Smart Ticketing and Seat Reservation System for Sri Lankan Railway

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Abstract - This system is formulated to overcome the significant flaws in the present scenario and the consequences of traveller ticket buying and seat reservations, which frequently lead to mistakes and long queues. Long queues are a massive issue in the current railway system. The proposed system provides proper solutions for train passengers to make their daily travels easy, and most local and foreign travellers use trains to move to their travel destination. Nevertheless, there are some issues with the current train seat reservation system. The proposed system will be able to give a solution for these issues. The proposed method is an online application that allows travellers to buy ticket seat reservations from their mobile phones. The unique feature of the new proposed self-seat reservation system is that travellers can reserve any number of seats according to their preference. Moreover, in this research paper, we have discussed some solutions for people who cannot use smart phones, and who do not have the technical knowledge to use smartphones and modern technologies. A system dashboard is a separate application of a system used for management system works, reservation and database.

Keywords: smart reservation, e-ticketing, train ticketing, e-transportation

I. INTRODUCTION

The railway is one of the most important modes of transportation and plays a vital role in the transport industry. With such a vast customer base, purchasing train tickets has been a preeminent problem. Every day there are long queues in front of the ticket counters at the busiest train station. It is a waste of time, and most local and foreign travellers have faced many difficulties with the current train seat reservation system. There is no proper method to refer to train details before reserve. The difficulty of railway tickets might be solved through electronic commerce. Implementing a new online ticketing system is not the only technological advancement, but it will also improve railway services and, to a certain extent, resolve the challenging problem of railway ticketing.

"Smart Ticketing and Seat Reservation System" is a mobile application as well as a web application. It is for making an online reservation and ticket buying. To buy a ticket, the user should create an account and log in to the application. After that, a payment method should be set. As soon as payment is made, a QR code is generated. Passengers should scan QR codes to enter the train station before getting on to the train. After they get off the train same QR code should be scanned to inform the end of the ticket to the system. The system calculates ticket prices using start train station, end train station, and transitions. As well as someone wants to print a ticket at home, the system gives function for it. A computer can be used for it. A train seat reservation can be made by mobile application or web application. Users should pick a train and give the number of seats as well as train class. Then generate a reference number for every reservation. It is generated after making the payments. Quick Response code technology inputs passenger data correctly and quickly; people cannot stay much in front of the flatform gate at the busiest moment. Therefore, QR technology help to make it efficient. The system will be implemented as a mobile application and web application. Sprint boot, Angular, Ionic, and MySQL technologies are used to develop the entire ticketing, reservation, and other applications. Some people have no computer literacy. As well as some do not use smartphones

or computers. Therefore, they are unable to use the system. Therefore, they will not be able to use the train service. It is trouble. Therefore, as a solution, a ticketing machine will be implemented with the ticket agent. Passengers can ask for a ticket from the agent, and the agent issues tickets. To manage the database as the admin, it can provide a dashboard. It is a separate component of the system, and railway employees can log in to this application.

II. PROBLEM DEFINITION

The reservation system was done manually before the advent of modern technologies. This meant that someone planning a trip would have to waste much time standing in lines to buy their tickets. The manual reservation procedure was also subject to human mistakes, resulting in an outstanding level of frustration among tourists and local travellers. Long queues at ticket booths are caused partly because most stations do not have enough ticket counters to satisfy peak-hour demand. However, increasing the number of ticket counters to service during peak hours is not realistic. Another factor is the amount of time it takes for a single passenger to purchase a ticket. The person behind the counter is responsible for issuing the ticket, and this transaction will take longer to complete due to this. Tickets printing cost is also high.

Furthermore, it is not easy to catch any imposters who travel without using tickets. The difficulty can be solved by automating the system. However, when choosing how to automate the system, we must consider the Sri Lankan railway scenario. Because many train riders do not utilize debit cards, the debit card system is ineffective. The system we have proposed is a fully automated prepayment mechanism. The primary users can be categorized into different levels according to the usage of the system. They are daily basis travellers, non-daily basis travellers, seasonal travellers, people who can use smart devices, and people who do not know to use smart devices.

III. RELATED WORKS

(Zongjiang, 2012) According to this research paper, the Researchers discuss guideline applicability and propose a method for evaluating rule effectiveness in rough sets.

Moreover, provide a way for obtaining the most effective rules. In comparison to the approach for obtaining the fascinating rules, this one is straightforward and objective. The rule of interactiveness must take into account prior knowledge of what types of information are fascinating. This technique significantly decreases the number of rules created while providing a measure of rule effectiveness.

Moreover, the researchers build and implement an online train ticketing system in this study: the data access layer, business logic layer, and business exterior layer composed up the whole system. Customer registration, cancellation, ticket inquiries, online booking, and online ticket refund are all implemented in the system. The focus of this system is a business process and database design, which are clearly and effectively developed through business process diagrams and database ER diagrams. Travellers will receive real-time ticket messages via the online railway ticketing system. The reservation efficiency has increased, manual booking flaws have decreased, and the administration of railway passenger transport and customer reservations has improved.

(Musa, n.d.) According to the research, online train reservation is one of the best innovations in the rail industry, and those service providers that have not yet accepted online reservation systems should forfeit. They may see extra expenses, maintenance expenses, and production costs as pitfalls. However, business is more than almost any other invasion, and it is a constant negotiating with the coming years and persistent assessment, an instinctual forecasting activity. The World Wide Web and the Internet have emerged, and transportation firms will take advantage of this chance to build online reservation systems and flourish in the future.

(Yadav et al., 2014) This concept envisions a significant shift in railway operations and passenger experience. TTEs are provided with hand-held devices to make passenger confirmation easier and faster. The tickets include a QR code on them, which is read by HHT devices. A passenger-specific URL is saved in a QR code; when the HHT device encodes this URL as part of the Scan procedure, it directs to the PRS server and retrieves the encoded data to verify

the traveller. The scan procedure refreshes the details of all passengers on board and informs the DSA server if a seat is reserved or empty. The check-out method allows travellers to stop their travel at any station and get their remaining money while having their vacant seat filled by a waitlisted traveller. The reservation portal allows users to book tickets for travellers. These technological improvements to the train increase transparency and minimize tout behaviour during the high season.

(B. et al., 2018) Smart trains have been introduced in developed countries leveraging the internet of things (IoT), which allows them to take advantage of the opportunities offered by the Industrial Internet of Things (IIOT). The survey in this article focuses on various communication methods within the IoT paradigm like Global System Mobile Communications-Railway, Long Term Evaluation, 5G, and Wireless Sensor Networks. The passenger ticket production and validation were detailed with the Unique Identification Authority of India database as part of the smart rail transportation vision of India 2022, and the testing results showed that the IoT system is more practical than the well-known approach. The results revealed that passengers could get tickets in fractions of a second, that the reservation chart included the travellers' names and photos, and that adequate customer reservations were preserved.

(Pothineni, n.d.) According to this research paper, anyone with a login can access the data. So, in addition to ticket buying, this application will also include ticket cancellation, ticket and train status, and live station info. The primary focus of this research is to provide a user-friendly interface for all clients that will assist them in whatever way they require in response to their questions. This program must be beneficial to all of the travellers that use trains and must fulfil their expectations.

IV.SYSTEM DESIGN

According to the issues detected above, the existing purchasing train ticket and train seat booking system should change with the new technology. However, the solution of online services made it easier to obtain many things at

any time and anywhere. The leading solution is 'Smart Ticketing and Seat Reservation System.' It provides an alternate and convenient method for train passengers to purchase tickets. An Online Ticketing and Reservation System allows a potential customer to book and pay for a service directly through the system. That means from the moment a customer decides they want to book a slot for service to choosing

> i. Date
>
> ii. Picking time and
>
> iii. Paying for the book
>
> iv. membership management,

everything is handled online (thus) through a simple operation. The customer can select the seat and make the payment. The customer can also cancel the ticket

Further Smart Ticketing and Seat Reservation system consist of two main parts. They are,

> i. Ticket Buying
>
> ii. Seat Reservation

In the process of ticket buying, the traveller will access the online Ticketing and Reservation System and open an account by registering themselves on the system. The process includes,

i. First, enter their details (First Name, Last Name, Email, NIC, Mobile number, Password) for user registration purposes.

ii. Verify the phone number by verification code.

iii. After that customer can log into that system using NIC as user id and Password.

Travellers who do not have a (NIC) National Identify Card need to use mobile numbers as user-id when accessing the account. Once the passenger logs into the account, the account will automatically log in until the passenger logout from the account. That is, the system does not automatically log out. After that, the passenger must enter the payment method. That customer can use online payment cards issued by any bank in Sri Lanka. If there is a foreign traveller, they can make this payment through 'PayPal.' Thus, online ticket booking payments can be made using all Master/ Visa/ Amex cards. That system also offers secure online payment via its e-wallet

service. An E-wallet is a scheme under which users can deposit money in advance with that system. After that, the payment method details are entered, a QR code is generated, and it can be used at the entrance to any train station.

There are two ways to purchase train tickets under this scheme.

A. First Method

In that way, Tickets can be purchased using the QR code that includes the details here. Passenger can scan the QR code to QR code scanning machine that located at train station platform entrance. The passenger can enter through the flap gates to the platform. Then the ticket will open with the starting point. When the traveller reaches the destination and gets off the train station, the traveller must scan the QR code again. However, there is a problem here. When the passenger gets off the train and leaves the station, the ticket will not be completed if the code is not scanned because the destination railway station was not mentioned. Then the ticket charges cannot be done. As a solution to that, when the passenger first enters the station, after the scan the code. That system charges the total cost of travelling to the train station with a long destination from that place. However, the passenger gets off the train and scans the QR code again; the extra charge will be refunded.

Nevertheless, passengers leave the station and fail to scan QR codes, and they will not recover their extra charge. It is a unique point of the Smart Ticketing and Reservation System. Passengers can also get a card with a QR code at all train stations. The passenger can use it when they do not have their smartphone.

B. Second Method

In that situation, the passenger should know about the starting station and destination station before purchasing the ticket. This can be done at home, and payment should be made in the same manner as above. The train ticket is made after entering the start train station and the destination train station and train class. The passenger can print it at home. QR code is printed on the ticket, and a QR scanner checks validity at the train station. After, the passenger can enter the railway station. However, if the passenger cannot print the ticket, he/she can be printed the

ticket by a particular ticket-making machine at the railway station. However, passengers must have the reference number (given at the time of making the ticket). Passengers can make a ticket on that method. Passengers need to log in to their accounts and do so. After that ticket is printed, this can solve when the passenger does not have a phone or card containing a QR code.

The following central part of the Smart Ticketing and Seat Reservation System is the train seat reservation. The problem mentioned passengers do not have any method to see all train details before reserving a seat. It is very uncomfortable for local travellers as well as foreign travellers and regular passengers. Smart Ticketing and Seat Reservation System make proper solutions for this problem. In that situation, the passenger should log into their account. If there is no account, the passenger should do the same manner as above to register in the system, and a passenger should give a payment method if there is no existing method. The above method can be used. After that, all the railway lines of Sri Lanka can be seen. By choosing a railway line, passengers can see trains on that railway line available a seat reservation facility. Then all details are displayed about the selected train. They are train number, available classes, departure time from start station, arrival time to destination, the train station that train stops, train name, number of compartments, and attached pictures. Passengers can see inside the compartment by those pictures. It is a proper method to get an idea about seat format in the compartment, lavatory facilities, food and beverages, phone charging facilities, window facilities, and other facilities. As well as this part consists of other passenger services of Sri Lanka Railway like observation saloon. Then passengers can reserve seats in different classes. Sri Lanka passenger trains consist of three classes as first-class, second class, and third class. Seats are numbered, and available seat numbers are presented to the passenger. It means those seats had not been reserved. Passengers can reserve one or more seats. After reserved seats are locked, and another passenger is unable to reserve locked seats. This is the process of seat reservation. As well as anyone who wants to cancel a reservation, there is a function for doing it. However, refund money only eighty percent of

ticket value. Above all, functions are essential for the tourism industry because there is no method for foreign travellers to make their train journey properly. Not only for foreigners, but local travels can also make their journey correctly.

An application for managing server-side can be proposed to enhance further the project to manage the database as the admin. Railway employees can log in to this application and manage reservations and check validity. The system has a separate application called checker application for the validation of tickets. Since the Checking application, it saves a massive work of the ticket checkers for validation of tickets by moving from manual ticket checking process to digital ticket checking process. This has happened during the train journey.
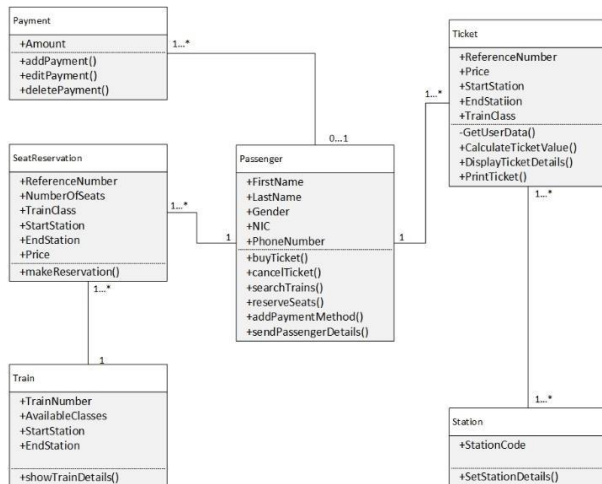

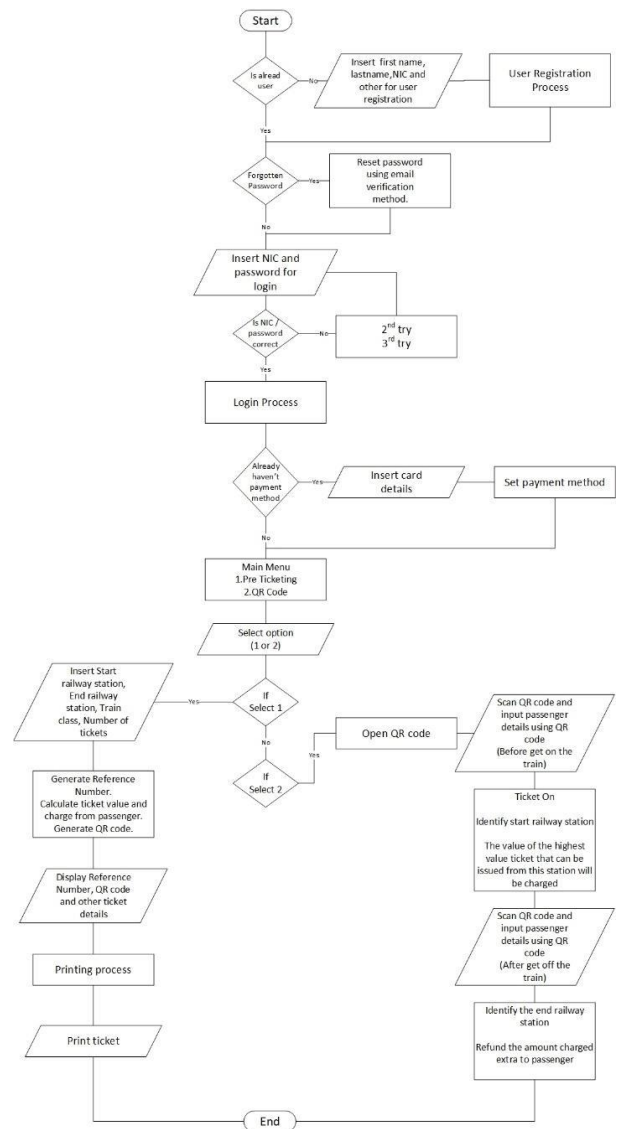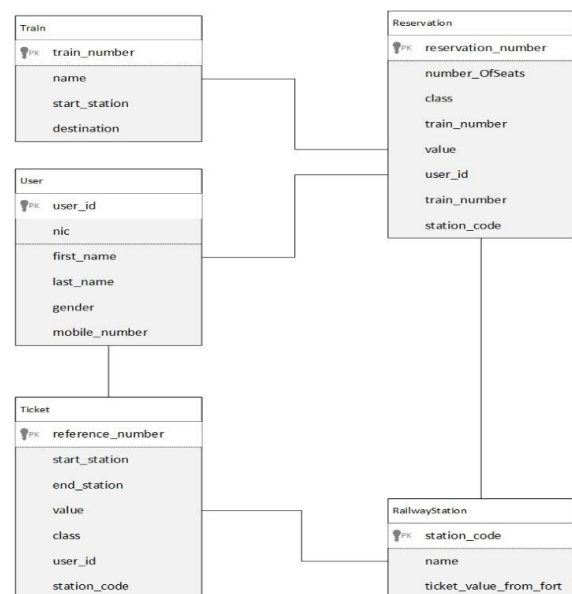Figure 1. Class diagram of the system

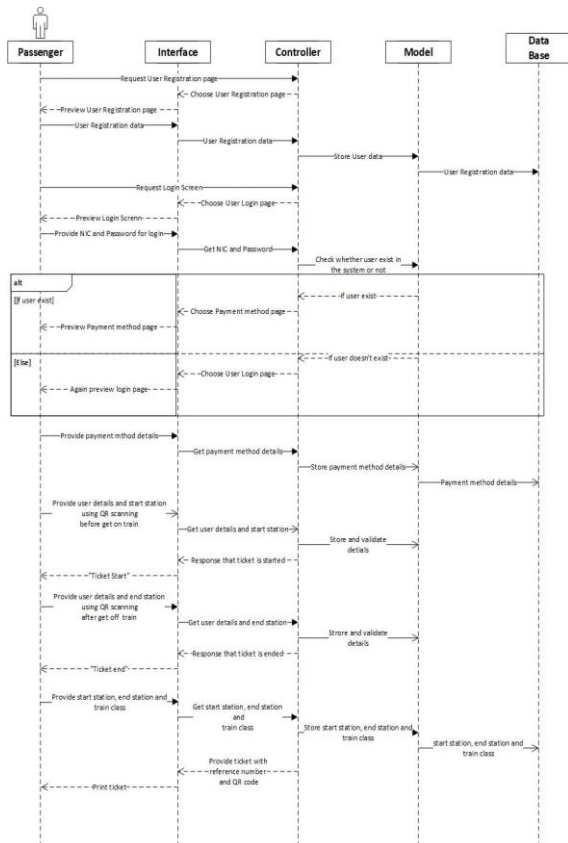

Figure 2. Flow chart

Figure 3. Database diagram

Figure 4. Sequence diagram of the system

V. CONCLUSION

In this research paper, we have discussed some problems of the current manual railway system of Sri Laka and proposed a Smart Ticketing and Seat Reservation System; the underperforming railway transportation in Sri Lanka is not still running on the self-seat reservation system. The Sri Lankan railway has been following the same traditional way of issuing tickets. According to that process, passengers need to visit the counters in railway stations, pay for the tickets, and get the tickets. The tickets currently issued by the Sri Lanka Railways are valid only from the date of issue and to the given destination only. Also, the current ticket reservation process of Sri Lanka Railways can be identified as a primary level system. Therefore, passengers cannot know about their seats and ticket prices and train details, train destinations. However, Travellers can reserve any amount of seats according to that new proposed system. It is a unique feature in that new proposed self-seat reservation system. When in a situation like, when a passenger is trying to book the window seat, the passenger will get the opportunity for it. Although that

system can provide many travel options, explanations about destination area to local travelers and tourist when they choose, that has posed changes for the tourism industry and travel services infrastructure.

Further, All these facilities are most important for ordinary train passengers and local and foreign tourists, which is a mobile application and a web application with the use of QR technology. The complete ticketing and reservation can be built using Sprint Boot, Angular, Ionic, and MySQL technologies. Furthermore, the research paper highlights the Several alternatives for those who are unable to use smartphones and people who are not having the technical expertise required to utilize smartphones and current technology.

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