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Identifying the Possibilities of Integrating Speed Train and the Bus Rapid Transit System through Mobile Payment and Information Dissemination

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1 ABSTRACT

South Africa's public transport has been formalised in the past years in order to provide a good flow for travelling. However, commuters struggle with taking formal public transport on the anticipated stations and reaching the desired destination. One of the challenges identified is the lack of integration between the different modes of formal public transport in the Gauteng province, South Africa. Previous studies conducted has shown that there is spatial connection between these systems. Though, this study explores beyond physical integration but electronic integration. This work therefore investigates the possibilities of how mobile information distribution and payment systems can integrate the Speed train and the Bus Rapid Transit (BRT) systems in Gauteng to create a convenient public transport system for commuters. Accordingly, introducing integrated mobile payment system and integrated mobile information distribution for BRT system and the Speed train. A qualitative research study design was used to enable gathering, analysing and data presentation. Explorative, comparative and content analysis were used to collect information. Preliminary results indicate that the formal public transport systems (High speed train and BRT systems) are not integrated, the use of mobile payment systems are not developed, mobile information distribution are only used by the speed train and the integration of formal public transport services through mobile technology are yet to be established. The paper concludes by acknowledging the significance of integrated public transport systems and identifying possibilities of these systems working together promoting viable transportation network. The study recommends the use of integrated mobile technology for public transport as it is safe, fast, reliable, and convenient for both commuters and authorities.

Keywords: Formal public transport, integration, Mobile payments, Mobile information distribution.

2 INTRODUCTION

Public transport plays a vital role in every country around the world. It can be viewed as a basic need as it is used by all different classes in all cities globally. It reduce negative impacts such as traffic jams, negative emissions produced by many cars on the road, car accidents etc. Most developed countries make sure that the public transport system functions well and efficient. These countries integrate different modes of public transport and develop them in a manner that is compatible. The use of advance technology is deployed to integrate these modes of public transport. Techniques such as electronic payment and information provision are some of the key factors used to connect the different modes of public transport. In South Africa, Gauteng province, adoption of technological advancement for public transport has been deployed to make the use of public transport easier and accessible. This includes, e-smart cards for fare collection by both Gautrain and BRT system, online information access for commuters by both Gautrain and BRT system, and smartphone information application by Gautrain. However, with these technological advancements for public transport developed, commuters are still challenged with inefficient, ineffective and non-reliable public transport system. The study aims to identify possibilities of introducing connected public transport in the Gauteng province.

3 LITERATURE REVIEW

Innovative urban transport systems can be defined as practices that are new and provide better solutions to existing challenges and traditional measures in urban transport planning and mobility (Polis, 2015). Most common examples of these innovative public transport systems include technologically advanced high speed trains, Bus Rapid Transit (BRT) systems, etc. (Ndwandwe & Gumbo 2017). Innovative public transport systems have emerged as a component to produce efficient, reliable and effective public transportation. These public transport modes function better when integrated and with deployment of advance technology

such as mobile application for information dissemination and payment methods, they tend to produce a quality functioning public transport system.

3.1 Mobile technology

Currently, smart phones are ubiquitous systems of our society. In several activity sectors the use of mobile phones can be used to revolutionize their services. The public transport sector is not an exception. Here such technology can change the current service delivery process and its value proposition (Campos Ferreira et al. 2012). Public transport providers may offer new services to their customers through a single channel. This not only changes the overall travelling experience, since travelers could access to real-time information, maps, timetables, share opinions and pay for their trips, but also changes the way of how providers manage their resources. For both stakeholders great operational gains are expected (Campos Ferreira et al. 2012). In order to implement such technologies, in the recent years several studies have analyzed the potentialities of mobile technologies, such as Wi-Fi, QR Codes, NFC and BLE (Jose et al. 2013; Campos Ferreira et al. 2014a; Leal et al. 2015). Based on these technologies, several researchers have proposed ticketing solutions for specific regions (Campos Ferreira et al. 2014b, Rodrigues et al. 2014; Campos Ferreira and Dias, 2015). The adoption of these solutions has been analyzed for different public transport modes (Brakewood et al. 2014, Cheng & Huang, 2013; Mallat et al. 2008). However, although some cities, such as Bordeaux, implemented mobile ticketing solutions on their public transport network, the adoption of such technologies seems to achieve limited success (Dahlberg et al., 2015; Thakur and Srivastava, 2014).

Mobile payment

Mobile ticketing is included in mobile payment as a natural evolution of electronic payment that enables feasible and convenient mobile commerce transactions (Mallat, 2007). Mobile payment refers to paying for goods, services, and bills using a mobile device using wireless or other communication technologies (Dahlberg et al., 2008). Nambiar et al. (2004) define mobile payment considering different perspectives. Mobile payment is any electronic transaction or information interaction conducted using a mobile device and mobile networks that leads to the transfer of real or perceived value in exchange for information, services, or goods. It is possible to summarise mobile payment as any payment in which a mobile device is utilised to initiate, authorise, and confirm a commercial transaction (Au and Kauffman, 2008). The most common type of mobile payment is mobile ticketing, which includes micropayments. Micropayment systems are electronic payment systems that support low-value money transfers for low transaction costs. Micropayments are processed instantaneously, with a low risk of losing money (Párhonyi et al., 2006).

Mobile ticketing addresses several user needs, given that mobile services have become an increasingly large part of everyday life (Hwang et al., 2007). This increase is because of the need for ubiquitous, universal, and simultaneous access to information and services and the possibility for a unique and personalised exchange of information (Watson et al., 2002). Thus, the main advantages of mobile ticketing are time and place independence, availability, possibilities for remote purchases, and queue avoidance (Mallat, 2007); mobility itself is considered the ability to access services ubiquitously, on the move, and through wireless networks and various devices (Coursaris and Hassanein, 2002). Although mobile ticketing can bring many benefits to users, the outcome of mobile ticketing depends a great deal on the customer's skills and knowledge, and the provider is thus not solely responsible for the outcome and results (Johnson et al., 2010). From another point of view, self-service is not restricted to technologically advanced customers, but it can attract new customers who have few high-tech skills (Bitner et al., 2002). The literature suggests that the use context, including local conditions such as the availability of other means to purchase tickets and time pressure, are significant determinants of the intention to use mobile ticketing (Mallat et al., 2005). It can be argued that the use of mobile ticketing in public transportation depends on the context; for instance, people use this technology occasionally in situations in which they run out of cash, are in a hurry, or need a ticket unexpectedly and attempt to avoid queues (Mallat et al., 2008). Although mobile payments are predicted to be successful because of the rapid proliferation of mobile device adoption and the ubiquity of access, the development of mobile payments must tackle the following obstacles from users' perspective to fulfil its complete diffusion: cost, a lack of security, difficulty of navigation, low access speed (Smith, 2001), the complexity of the transactions and the lack of user-friendly mobile portals (Frolick and Chen, 2004; Siau and Shen, 2003).

3.2 Mobile information distribution

Public transport information has developed over the years allowing commuters to view time tables over the smart phones (Speed and Shingleton, 2012; Dickinson, et al., 2015). Developed countries have recognized the potential use of developing an application in the smartphones for information provision to public transport users. Smartphones allow commuters to view the current travelling status and options for reaching desired destination faster (Dickinson et al., 2015). This application identify the real time information of certain public transport modes and connection to other public transport modes. It allows users to plan well for travelling, if any changes occur, users are informed in-time and can manage to go for alternatives. With this, it easier for users to comment on certain issues directly regards to the public transport mode they are using.

3.3 Integrated public transport

Integrated public transport system assist to deliver to commuters a system that has alternative that does not limit they are desired travel routes and also with an appropriate, accessible, efficient, safe, effective and reliable system (Ibrahim, 2003; Luk and Olszewski, 2003; Ulengin et al., 2007). Numerous researches have revealed that integrated urban public transport systems can draw more users. Ibrahim (2003) stated that in Singapore, where urban public transport use is considerably high at 60% of mode share, the government aimed to increase the mode share to 75% through integration. Matas (2004) examined the important rise of urban public transport use (>40%) in Madrid, Spain from 1986 to 2004 and got the reason to be the changes made for integration. The research showed that integrated urban public transport fare system and network integration had high influence on the use of public transport. Buehler (2011) piloted an assessment study between USA and Germany and indicated the use of urban public transport in Germany to be greater; 40% of German travelers used sustainable modes (8% for public transport) while only 11% of American travelers used sustainable modes (2% for public transport). One of the reasons given was better integration of urban public transport services in Germany. Abrate et al. (2009) assessed the impact of fare integration on the ridership of services from 69 Italian operators. The effects of integrated fare systems on patronage were 2% in the short-run and 12% in the long–run.

4 METHODOLOGY

The objective of this paper is to assess the payment system, information dissemination of Gautrain and BRT, and the possibility of introducing a more convenient and a faster way for accessing information and fare collection, and integrating Gauteng formal public transport (BRT and Gautrain). The study adopted a qualitative research design, interviews were conducted to collect data. The use of journal articles was key for literature in order to understand what has been researched previously relating to this study. The snowball sampling technique was adopted to locate the officials for the interviews; whereas, the sample size for commuters was selected randomly. Snowball sampling was useful since it was difficult to locate officials and random sampling was useful to receive views of regular and non-regular commuters to understand how relevant the study is to all commuters. Fifteen interviews were conducted with officials, five interviews with BRT officials, five interviews with Gautrain officials and five interviews with Urban/ Transport planners. The interviews with officials were based on payment systems, information dissemination, the state of integrated public transport and the importance of integrating various public transport electronically through payment system and information dissemination. Further, twenty interviews were conducted with the users of both BRT and Gautrain. Interviews were based on whether commuters switch off smoothly from Gautrain to BRT, the necessity of integrating Gautrain and BRT, and the necessity of introducing an integrated smart phone application for the purpose of payment and information dissemination. The data collected from interviews was transcribed into a word processor.

5 FINDINGS

Certain procedures were followed in gathering the data, both primary data and secondary data was key for this study. Fifteen interviews conducted with the government officials (Town/ Transport planners), BRT officials and Gauteng officials different feedback was shared, however, the data was positive. Five interviews with the government officials revealed that the innovative urban public transport in the Gauteng province has provided necessary public transport services and has extended the public transport network in the province. During the implementation phase new routes and rail tracks were developed to service the

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locations that were struggling with formal public transport. However, these modes of public transport service different streets and areas. With these public transport modes implemented advance techniques to make the public transport easier to use electronic smart cards and online information website were developed. Five interview conducted with BRT officials were positive which were mostly on electronic integration. The interviews revealed that the BRT system provides the necessary information on website including the bus timetable. The payment method is done electronically by taping in and out of the bus stations through the use of the smart cards. The BRT system in South Africa is connected through the use of electronic smart cards. On the other hand, five interviews conducted with Gautrain officials revealed that the Gautrain is accessible anywhere through the provision of an online application that can be installed in the mobile phones. The payment method is electronically through the use of gautrain smart cards. The gautrain smart cards are used to board in the train and the bus (Gaubus). The gautrain and the Gaubus work hand in hand.

Twenty interviews conducted with Bus Rapid Transit users relating to the study were positive. The BRT users feedbacks revealed that the use of smart cards is a good initiative although uploading money to the smart card is a challenge on some occasions as the BRT system is found offline and the alternative is to buy single or double trip tickets which is expensive, and sometimes the single or double trip tickets are sold which becomes a challenge to travel using the bus. Another challenge, the users cannot check the balance of the funds available in smart card besides going to the BRT station. The timetable that is provided on the BRT website is not reliable as it does not correspond to arrival of the bus to the station, commuters can wait for more than 45 minutes to one hour. On the other hand, the Gautrain commuters have alternatives for uploading money in the smart cards as there is provision of self-service machines in all the Gautrain stations which is mentioned to be efficient as it reduce long queues and users can also upload money in smart cards from the counters. Information distribution to commuters is more accurate and can be viewed online through the Gautrain application with the operation schedule of both the Gautrain and Gaubus.

5.1 Findings summary

Both Bus Rapid Transit system and Gautrain service different routes and location. Some commuters use both modes to reach desired destinations. It has been realised that both Gautrain and Bus Rapid Transit system are not connected electronically and they function differently, however, they have the same objective of delivering efficient, effective and reliable public transport for the users. Switching in-between the two modes (Gautrain and BRT) is not easy, every time when commuters switch in-between they have to upload money in the different smart cards and this is delaying especially when there are long queues. Accessing information online for both modes is challenging, commuters need to get to the station by good chance get the certain mode of transport immediately and if not they have to wait for as long as the mode of public transport arrives at the station. Further, the scheduling of the BRT and the Gautrain is not compatible, each modes has its own arrival and departure time. Therefore, this makes commuters to miss some of the connections intended. Technological advancement is adopted in the new developed public transport (Gautrain and BRT) in Gauteng province for commuter's convenience. However, there is more that can be done in order to deliver desired public transport flow for commuters by introducing advance technological techniques which will integrate these public transport since they are existing in a manner that is efficient, effective and no delays.

6 DISCUSSIONS

South Africa, Gauteng province, is the only province in the republic and Africa as a whole that has introduced the high speed train operating through different Metropolitan Municipalities. Consequently, with the operation of the BRT systems in these Metropolitan Municipalities. The BRT system operates separately from the high speed train in the Gautrain province. The high speed train operates from the City of Tshwane Metropolitan Municipality to the City of Johannesburg Metropolitan Municipality. In both cities there is availability of these public transport modes. A re Yeng (BRT system) operates only in COT and Rea Vaya (BRT system) operates only in COJ. These two have different bus schedules since they are in two different cities and have different smart cards for fare collection. However, A re Yeng smart card can be used to board in the Rea Vaya bus and the Rea Vaya bus smart card can be used to board in the A re Yeng bus. This indicates that the BRT system in South Africa is integrated electronically in some way for commuter's convenience to manage to use BRT when travelled to a city with the availability of the BRT system and the individual is in possession of the BRT smart card. Although, the BRT smart card cannot be used to board in

the high speed train (Gautrain). Gautrain has its own smart card which is used to board in the train and the Gaubus. In order to integrate the public transport in the Gauteng province between the two Metropolitan Municipalities, Gautrain is the main source of connector as it moves from the COT to the COJ. Integrating the BRT system in COT, COJ and the Gautrain will allow easy movement, less transport cost, reduced time for commuters who travel daily as there are individuals who live in COJ and work in COT.

As can be noted from developed countries with innovative public transport modes, technology has a vital role for the provision of efficient, effective and reliable transportation. Technology for public transport is improved every day in order to meet commuters demand. It is now advanced, as commuters do not have to pay with hard cash in order to board the public transport and commuters do not have to go to a certain station or a place in order to get any kind of information for instance public transport schedules, all this can be done through mobile phones. In South Africa, Gauteng province, innovative public transport such as the BRT system and the high speed train have implemented some of the advance technologies used for public transport. The Gautrain use an online application for information dissemination, both Gautrain and the BRT system use smart cards for fare collection. However, these two different operators of public transport are not integrated and function as one, they operate separately which is found as one of the factors that make the Gauteng province public transportation not to be strong as expected. The provincial government have implemented these strategies with the provision of necessary infrastructure but low intention of integrating these different innovative modes of public transport from the implementation phase. It is high time that innovative public transport in the Gauteng province is integrated and function as one system. The innovative public transport modes are already existing and operating which is one of the factors to make this change feasible, there will be numerous challenges in the development of this change to integration as these are two different operators, although, it is possible as demonstrated by developed countries with such public transportation. The introduction of mobile application to bring these two modes in one platform will bring efficiency and reliability.

7 RECOMMENDATIONS

In South Africa, integrated mobile payment and information distribution for public transport are not popular and are not yet implemented. Integrating public transport with the introduction of such advanced technology will benefit users, operators and improve the functioning of the public transport. Users will manage to plan trips properly as they will have access to of real time information of the whereabouts of the public transport and will have access to view timetables in their own time and comfortable space. Consequently, users will not have to struggle with uploading money in their smart cards and worry about the long queues. Everything can be done through the mobile phones, checking the balance and uploading money. Further, operators of both high speed train and the BRT system can use the data collected from the mobile phones in order to improve the services and strengthen the public transport, and identify areas that need further extensions of the system.

8 CONCLUSION

South Africa, Gauteng province, is moving towards the smart mobility state with more reliable, efficient and effective public transport. Innovative public transport is currently existing with good infrastructure and in order to have a good function public transport to attract more users and reduce private vehicles on the road is to integrate public transport modes and introduce techniques that will allow users to access information and payment method easier and faster.

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