Proceedings of the
International Conference on Mechanical Engineering and Renewable Energy 2013
(ICMERE2013) 1 - 3 May 2014, Chittagong, Bangladesh

DESIGN AND IMPLEMENTATION OF A RFID-BASED TRAIN TICKETING SYSTEM: PERSPECTIVE BANGLADESH

Md. Tamjid Hossain[1], Kazi Sharfuddin Nayem [2], Md. Hasibul Jamil[3] and Prasenjit Mazumder[4]

[1-4]Chittagong University of Engineering and Technology (CUET), Chittagong-4349, Bangladesh

[1]t.hossainarko.10@gmail.com, [2]kazisnayem@gmail.com, [3] hasibjamil113@gmail.com, [4]prasenjit.eee.69@gmail.com

***Abstract**- Artificial ticket crisis in Railway is the worst problem the passengers are facing now-a-days in Bangladesh. Though Bangladesh Railway (BR) has introduced online ticketing system (e-ticket) almost a year ago, the fruits have not ripened yet. Corruption in railway ticketing system still prevails all over the country. Here comes the need of adopting such a ticketing system which will prevent scalping as well as reduce the pain of collecting ticket. The system should be user friendly, automated, cost effective and it should have the ability to store personal data so that no one can get a chance to siphon off tickets to black marketers. This paper deals with the implementation of a system that has all the qualities stated above. The total system includes matching the RFID card with the existing database which should be made up with the help of our national ID cards and delivery of the available automated generated ticket according to the requirements of the users instantly. A RFID card must have a maximum ticket purchasing limit for a certain period of time. As a consequence, no one get a chance of scalping and if it occurs somehow, the identification of blacker will be just a matter of time via monitoring the usages of cards. Thus, the system reduces the black marketing. Moreover, since the system is automatic, need of manpower as well as cost behind it is reduced. Setting up a reasonable number of ticket selling booths will make the purchasing of ticket more comfortable and more importantly time will be saved too. So, Implementation of RFID-based train ticketing system can bring up a revolutionary change in the field of railway service in this country and both the government and people of Bangladesh will be benefitted.*

Keywords: E-ticket, RFID card, Black marketing

1. INTRODUCTION

Railway is one of the easiest and cheapest transportation systems in Bangladesh. Development in this public service will not only bring satisfaction among people but also open a doorway to earn profit [2].

To make this service to run properly and profitably, corruptions in this sector must be tearing apart. In this case, technological blessing may be applied to train ticketing system. There are several types of train ticketing systems in Bangladesh. This paper illustrates the procedure of implementing a user friendly, automated, cost effective ticketing system using RFID card, PIC microcontroller and C# .NET programming environment. The system can be subdivided into two major categories- a hardware unit and a software unit. The hardware unit includes a RFID card reader; a PIC microcontroller (16f877a) based controlling section and a printing machine. On the other hand the software unit is developed using C# .NET in visual studio 2012, which enables the visualization by a Graphical User Interface (GUI). The system can be implemented acceptably by following the design procedures given in this paper.

2. PROBLEM ANALYSIS AND TECHNOLOGY SELECTION

Travelling by train is the most popular way in Bangladesh. It is much cheaper than buses, as it is providing services to the nation at a subsidized rate in order to help the country's economy and for the ease of people. For all these to keep going smoothly, our ticketing system must be user friendly and automatic. Moreover, the system must be cheap since large number of tickets selling booths have to be set up all over the country. The system also should be able to store travelers' data for future use like reducing black marketing, detecting criminals or identifying the dead people in case of severe train or road accidents etc.

To overcome following problems the light and simplest but modern technology has been proposed for implementation. The whole system will be consists of 3 main subsystems. First one is RFID card reader which will be basically PIC microcontroller based. The next one is a General User Interface (GUI) which will guide customers through purchasing process. This GUI will be developed using C# .NET in visual studio 2012. And the last one is a printing machine which will execute the final command and print out the ticket to the customers. The following figure 1 will demonstrate this more clearly.
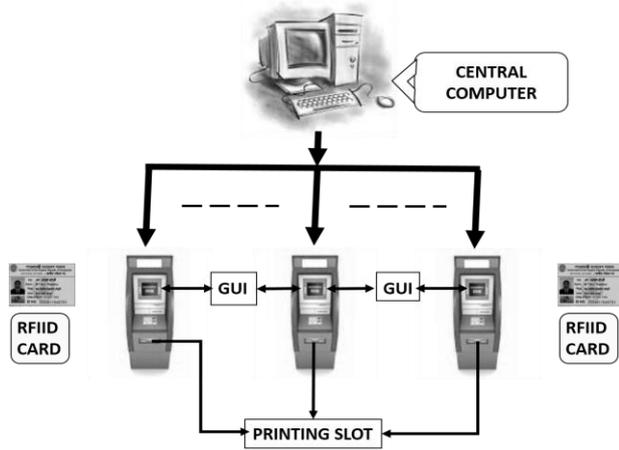
Figure 1: Outline of the Ticketing System.

3. SYSTEM DESCRIPTION

As mentioned earlier he whole system is consists of 3 main subsystem and they are the reader, the GUI and the printing machine. These subsystems include several more parts. These are-

RFID Card:

Radio-frequency identification (RFID) is the wireless non-contact use of radio-frequency electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information [3].

RFID Reader:

RFID reader can be classified as Passive Reader Active Tag (PRAT) and Active Reader Passive Tag (ARPT).
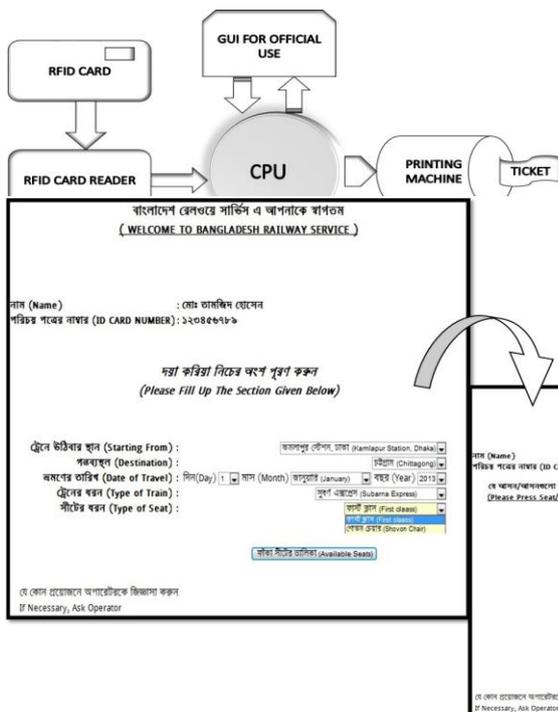

only receives radio signals from active tags (battery operated, transmit only). As a consequence we need to use ARPT since it has an active reader, which transmits interrogator signals and also receives authentication replies from passive tags. Moreover, it also uses active tags awoken with an interrogator signal from the active reader [3]. The system might use separate reader display or the GUI (for public use) as described in figure 2.

Figure 2: Block diagram For Total System

CPU:

CPU stands for Central Processing Unit. This may be a computer. When the RFID card reader detects the card valid by matching its value with the central database stored in CPU, the CPU will command the GUI to show the interface for purchasing tickets. If the detection Process fails, the CPU will command the GUI to show error message. Moreover, connection with the user account in bank database is another important work of CPU. The final task of the CPU is to give printing command and store the related information to the central database.

GUI:

GUI stands for Graphical User Interface. The system includes two types of GUI. One of them is for public use and another one is for official use. The GUI for public use may look like as figure 3. The GUI for official Use can be made according to the need.

Printing Machine:

Printing Machine is a command following device. When the CPU commands it to print the ticket, it simply follows the order.

4. WORKING PRINCIPLE OF PROPOSED SYSTEM

Government of People republic of Bangladesh can issue separate RFID card or make the existing National ID card to RFID card for this train ticketing service.

Figure 3: GUI For Public Use

This system will not use PRAT because a Passive Reader Active Tag (PRAT) system has a passive reader which
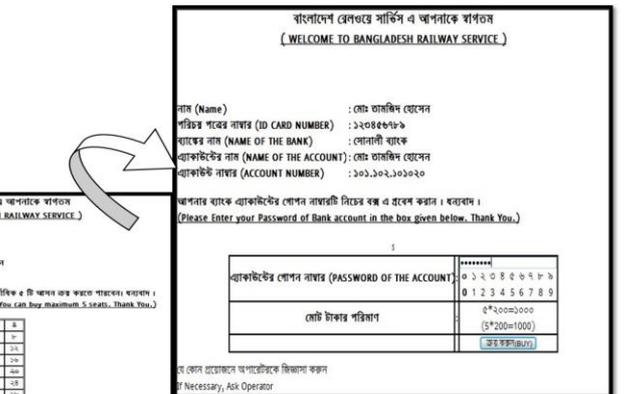
Actually this RFID card can be used as a multipurpose smart card. Since, all the information about the owner of

this card can be saved in central database; this card can be used in banks, hospitals, schools, libraries, for purchasing tickets of trains, planes or buses etc.

The authority must select the usage limit of this card. Anybody holding this card should have a maximum purchase limit e.g. 5 tickets for a train for a pre-selected time period. This will help to reduce black marketing as well as identify the persons behind these heinous activities.

The customer will simply go to his/her nearby station and show his/her cards to the reader in ticket selling booths. If the reader detects the card as valid, the GUI will on and as we can see it from figure 3, customers have to select their location, destination, date, train type, seat type, seat number etc. The screen of the booths has to be touching sensitive on this purpose.

When the selection process is completed, the software will automatically display bank account related page of the customer and request him/her to enter the password and the price of the tickets. Finally, after completion of the process, the software will automatically command the printing machine to print out the tickets.

So, all the works passengers have to do is simply fill up some fields regarding their travel and pay for the desired tickets. The whole process is shown in the flow chart given in figure 4.

5. PRACTICAL CHALLENGES

As it was discussed earlier, passengers have to fill up some fields for purchasing the tickets. Here comes the point of difficulties for a passenger to use the booths properly. Actually, this process is so easy that if an operator explains a customer the process once, he/she will not need any help in future. So, habituating the people with this system will take only a few days. Both the authority and the people have to be cordially willing to adopt this system for the progress of Bangladesh.

6. COMPARISON AND BENEFITS OVER PREVAILNG STRUCTURES

Here in Bangladesh, various structures have been adopted previously. Among them the very first and standstill approach is ticket selling manually by the person sitting in the railway station. This is the most conventional ticketing system which is still running though other structures have been introduced [1]. The advantages of this system lie on its easiness and simplicity. Whoever want to buy a ticket, he/she just goes to railway station with money and buy a printed version of ticket. But this conventional ticketing system is not automated, it is not fast enough and collection of ticket is a tedious process as we can see it from figure 5. Moreover, more human power is needed for maintaining and controlling the whole process and expenses behind these increases. This conventional system cannot store the travelers' data. So it is not possible to extract data for later use. At last and very importantly, black marketing and corruptions are severe in case of this system. Now, if we come to other existing structures, we will see that beside the manual system there are two other systems in
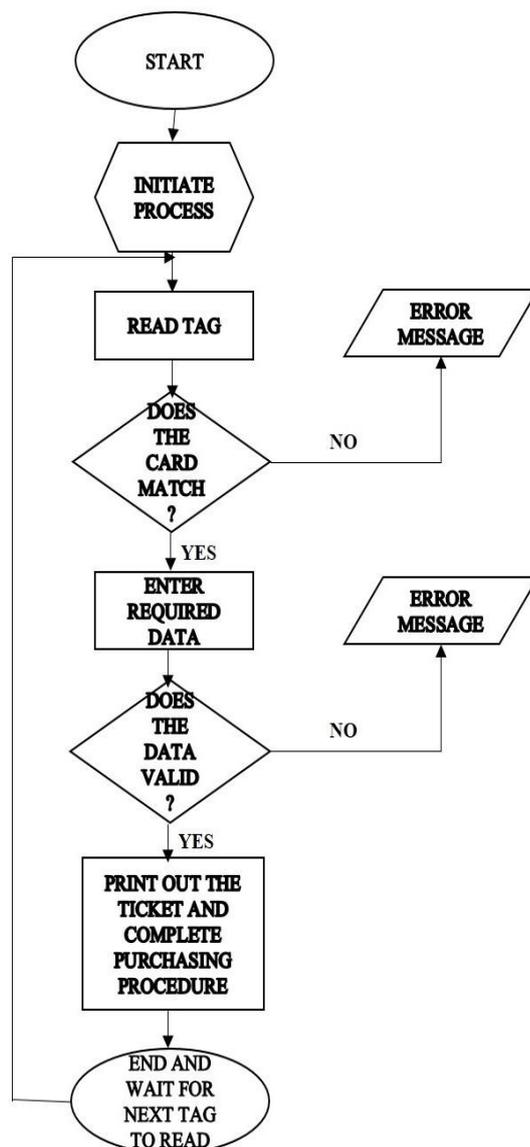

Figure 4: Flow Chart for Reading Cards and Automatic Transaction.

the field of train ticketing system here in Bangladesh. One of them is Mobile ticketing which has been launched in early 2010. Several national and international mobile companies like Grameen phone, Banglalink, Teletalk etc. are providing services in this regard [4]. Earlier 25% of the tickets were available for mobile ticketing system. Though the system is automatic and fast enough, black marketing and large service costs of mobile companies are great impediment in this sector. Finally, Bangladesh Railway launched online internet ticket purchase service (e-ticket) to ease the sufferings of passengers on May 29, 2012 [5]. Bangladesh Railway (BR) would keep 10 percent of its tickets reserved for online purchase as e-tickets. So, 15% will be allocated for mobile for these days. Internet ticketing is surely fast enough but its great impediment lies on its simplicity. Internet, no doubt, is modern blessing but it is not entirely true for Bangladesh as most of its population is still out of internet range. Consequently, it is being thought that the ripe fruit of this

e-ticketing system will be out of reach for more years.

RFID based train ticketing system will shake off these obstructions. Presently, Bangladesh Railway (BR) needs 34,168 regular employees for running the railway services properly [6]. This system will reduce this number and as well as cost behind them as it will be required to have lesser employees in railway station than it is now. It is automatic, fast enough, there is no pain of collection of ticket and this system can store travelers' data also. People do not need to stay long for purchasing ticket as many booths can be fitted inside a station. Like many developed countries all over the world, Bangladesh can adopt RFID based ticketing for marching towards the advancement and prosper.

7. FUTURE SCOPES

Day by day, Bangladesh is introducing with modern technology in every fields. Buses, Planes or any other transport, banks, offices, hospitals whatever it is, the application of modern technology is everywhere. This smart card and the information will help the authority to keep pace with the new world. Moreover, the cheapest and the easiest way of transportation is train in Bangladesh. So, development must be brought out in this sector. Recently, the government has launched Diesel Electric multiple units (DEMU) train [7]. This ticketing system can be applied more successfully here. Furthermore, there is a plan of making underground metro rail in Dhaka city for reducing traffic jam. It is one of the vision-2020. So, to fulfil the dream of making a digital Bangladesh its technological advancement have to be considered in first place and RFID based train ticketing system can play a great role in this regard.

Figure 5: The queue for purchasing ticket in Bangladesh.

8. REFERENCES

[1]   Md. Foisal Mahedi Hasan, Golam Tangim, Md. Kafiul Islam, Md. Rezwanul Haque Khandokar, Arif Ul Alam, "RFID-based Ticketing for Public Transport System: Perspective Megacity Dhaka."

[2]   Mohamed Mezghani, "Study on electronic ticketing in public transport".

[3]   http://en.wikipedia.org/wiki/Radio-frequency_identification (last date of access : October 30,2013)

[4]   http://wirelessfederation.com/news/23182 -grameenphone-users-to-book-rail-tickets-via-mo bile-bangladesh/ (last date of access : October 30,2013)

[5]   http://bdnews24.com/bangladesh/2012/05/ 29/train-tickets-go-online (last date of access : October 30,2013)

[6]   http://www.railway.gov.bd/br_short.asp (last date of access: October 30, 2013)

[7]   www.demotix.com/news/1986211/ bangladeshs-first-high-speed-commuter-train-de mu-launches (last date of access : October 30,2013)