PROPOSED MODEL FOR AN INTEGRATED MANAGEMENT INFORMATION SYSTEM IN INTER-STATE ROAD TRANSPORT BOOKING PROCESS

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Abstract- Technology and modern science has brought the current world into the digital time and this has greatly improved the efficiency as well as simplicity of our daily activities. In the field of transportation informatics for instance, lots of technology devices have been developed by various researchers and scientist to assuage the problem of passenger information management. However, most of our transportation system are not as such effective and still suffers inefficiency as passengers in our terminals still need to queue up in this technology age when trying to purchase travelling tickets from transport operator, thereby resulting to time wastage. Additionally, some services like chartered services, holiday trip services and courier services are not included in the existing research works. Hence, booking and reservation model that will comprise the aforementioned left out services will bring great ease and simplicity to the society. This research is aimed at developing booking and reservation model (IPMIS) using hybrid approach that will comprise the aforementioned services. Dijkstra algorithm and Demand Responsive Transport (DRT) technique will be integrated together to develop the model after which it will be implemented on mobile cross platform of Android, iOS and Windows.

Keywords- Android, Booking, Dijkstra Algorithm, DRT, iOS, IPMIS, Reservation, Transportation, Windows.

I. INTRODUCTION

Impacts of transportation in our daily activities have brought great ease right from inception. However, it has made the movement of people, animals and goods from one location to another a stress free task. It plays an important role in economic growth and globalization of a nation simply because it enables trade between people from different locations. Good planning of transport system is essential to make traffic flow and restrain urban sprawl. Although, the fact that transportation has been contributing immensely to the economy of a nation and individual, it has often faced some significant challenges such as Traffic congestion, parking difficulties, Longer commuting, Public transport inadequacy, Difficulties for non-motorized transport, Loss of public space, High maintenance costs, Environmental impacts, energy consumption, Accidents and safety, Land consumption, Freight distribution, poor innovation in passenger mobility services among others as identified by [1], and [2].

Researchers at different levels however, have carried out researches to alleviate these problems, especially in the area of transportation informatics where wealth of data are been mine by employing wide variety of tools and models, including methods from Artificial Intelligence (AI), Machine Learning, Statistics, and Database Systems [3]. Some of these research works has proposed tailored solution to some of these transportation problems, the ultimate goal of the said researches are to make life easy for passengers as well as to improve quality of service delivery. Studies such as [4], [5], [6], [7], and [8] majorly focused in the direction of reducing the amount of time spent on queue as well as the stress many passengers undergo all in the name of acquisition of traveling tickets as well as the advantages of low cost and low risk by proposing mobile booking and reservation models alongside with E-ticketing models.

However, the aforementioned research works can maximize the capabilities of technology in this area by including some additional services that are been provided by transport operators. Some inter-state transport operators for instance, do not limit their services to conveying of passengers alone but also involve in additional services like chartered services, holiday trip services, courier services, and services for handicapped citizens among others which are very crucial to a large group of people in the society.

These among others, are primary motivation for the development of the proposed Integrated Passenger Management Information System model (IPMIS).

This proposed model will extends its features to some of the left out services (passenger booking reservation services, chartered services, holiday trip services and courier services). It will also manage the booking process of several transport operators in its area of application. Moreover, the role of ICT reservation system connected with new technology is crucial to easy management, supporting cost reduction and maximization of transportation efficiency [9].

On the part of the passengers, it will reduce stress, time, cost, accidental risk and delay in getting a traveling ticket for a particular journey.

II. LITERATURE REVIEW

Currently, there are quite number of models or applications running on mobile platform that manages or coordinates booking and reservation activities of numerous transport operators. A good example is Orbitz that manages collection of airlines operator booking and reservation activities in the United States. Orbitz is a Chicago-based online ticket seller set up by American, Continental, Delta, Northwest, and United Airlines in 2001 due to GDS (global distribution system) high charges. GDS created web base platform for airlines to sell their tickets and charge each airline certain percentage on each and every tickets sold [10]. Orbitz taps into each of the airlines' reservation systems to find and book tickets by going through the airline operator's web interface.

Another example is that of 12306 website that was developed by Ministry of Railways of PRC (People's Republic of China). It is an online train ticket booking system to solve the inconvenience problem of buying ticket in china during festive period [11]. It allows passengers to book train tickets online via signing into the website. Using this online booking system however, people have to be checked for identity, choose the train number as well as complete the payment process online. Reference [5] shows that this system indeed has brought a great convenience for Chinese passengers with nearly two million visitors everyday on average as well as significant reduction in purchasing of travelling tickets. Although, due to the large number of users, the system is often down and leads to page crash.

Further example is TUTPIS model [12] which was developed based on the requirements of Finnish public transport services with the aim of networking passengers with public transport operators. It is a passenger information system that was developed in the Institute of Digital and Computer Systems at Tampere University of Technology, Finland. This model was designed to run on the developing wireless network infrastructure of mobile, personal and local networking technologies. This model concentrates on bus services. It was implemented using Specification and Description Language (SDL). The model contains functional implementations of a server and mobile terminals. It was developed due to unavailability of real-time information services and systems for combining, as well as refining information from heterogeneous sources. However, SDL architectural platform in which TUTPIS was implemented was not meant for real time systems and moreover it has a number of drawbacks like obsolete data types, old fashioned syntax, no pointer concept, and no semaphore concept. All these drawbacks have prevented it to be widely used in the industry [13]. Reference [7] also developed train ticketing application integrated with NFC (Near Field Communication) device known as TraiNFC and Trainductor. The application was made to support transaction in transportation industry. It was implemented using cell phone with NFC technology planted within. When the conductor approach the passenger, the passenger can open his/her electronic ticket and send the data to conductor's cell phone. NFC allows data trade between two gadgets and commonly integrated within mobile devices which allows the device to establish communication with sim card or other reader devices. Truthfully, NFC technology can be used to simplify train ticket purchase process and electronic ticket distribution, but it has weakness of been prone to security challenges like computer hacking or phone hacking [14]. Another important point to be noted here is that passenger must own a mobile device before he/she can make use of the application.

The drawbacks mentioned in the above paragraphs such as obsolete architectural platform designs, size capacity, among others will be taking into consideration in the proposed IPMIS model to achieve better and more efficient inter-state road transportation booking and reservation system as well as improved service delivery by integrating Dijkstra's algorithm and DRT techniques.

III. SYSTEM DESIGN

This research work is aimed at developing booking and reservation model using hybrid approach that will comprise passenger booking reservation services, chartered services, holiday trip services and courier services that will run on mobile platform. In other to achieve this aim however, Dijkstra algorithm and Demand Responsive Transport (DRT) will be used to build the model after which it will be implemented on mobile cross platform of Android, iOS and Windows. These two algorithms and technique are quite popular in the field of transportation informatics. Both have been used on several related works [15], [16], [17], [18], [19], [20], and [21] independently to alleviate one problem or the other.

Dijkstra algorithm has the capacity of solving the fastest path-finding problem on a time-dependent graph in polynomial time. Its running time depends on the priority queue used. DRT technique is a system whereby scheduling of client's traffic requests are been handled by a programmed computer system using different vehicles available for these purposes. Both techniques will be integrated on the proposed IPMIS model for better performance. Fig: 1.1 shows the architectural design as well as the components of the proposed model:

1. Available services: These are the basic activities that can be carried out on the model after implementation.

2. Techniques (Dijkstra's algorithm and DRT technique).
3. Nodes: These represent the transport operators that are available on the model.

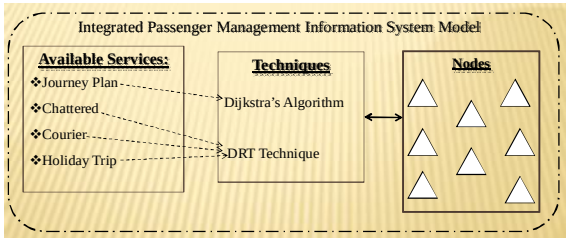


Fig: 1.1 IPMIS

IV. RESULTS

After implementing the developed IPMIS model on mobile platform, it will be available freely for users to download and install from Google play store. Passenger will have to launch the application, select the type of services they need and key in their destination (parameters). After which all the available transport operators for that particular route and the requested services will be displayed. It is now left for the passenger to select or choose the operator of their choice then proceed to the booking page. Passenger will have to type in his/her particulars and probably make their payment after which a confirmation code (QR code) will be generated for the passenger (Fig: 1.2). This code will serve as a boarding pass at the point of boarding on the day of traveling. There will be a system that will monitor all this activities.

Basically, the infrastructure implementation of this model will involve majorly two servers (Fig: 1.3). One for the designer (Admin) to monitor all the activities and directs request to the proper channel. The second server will be for the transport operators which will receive the booking and payment information and generate confirmation code (QR code). Moreover, if there is any update from any transport operator it will only be carried out on their server and since both servers are connected, the application will be updated automatically.

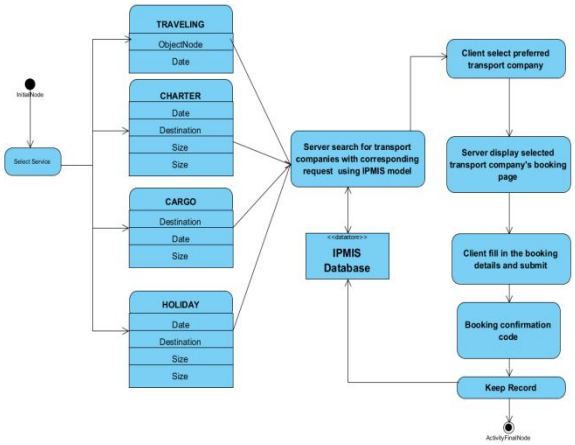


Fig: 1.2 Activity Flow of the proposed model

V. CONTRIBUTION

This research is intended at developing an enhanced booking reservation model for inter-state road transportation system. The applicability of this model is not limited to road transport system alone. It can as well be applied in other areas that involve booking and reservation processes. The outcome of this research will be economically efficient for both the transportation operators as well as the passengers because it will reduce operational cost significantly. It will also reduce stress and risk passengers go through when it comes to acquisition of travelling tickets since the activity can easily be carried out on their mobile devices. Furthermore, it will improve service delivery on the part of transport operators because passengers can view all the available services that are been provided by transportation companies.

Finally, the proposed model will facilitate transport operators business simply because virtually everything is going on mobile which will serve as a kind of patronage as well as contributing positively to transportation infrastructure development.

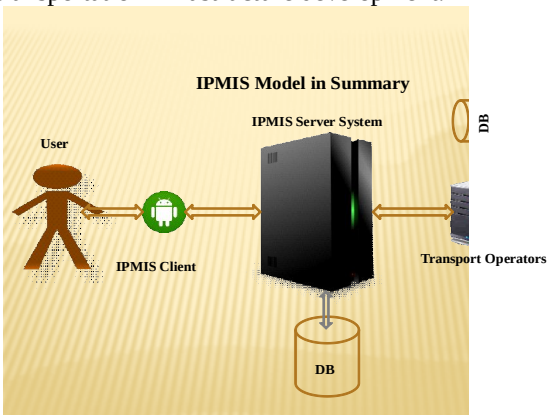


Fig 1.3: IPMIS Model in summary

CONCLUSION

In conclusion, development of information society and the improvement of people's needs, IPMIS model is an inevitable trend, which means a common platform for mobile booking and reservation has become a priority. More also, people have no patience to spend time in queue waiting, hence IPMIS is to relieve the pressure of queue congestion due to the contradictions of supply and demand between people and social resources as well as achieving well-ordered management of social resources. Moreover, IPMIS will not only reduce users waiting time on queue, but also provide data support and guarantee for individualized services.

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