literature review.

An online railway booking system in China provides their passengers to register, book and cancellation (Zongjiang, 2012). This system has a typical three-layer system. DB layer, Application service layer and the user interface layer. Normally the DB holds the data of user registration, ticket ordering, and ticket data. The Application service layer consists of the business logic of the Railway online booking system. This system has customer register function, customer cancellation function, searching function, booking function, refunding function. In the Customer register function you can purchase tickets after logging. In cancellation function, can cancel either a ticket or registration of a user. So the database deletes the records according to the user requests. In searching function, you can search for the train and it will return a bulk of information about the train. After checking the data of the ticket the cancellation and refund system happens. The business process of this is Customers register personal information, so they can order tickets in the system. Customers search for train information through the system and see whether having appropriate tickets, order tickets on the user interface. The system returns the result of ordering tickets information. Customers can select canceling operation for some reason, so the personal information will be removed from the system. In the database, they store data about the ticket, ticket message, customer, and the train details. They haven't given the programming language about the system but I think they are going to use java and MySQL for the program.

There is a railway ticket issuing system using a smart cards in India (Kumar & Ram, 2013). It consists of these items for the ticket issuing process. It is a completely new hardware and

software combination. Microcontroller, power supply unit, keypad, printer, display, smart card driver in each system. So these people creating a new machine for the smart card technology. According to their research paper, they first Insert the SMARD CARD and enter the secret password. Then check whether the entered password is correct or not. If the password is correct it will go to the next step. If it is wrong it will go to the previous step. Then we have to select our option from these two options 1. Recharge, 2. Ticket. If we select option 2, the following steps to proceed. Select our destination place and the number of tickets. Then the following details will be displayed ticket price, the number of seats, seat availability. The printed ticket will be collected from the printer else if we select option 1, the following steps to proceed. Enter the amount to recharge Confirm the amount to recharge or cancel. Then the following details will be displayed successfully recharged and remove your card. They are going to use these two software for the development PIC COMPILER and Proteus 7.6. So this system is not only a program, it is a complete system. They have these FLASH Program Memory, Up to 368 x 8 bytes of Data Memory (RAM), and Up to 256 x 8 bytes of EEPROM Data Memory. And also the smart card can be also reprogrammed.

A mobile solution for railway booking in India using a Wi-Fi to get tickets (Maheshwar, 2018). It used Wi-Fi facility in the train stations. Installation starts from registering the user to the system. After that, there is a typical login page for the user. So the user has to enter the information about the destination, no of tickets and about the return ticket or normal ticket. Then the user can see the price amount. Users can also view the existing account balance according to the user requirement. Users can also top up the application using manual payment or using a credit card. After that pdf type ticket will

generate in the device and at the destination user has to give that to the e-ticket checker application. Their expectation is to reduce the time in the ticket queue. They listed down the software requirements for this application as follows, Programming Language (Java) JDK 1.8, Operating System (Windows 7, 8, 10), Android Studio, and PHP as a server, Database (SQLite, Cloud). They have listed down the Hardware Requirements as Intel Pentium 4 processor or higher. Minimum RAM of 512mb. Free disk space of 16GB or more. 1024 x 768 resolution monitor. For the development purpose. They are using SQLite for the internal DB, QR Code Technology as technologies for the android application internal technologies. This system helped me a lot but there are some technological gaps so I am going to fix them in my application.

It was found another similar type of railway booking in India with the E-Wallet system (GIRINIVAS, 2015). E-wallet scheme ensures that registered customer is not directed to the bank's server for the payment every time, ultimately saving a considerable amount of time and increasing accuracy. So people can go and deposit some money in the IRCTC and they can access that money for the ticket buying. This application has a login function for the app and if the user is not registered have to register. Then the user can access that e-wallet and buy a ticket. There is a wallet button to see the credit balance. Users can use that to book the tickets also. Admin can log in and add fare details to the system. Users can buy tickets using that system. After the booking ticket user can see the details about the trip and also the fair. Then he can purchase that ticket using the E- wallet. The technology that they going to use for this system is android, SQLite, Eclipse, and Android Studio. Actually there are so many spaces in this system. So I am going to fix those spaces in my system. Their aim is to reduce the traffic in the system so user don't

need to access the bank servers all the time to purchase a ticket.

Most of the similar types of the system were used online booking systems and card-based systems (Brakewood, et al., 2014). According to this their tickets purchased and validated through smartphones. In their country they have a conductor and they show that ticket to the conductor. Using credit, debit card or any other payment method travelers can purchase a ticket using mobile. It happens real-time over the cellular network. Then the conductors have a machine to check the barcode of the ticket. So it can be validated using that system. This app is launched to android mobiles and iPhones. They can purchase multi-ride or single-ride tickets using the app. They have used the barcode system to validate the ticket. In the app you can see recent trips. After giving the information can review the details of the ticket. Then you can do the payment after the payment can see the barcode of the ticket. This barcode then validated using the conductors' app. So these people did some research to find some data about the user. The most used device during the past 30 days is the iPhone. It is about the US railway system. But in those days most people don't like to do online purchases. The users finally adopted the mobile ticketing system. They forecasted the future before introducing the system. With the spread of mobile devices, is likely to increase users in the future. From the first phase 26% of users liked to adopt this technology in the US. The simple but efficient system was designed for android and also IOS.

Research Methods

Sample (N=400) consists of passengers and staff at the railway station. Interviews, Questionnaires, and Observations are used to collect requirements (Rouse, 2007). Figure 1 illustrates the features available in the

system based on the gathered requirements from the sample.

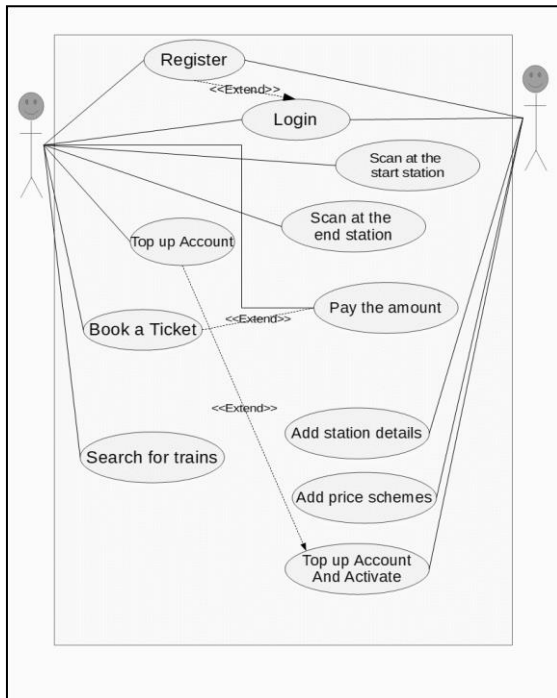


Figure 1: Use Case Diagram for the System

Main mobile app named TrainGO and the backend admin TrainAdminGO was developed. This process was time driven and developed to satisfy all the needs and wants of the Train Department in Sri Lanka.

Hybrid methodology was decided to use through the development process. Because of its advantages from the waterfall model and the agile method as it was the best methodology to use. For the development purpose react framework, the Vue-electron framework and node.js were used mostly. Couch DB and the Pouch DB were used as the databases for the development purpose. Marvel App was used to design the App.

Result and Discussion

A mobile-based train ticketing system is developed by carefully analyzing the collected requirements. (1) Navigation must be simple, (2) easy to set up and use, (3) make quick the response, (4) payments must be easy, (5) user training are the expected requirements from the solution.

The train ticketing system has two (2) mobile applications. One application (TrainGo App) is for the train passengers and other applications (Train AdminGo App) for the station masters and guards. At present, most of the people in Sri Lanka use smart mobile phones. Therefore, the mobile-based train ticketing system “TrainGo” is a practical solution to issue and reserve tickets.

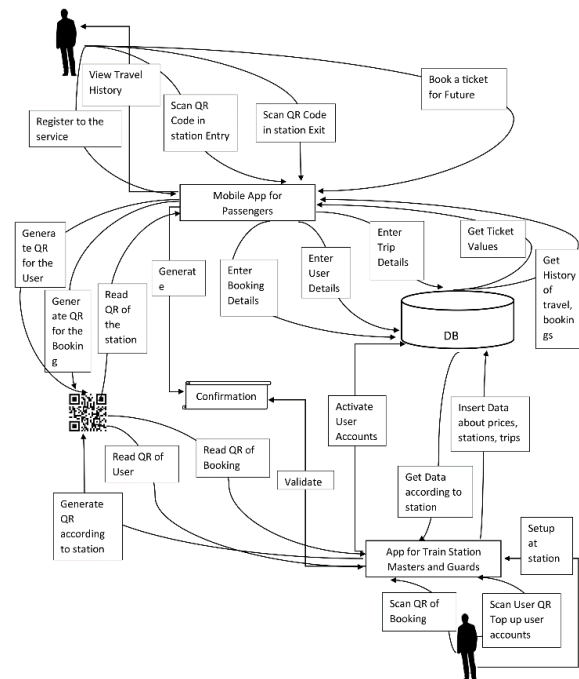


Figure 2: Overview of the Mobile based Train Ticketing System

Source: Authors Constructed

According to the above figure 2, there is a device placed in the railway station to display a QR code (QR code varies from the railway station and the date). Passengers have to scan the QR code which placed in the railway station using the “TrainGo” app before they start the journey and it gives users/passengers access ticket screens. Through the “TrainGo” app simply avoid purchasing a ticket from the counter which reduces the usual queue. While traveling, passengers can change their class and number of passengers. The tickets will be validated by train guards on the train. When the passengers arrive at the destination, they can scan the QR code in the respective railway station. Further, the system

calculates the total cost of the trip and it deducts from the e-wallet of the respective passenger that integrated into the app. The e-wallet can top up using a credit card, debit card, or cash.

Passengers can reserve their tickets using the “TrainGo” app. Once the reservation is made, the relevant data transfers to the DB and can be validated using the guard’s mobile application during the journey.

As there is no human to human involvement during issuing tickets or season pass, social distance can also be maintained at the railway station and no transactions through money which reduces the risk of Covid-19 Pandemic.

The new ticket purchasing method using QR codes, E-Wallet system, Ticket booking system, Report generating system, and Admin backend panel are the main features of the mobile-based train ticketing system.

In the manual system, the railway guard checks and validates the tickets. According to the passenger's requirements, they can use the E-Wallet facility to the top-up the available amount, check balance, and get notifications. Furthermore, passengers can reserve tickets by providing the date, time, and number of seats through the “TrainGO” app. User interfaces of the mobile-based train ticketing system are as follows:

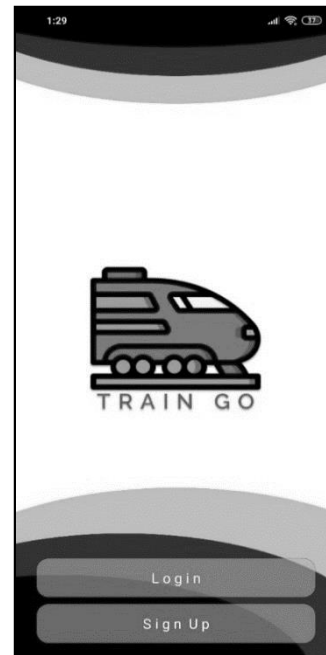


Figure 3: Login Page of the App

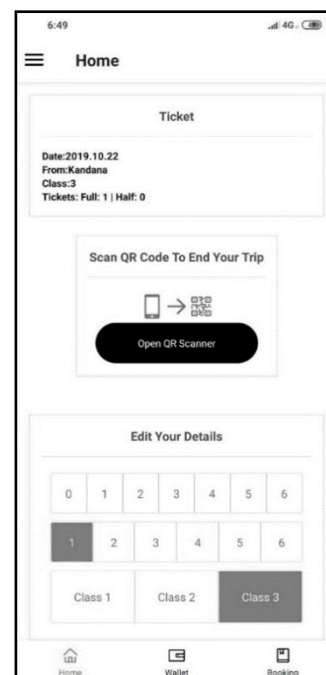


Figure 4. Scanning QR Code

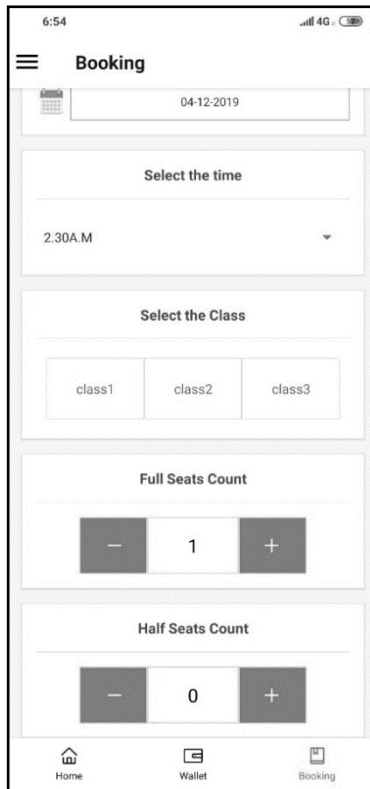


Figure 5: Make Booking Screen

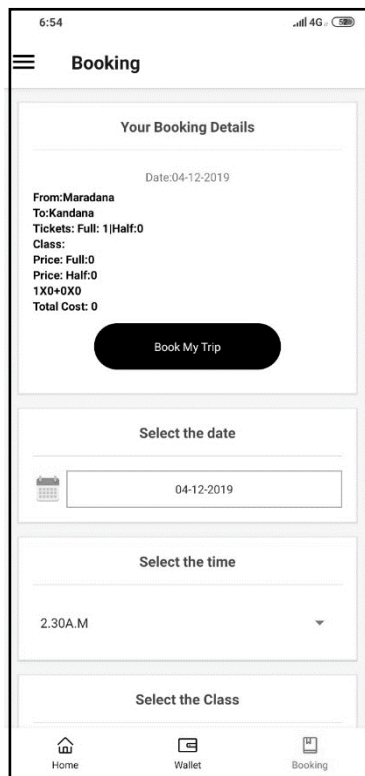


Figure 6: Change Booking Details

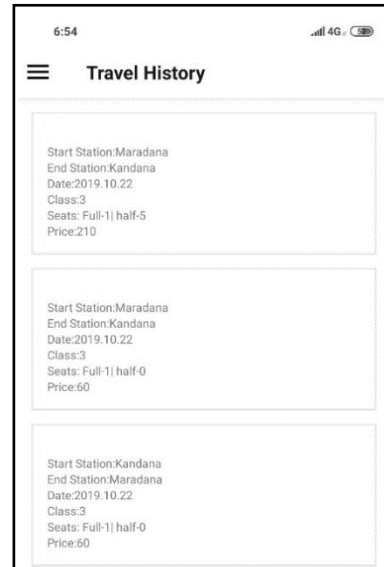


Figure 7: Travel History Details

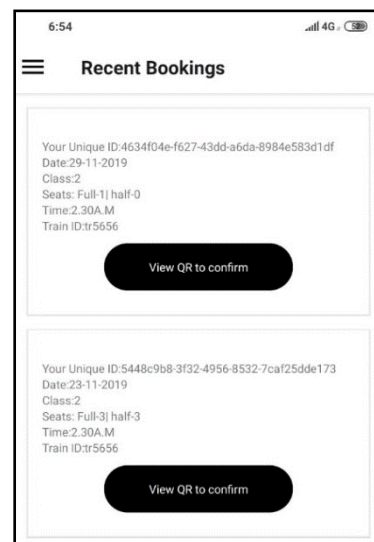


Figure 8: Recent Booking Details

It was decided to print QR codes and set it in train stations as the initial plan. But then, it was found that the static QR codes can be bypassed by the passengers. Hence, the QR Codes for the stations are generated by the devices dynamically, based on the station and the date. Through the E-Wallet mechanism, passengers can pay for the tickets, and also they can top up the E-Wallet system through a bank transaction, credit card, or debit card. These are the novelty features available in the “TrainGO” app which cannot find in the similar types of systems available in other countries.

Due to the limitations of testing the system in the real environment, the testing of the system is done in a simulated environment. Finally, this system can be installed in any device that runs Android OS. Accordingly, the generated QR codes can be pasted at several locations in the railway station which passengers can easily scan the code through their smartphone.

Conclusion

Sri Lankan Railway Department uses a traditional method to issue tickets to their passengers who used short distance travel. As a result, long queues can be seen in ticket counters and passengers have to wait a long time in the queue to get their ticket and there is a possibility of miss the train. Hence, most of the passengers have a bad impression of train service in Sri Lanka. The mobile-based train ticketing system "TrainGo" provides a practical solution to those issues and it enhances the ticket issuing process, provides better service to the passengers, and impresses about the railway service in Sri Lanka.

The React framework, the Vue-electron framework, and node.js were used to develop the "TrainGO" app. Couch DB and the Pouch DB were used as the databases for the development purpose. Marvel App was used to design the App. Therefore, the "TrainGo" app can introduce with a minimal cost that can be affordable to the stakeholders of the system. At present, smartphone usage has increased considerably. Even without training, stakeholders can use the "TrainGO" app.

References

Brakewood, C., 2014. *Forecasting Mobile Ticketing Adoption on Commuter Rail by Candace Brakewood*. [Online] Available at: www.scholarcommons.usf.edu/jjpt/vol17/iss1/1

GIRINIVAS, N., 2015. *International Journal of Computer Science and Mobile Computing*. [Online]

Available at: www.ijcsmc.com/docs/papers/March2015/V413201594.pdf

Kumar, C. & Ram, V., 2013. "IJIREEICE_ A Monthly Peer reviewed Online Journals,". [Online] Available at: www.ijireeice.com/wp-content/uploads/2013/03/6b-a-Ram_Kumar-train_ticketing.pdf

Maheshwar, V., 2018. *IOSR Journal of Engineering*. [Online] Available at: www.isorjen.org/Papers/Conf.ICATE-2018?Volume-13/9-33-38.pdf

Rouse, M., 2007. *requirements analysis (requirements engineering)*. [Online] Available at: <https://searchsoftwarequality.techtarget.com/definition/requirements-analysis>

Zongjiang, W., 2012. *Railway Online Booking System and Implementation - Science Direct*. [Online] Available at: www.sciencedirect.com/science/article/pii/S1875389212016155

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Author Biographies



Mr. A. D. Supun Nimesh graduated from the faculty of IT in Horizon Campus in 2020 and developed the "TrainGo" app to fulfill the requirement of the final year project. Currently, he is working as a Junior Custom Officer and involving software development project in part-time basis. Further, he was an awardee of the Deans' List in all four years during my degree program.



Ms. Samantha Wickramasinghe completed my MSc in IT (Cardiff Metropolitan, UK), BIT (UCSC, Sri Lanka). Currently working as a Lecturer in IT at Horizon Campus. She has more than five (5) years of teaching experience in undergraduate degree, final project supervision and twelve years of experience in Quality Assurance in Higher Education. She published twenty papers related to IT and QA. She has the membership of Computer Society of Sri Lanka.



Mr. Sunesh Hettiarachchi has more than 14 years of industry experience in Software Industry including 6 years of managerial experience. He is working as a part-time visiting lecturer and conducting lectures and supervision for undergraduate and postgraduate level. Nearly eight (8) papers related to the Business Management and IT are published at National and International Conferences. Further, he is currently reading for the DBA (Lincoln University College, Malaysia). He is a member of ACS.