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Inclusivity of ICT-Based Solutions to Public Transportation Problems: Challenges and Opportunities for Bloemfontein

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ABSTRACT

The efforts to achieve sustainable transportation typically drawn on information and communication technologies as solutions to issues of mobility and access. However, these efforts do not address socioeconomic vulnerability, and fail to meet the mobility and access needs of specific marginalised groups. The limited mobility and resulting physical isolation of these groups reduce access to education, work and health facilities and limits job-hunting. This emphasises the need for a fully inclusive transportation system. Technological innovations such as tele-activities, e-payments, security and surveillance systems that seek to resolve transportation problems remain inaccessible to many in society. This study thus investigates whether developing countries can achieve inclusive, sustainable public transportation by using technological innovations focused on commuter behaviour. It explores the effectiveness of ICT solutions to travel, mobility and accessibility in a South African city with a relatively traditional public transport system. The question is whether travel processes drawing on ICT that consider the socio-economic factors and travel behaviour of commuters can enable equitable solutions. The study found that travellers have smartphone access, but the phones are not used to inform decisions on travel and transportation. Public transportation service providers also do not have an online presence. The conclusion is that, if we are to use ICT to enable equitable public transportation in developing countries, easily accessible technologies such as calls, and SMSs must be considered.

1. Introduction

Integrating ICT solutions into conventional public transportation systems in developing African cities is an appealing prospect for those seeking to resolve dissatisfaction with current public transportation systems. However, most cities are not able to fully provide both the transportation systems and users with such ICT solutions. Thus, sustainable and socio-economically inclusive mobility solutions are needed. Inclusivity is a crucial principle if we are to develop accessible public transportation.

Public transportation in developing countries needs attention that goes beyond the increasing provision of road infrastructure and issues of formalization. Mbatha et al. (2021) state that, conventionally, public transportation systems are meant to solve problems of mobility. However, issues of limited accessibility and insufficient mobility remain unsolved. The mobility needs of most people living in developing countries are not being sufficiently met by public transportation (Pojani and Stead, 2015).

In some cities in the developing and developing world, ICT has been successfully introduced as a solution to accessibility and mobility issues. Elsewhere, advances towards integration have been unsuccessful and, in some cases, they are unheard of, especially in developing countries. The drive towards digitalization of transportation systems has led to Intelligent Transportation Systems (ITS), which are advanced and enable the high-level efficiency of transportation systems infrastructure as well as advanced ICT, including payment systems, smartcards, ticketing systems, e-hailing mobile applications to less advanced technologies such as USSD. Mobile apps, use of social media, and real-time information dissemination are some of the ICT solutions applied towards improving public transportation systems (Mbatha et al. 2021).

Furthermore, Mbatha et al. (2021) also credit the use of ICT and GPS for the inventory of trips taken, therefore helping drivers and operators account for the trips to owners. They conclude that commuters can make online bookings using ICT, thus improving reliability of the public transportation taxis and enhancing safety. It is undisputable that ICTs are beneficial to public transportation systems. However, there are major challenges that hinder the uptake of ICT, most especially in the case of developing countries. These are reasons why public transportation systems are still conventional. In the case of Bloemfontein City, the area of this study, public transportation is still lagging when it comes to technology adoption and integration.

Overall, sustainable public transportation should be inclusive and provide mobility and accessibility to everyone; however, there remains contention over how these technologies can be availed by all equitably, which technologies are most useful to all public transportation users and how technologies can be leveraged to improve inclusion and provide accessible mobility.

1.1. Study area

Bloemfontein is South Africa's legislative capital. It is the capital city of the Free State Province and the biggest city within the Mangaung Metropolitan Municipality (MMM). According to the United Nations World Population Prospects of 2019, the city's population grew from 363 000 in 2001, to 462 000 in 2011, 567 000 in 2020, and is projected to grow by 1.94% to 578 000 in 2021 (United Nations Department of Economic and Social Affairs, Population Division, 2019). As a result of South Africa's political history and racial segregation, Bloemfontein has residents living in settlements and suburbs based on their economic status, with the majority of the city's poor and middle-income citizens living in the south-eastern parts of Bloemfontein and travelling, on average, 15 km to the city centre for jobs (Mangaung Local Municipality 2012) (Figure 1).

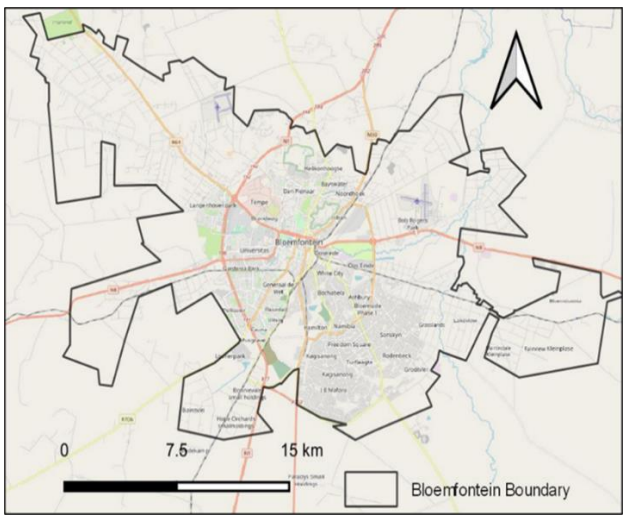

Figure 1. Study area location: Bloemfontein.

1.2. Public transportation in Bloemfontein

Public transportation in Bloemfontein consists of minibus taxis, which are the main form of public transportation, and buses run by a private company under government subsidy (Interstate Bus Lines). Road and passenger transportation systems in the city are slowly being developed to accommodate ICT-integrated, public transportation efficiently. However, transportation infrastructure and the city's urban landscape are inadequate. The insufficiency and inadequacy of road transportation and its support systems were highlighted in the Mangaung Integrated Development Plan 2019/20, in which inadequacy of access and quality of roads was noted and mention was made of future implementation of low-carbon transportation, promotion of public transportation, upgrading of transportation infrastructure and investment in green technology (Mangaung Metropolitan Municipality 2019).

Thus, the two modes of public transportation considered in this study are minibus taxis and buses.

2. Sustainable public transportation

A major concern for sustainable public transportation is achieving social equity for all of society. A sustainable transportation system should fully meet the mobility needs of all people in an area. Jeekel (2018) discusses involuntary disadvantages that result from exclusive transportation systems, stating that those household where no one has a driver's license and without access to private cars are disadvantaged if they are in areas with high car dominance or experience car dominant times of the day. The lack of access cannot be attributed only to lack of infrastructure or economic factors; even where there are extensive infrastructure and reduced transportation costs, poverty or inequality do not decline linearly (United Nations Economic and Social Commission for Asia and the Pacific, 2020). Involuntary transport disadvantage is divided into two types, disadvantage by distance and disadvantage by incapacity (Jeekel 2018). The residential location of a household can lead to exclusion if the residence is not easily reachable for services or is far from where other activities take place (Jeekel 2018). Lack of social capital and social networks can also lead to households being disadvantaged. Jeekel (2018: 15) defines social exclusion as lack of participation in social, economic and political life which, in relation to transportation, translates to a lack of access to a car and limitations to car use due to age.

Public transportation overcomes the exclusion of people who lack vehicles and driver's licences but does not address all issues that cause exclusion in transportation. According to Pradhan, Arvin and Nair (2021:1), "good transportation and ICT enable rural and marginalized communities to have better access to information, knowledge, education, healthcare and

higher paying jobs", hence, the integration of ICT in public transportation has the potential to improve transportation inclusivity through improved access to services. Additionally, Jeekel (2018:19) refers to the affordability of mobility, accessibility of key services as well as the role of transportation in creating or alleviating social cohesion as some of the social and economic elements supporting sustainable mobility. Sustainable transportation within that city would be ICT-based transportation services which are adaptable, reliable, accessible, scalable, secure and safe for everyone. Inclusivity can also be promoted by employing ICT to prevent unnecessary transportation costs (Asongu, Le Roux and Biekpe 2017).

However, acceptance is pivotal to improved urban sustainability (Wang, Han and de Vries 2019). Wang, Han and de Vries (2019) also lament that the achievement of urban sustainability will depend on transportation infrastructure and matching mobility services to land use and its development. Roselló, Langland and Viti (2016:25) previously supported these sentiments by stating that "public transport will play an important role in the smart city concept". Besides environmental sustainability, factors such as convenience, affordability, comfort, flexibility and are important to determine the effectiveness and sustainability of a public transportation system. Satisfaction of individual travellers will determine the inclusivity of the system and lead to continued use of the system making it sustainable in the long term.

Convenience is among some of the issues associated with efficient transportation, which can be improved by ICT solutions while modifications that improve flexibility by using IT solutions may be beneficial to transportation services (Jansson, Andreasson and Kottenhoff 2016). The cost of travel encompasses money, time as well as psychological components, therefore mobility costs are not easy to interpret or quantify (Roselló, Langeland and Viti 2016). Jansson, Andreasson and Kottenhoff (2018) suggest that demand for comfort and privacy in transportation influences the number of people transported collectively in a public vehicle. Solutions brought by ICT therefore must address the above-mentioned elements to create inclusive public transportation systems.

Lorini, Van Zyl and Chigona (2015) acknowledge low levels of access to ICT and lack of e-skills as major concerns hindering socio-economic and cultural equality that could potentially be improved by digital inclusion. Younger members of the public, even in disadvantaged communities, often have access to social networking sites (Lorini, Van Zyl and Chigona 2015). They further add that the use of ICT by older people in the community is in the form of phones and smartphones for social networking, but challenges associated with limited knowledge and awareness are still prevalent (Lorini, Van Zyl and Chigona 2015).

Some research has referenced exclusion based on a "digital gender divide" in use, access and adoption of ICTs. Williams, Millward and Layton (2018) state thateven though ICT evolves, the gender divide does not diminish, which could jeopardize access to transportation. However, social inclusion encompasses inclusion beyond financial constraints. Nevertheless, a lack of basic ICT access, skills and infrastructure may contribute to social exclusion. Zamani (2015, states that it is crucial to consider individual capabilities, opportunities and differences, before identifying individual needs of socially excluded members of society.

Older adults, single parents, ethnic minorities, offenders, underprivileged women and the homeless were identified as groups susceptible to social exclusion who may thus not have similar access to opportunities made possible by ICT compared to the rest of society. It is therefore essential for mobility and accessibility provisions as well as ICT-based solutions to support and accommodate all societal groups.

2.1. Meeting mobility and accessibility needs through public transportation

Mobility is linked to human activities and land-use and is focused on making more trips instead of longer trips (Rodrigue, 2020), while accessibility involves integrating land-use and transportation system interactions with social perspectives for transportation planning (Boisjoly and El-Geneidy 2017). Accessibility can be defined as a function that enables people to reach their destinations and perform activities (Boisjoly and El-geneidy 2017). Schiller, Bruun and Kenworthy, (2010:16) emphasized the importance of access by stating that access profoundly impacts the quality of urban life. Public transportation accessibility relies on the quality of service and ease of access to the public transportation service by users (Yatskiv and Budilovich 2017).

To improve the accessibility and mobility of public transportation, some countries have adopted methods such as Demand-Responsive public transportation services using ICT such as the Internet and mobile phones to improve flexibility (Commission of the European Communities, 2007). The mobility needs of most people living in developing countries are not met by public transportation (Pojani and Stea, 2015).

2.2. The role of ICT in public transportation

In defining sustainable transportation concerning passenger transportation. Schiller, Bruun and Kenworthy (2010) emphasize the need for meeting mobility and accessibility needs without causing environmental degradation, not depleting resources while maximizing their utilization, improving access to jobs, goods and services in shortened trip durations or reducing the need to travel.

Sustainability of public transportation would mean also that the users are satisfied with the services offered by the service providers, taking into consideration the different economic classes of users, regional disparities and their evolution, as well as determinants of satisfaction with public transportation (Abenoza, Cats and Susilo 2017).

It is well established that ICT is an enabling technology which, when properly used, can be leveraged to improve communication between people, increase productivity, help towards the provision of better services and connect people (Choudrie, Tsatsou and Kurnia 2018). Even though it is evident that ICTs have been important in development, it is similarly apparent that, with their advancements, they will continue to make an impact on the interactions between customers and service providers (Breidback 2018). Similarly, they will be continued interactions between ICT and infrastructure. Leveraging technology for support, analysis and improvement of transportation services, together with innovative use of ICT and adapting it to any changes within the systems to meet public transportation users' needs, is essential to a sustainable public transportation system.

2.3. ICT influence on travel behaviour

The advancement of ICT is perceived to be influencing travel behaviour internationally. The influence prevails in travel by both private and public transportation and is associated with providing people with travel flexibility in terms of where, when and how to travel (Pawlak, Polak and Sivakumar 2017; Zhao, Koutsopoulos and Zhao 2018). Flexibility in travel is partially influenced by individualization (Roselló, Langelang and Viti 2016), as travellers expect transportation to fulfil their distinctive demands. E-hailing and demand responsive transportation can be attributed to this individualization.

Mobile ICT, such as transportation applications, e-hailing services and location geo-tagging on social media, is an example of how technological advancements are reshaping people's activity-travel patterns and social interactions, as it also makes it possible to use the time spent on public transportation more productively (Pendyala and Bhat 2012; Hilty, Aebischer and Rizolli 2014). This can be done by way of automotive technologies and navigation systems providing instant travel information such as alternative routes, preferred destinations, and nearby recreation and leisure areas. Technologies used in Intelligent Transportation Systems lead to optimized performance of transport networks, improved reliability of travel time and changes in travel behaviour that might reduce externalities such as congestion, pollution, and carbon emissions (Pendyala and Bhat, 2012).

3. Methodology

A questionnaire survey was used to gather data from a sample of 415 respondents, who were randomly selected public transportation and private vehicle users. Simple random sampling, based on a 95% confidence level and a 5% margin of error against the population of the city, allowed for a sample above 384, hence the 415-sample size used. The questionnaire study sought to study ICT use in transportation and travel by people in Bloemfontein.

Economic factors, that is monthly income and cost of travel, were investigated. Further the amount of money spent on data was also investigated. The study also investigated ICT knowledge, ICT access and ICT usage for public transportation and, finally, the types of ICT devices, systems and applications used for travel and the purposes for which they were used.

Binary probit models were further developed to determine factors influencing the likelihood that ICT are used for public transportation. These factors are potential contributors to ICT adoption and use. In this case, the likelihood that ICT was used for public transportation-related reasons was used as the dependent variable. Various independent variables, which were determined by their normality as well as significance values ($p<0.05$), were applied to the model.

4. Results

4.1. Socio-demographic/ICT awareness of respondents

The results of the study are provided in this section. Table 1 provides the demographic background of the sample while Table 2 shows the monthly income of each respondent. Most of the respondents, 22.4% and 36.5% had a monthly income of between R1000 – R2500 and R2500 – R5000 respectively.

Figure 2 shows the monthly costs of using bus and taxi services in Bloemfontein. A majority of 70.7% of taxi users spent between R100.00 and R500.00, while only 29.9% of bus users spent the same amount. Most bus users (35.8%) spent between R750.00 and R1 000.00 on bus fares, compared with only 2.7% of taxi users spending the same amount. Furthermore, 14.9% and 16.8% of the respondents spent less than R100.00 on bus and taxi fares, respectively, while 17.9% and 8.5% spent between R500.00 and R750.00 on buses and taxis, respectively, and 1.5% and 1.2% spent more than R1 000.00 on bus and taxi fare, respectively. Spending less money on public transportation could have been influenced by respondents travelling only a few times a month or making single trips per day on a regular basis. The respondents who made multiple trips using public transportation daily, on a regular basis, spent more. These results showed also that taxi users spent less on transportation than bus users.

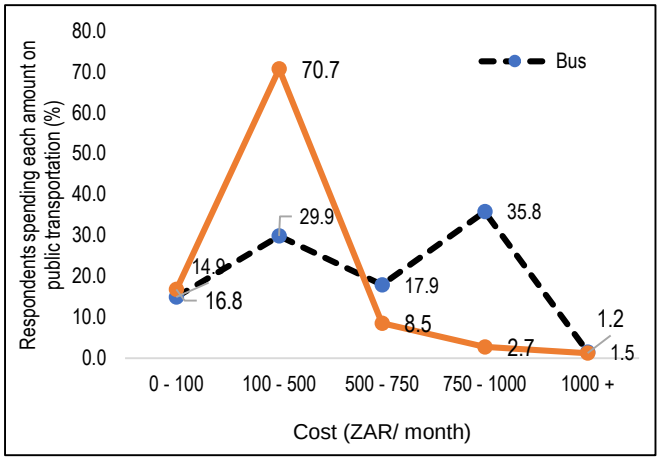

Figure 2. Monthly spend on public transportation

Table 1. Demographic of respondents

Characteristics		Percentage
Age	18-25	34,7
	25-35	40,2
	36-45	16,9
	46-55	7,2
	55+	1,0
Gender	Male	54,5
	Female	45,5
Characteristics		**Percentage**
Occupation	Student	29,2
	Part-time employee	13,5
	Self Employed	7,0
	Full-time employee	38,3
	Unemployed	6,7
	Student / Part-time employee	5,3

Table 2. Monthly income of Respondents

Characteristics		Percentage
Monthly Income (ZAR)	0 - 500	4.6
	500 - 1000	9.2
	1000 - 2500	22.4
	2500 - 5000	26.5
	5 000 - 10 000	13.3
	10 000 - 20 000	14.2
	20 000 - 30 000	6.7
	30 000 - 40 000	1.9
	40 000 - 50 000	1.0
	50 000+	0.2

Figure 3 depicts the respondent spending on data; it is worth noting that 50.3% of the respondents spend R1-100 on data and 30.5% spend about R100-250, thus, implying Internet access. Table 3 shows the ICT components and their use for travel in Bloemfontein. A majority of 89.2% of the respondents used smartphones for travel, only 13.7% used computer tablets, 17.9% used computers, and 8.6% used conventional, non-smart mobile phones.

A majority of 97.2% of the respondents indicated that public transportation service providers did not have an online or web presence, while 2.8% had a web presence. The results depicted a significant lack of online platforms offered by service providers. The respondents who identified public transportation service providers with an online presence indicated that their bus service provider had a website and was also accessible through email. Others indicated that their service providers were available on WhatsApp and Facebook. 0.3% of the respondents visited the bus company's offices, while 0.3% went to the taxi association offices. A further 63% of the respondents did not communicate with their service providers, while 11.4% communicated with operators and drivers during their trips. Furthermore, 24.6% used phone calls, while 0.6% used emails, and 0.3% indicated that they only communicated by staging protests against the public transportation system.

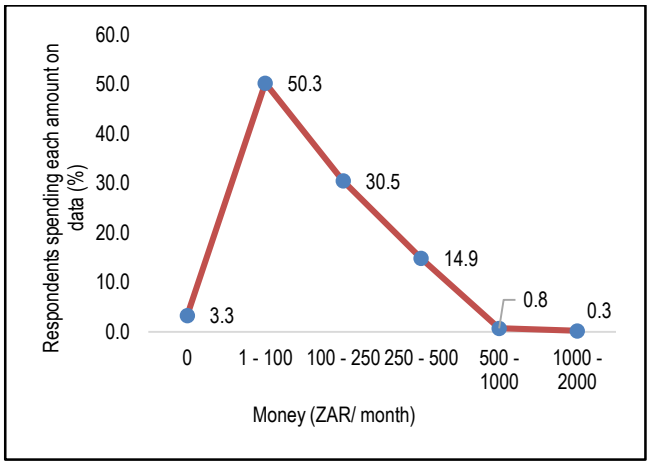

Figure 3. Monthly spending on data

The ICT components, devices, applications and systems, used for travel-related reasons were explored further in the study. The respondents were provided with options of components and were asked to indicate whether they used them or not. The absence of public transportation service providers in online platforms indicates a severe lack of online presence, singularly, this variable perpetuates and is a sign of exclusion. Only a few of the service providers are accessible through online platforms, hence ICT interventions may also exclude most service providers.

Table 3. ICT awareness and use in public transport

		Percentage (%) N = 415	
		No	**Yes**
Availability of public transportation service providers online		97.3	2.8
ICT Awareness and Use in Public Transport			
ICT Knowledge		18.3	81.7
Internet Access		10.9	89.1
ICT use for public transport		50	50
Use of ICT for travel		**Do Not Use**	**Use**
Devices	Smartphone	10.8	89.2
	Tablet	86.3	13.7
	Computer	82.1	17.9
Applications	Non-smart cell phone	91.4	8.6
	Call/ SMS	29.7	70.3
	Social Networks	74.4	25.6
	Web Browsing	66.1	33.9
Systems	Internet	27.8	72.2
	Cloud computing	94.9	5.1
	Payment Systems	86.3	13.7

4.2. Binary Probit Regression Analysis

ICT uses for public transportation

Variables used to determine ICT use for public transportation in Bloemfontein were tested for normality using Skewness and Kurtosis tests. The normality test results are shown in Table 4.

Table 4. Normality tests for ICT use for public transportation

	ICT use for public transportation-related reasons	Internet access	Time spent on the internet for transportation-related reasons	Data used for transportation purposes per month (Mb)
Std. Deviation	0,501	0,312	0,987	0,533
Skewness	0,000	-2,520	1,572	1,688
Std. Error of Skewness	0,121	0,121	0,126	0,130
Kurtosis	-2,010	4,373	1,922	3,898
Std. Error of Kurtosis	0,242	0,242	0,251	0,260

The data was acceptable for further analysis. The hypothesis that people with internet access and their use of the internet, i.e. mobile data and the time they spent on the internet influenced whether they used ICT for transportation.

The binary Probit regression equation below was applied:

$$Pr(Y = |X_1, X_2, \dots, X_k = \Phi\ (\beta_0 + \beta_1 + X_1 + \beta_2 X_2 + \cdots + \beta_k X_k) \quad (1)$$

Link of actual y to estimated y: $f(X) = \Phi(1 + e^{-X})$
Where:

$$Pr = Probability$$
$$Y = Binary\ response\ (Yes = 1\ or\ No = 0)$$
$$X = independent\ variable$$
$$\Phi\ (\cdot) = cumulative\ standard\ normal\ distribution\ function$$
$$x_1 = Internet\ access$$
$$x_2 = Time\ spent\ on\ the\ internet\ for\ transportation - related\ reasons$$
$$x_3 = Data\ used\ on\ transportation\ per\ month$$

The binary probit analysis results and model are discussed below:

From a total number of 258 observations (N = 258), 46.9% (N = 121) of respondents did not use ICT for public transport, and therefore responded No, while 53.1% (N = 137) used ICT for public transportation, responding Yes. The model was used to predict whether ICT use for public transportation-related reasons is influenced by Internet access, time spent on the Internet for transportation-related reasons and the amount of data used for transport-related purposes.

The omnibus test produced results indicating that the model was significant. Likelihood Ratio Chi-Square (103.815), DF (3), Significance (0.000).

The following model parameters were produced:

Table 5. Regression coefficients for ICT use for public transportation model

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	-1,977	0,4483	-2,856	-1,098	19,444	1	0,000
Internet access	1,522	0,4468	0,646	2,398	11,604	1	0,001
Time on the internet for transport	0,630	0,1102	0,414	0,846	32,690	1	0,000
Data for transport	0,743	0,1900	0,370	1,115	15,286	1	0,000

Table 5 shows the coefficients and significance statistics of the variables used in the model. The analysis produced a significant model. Internet access, time spent on the Internet and the amount of data used for transportation-related reasons were positive and significant variables towards the model ($p<0.05$). The Wald Chi-square statistics also indicated that the variables contributed significantly to the model. There is a positive regression slope for Internet access, time spent on the Internet for transportation and data usage for transport.

This means that:

- People with Internet access were more likely to use ICT for public transportation-related reasons than those without Internet access.
- People spending more time on the Internet were likely to use that time for transportation-related purposes.
- People who used more data for transportation were likely to be those who used ICT for public transportation-related reasons.

5. Discussion

Overall, the findings from the study show that the city of Bloemfontein is lagging in terms of ICT integration into its public transportation system. This can be attributed to the slow development of the city's transportation system. However, transport infrastructure in the city needs to be supplemented by well-operated systems, including vehicle operations and a well-integrated ICT system. Although results show that there is a high usage of smartphones, which implies access to at least mobile communication devices, the purposes for which smartphones are used are not directly related to travel and transportation.

Calls and SMS are the commonly used technologies for transport-related services. Hence, ICT in public transportation should use accessible technologies such as calls and SMS, which do not need Internet access.

There is thus a need to integrate ICT into the local public transportation system but to use policy that takes the needs and resources of disadvantages communities into account. Otherwise, the incorporation of ICT may serve to compound disadvantage.

ICT-enabled public transportation in Bloemfontein will require synergy between:

i. Transportation infrastructure: the bus ranks, taxi stations, terminals and bus stops serving the public transportation systems, particularly buses and mini-bus taxis.
ii. Vehicular components of the system (public vehicles).
iii. Geographical and spatial characteristics: location, distance and the interaction between these characteristics and travel.
iv. People: The socio-political as well as the economic interaction: stakeholders, users, operators, governing bodies, transportation authorities and government.
v. Technology: The enabling device (ICT) includes people's interaction with the technologies which will be based on technological awareness, accessibility, interest, willingness to use and purpose.

An ICT-based public transportation system, therefore, entails a public transportation services system integrated with ICT to create a synergetic, interactive, socio-economically equitable system with improved efficiency and minimal environmental detriment. This has to potential to fulfil individual travellers' mobility, and accessibility needs, leaving it to the users to decide how best they adapt to the ICT-based system.

6. Conclusion and Policy Implications

Inclusive, ICT-enabled public transportation systems are to serve all demographics within the city. However, modern-day cities are segregated by economic and social status, which is subjectively reflected in the urban transportation systems. Coyle et al. (2011) state that people living and travelling within a particular transportation network share experiences and ideas, which influence the development of similar socio-political and cultural ideals within a society. Vehicle ownership is prevalent in affluent areas, while public transportation presence is noticeable in middle-class and poorer communities. Moreover, the poorest communities of the city and informal settlements also have limited access to transportation services, due to a lack of road infrastructure and, to some degree, lack of official recognition by governments as residential areas. Such segregation has ultimately resulted in high vehicle ownership in affluent communities, who are thus able to conveniently access activities while the poor are faced with long walking distances and greater waiting time to access public transportation.

An all-inclusive public transportation system should cater to the affluent and the poorest communities equally. Social exclusion, which is the unequal experience of different population groups in a community based on structures that deliver unequal access to social welfare and economic resources, can be a feature of transportation systems. This construct thrives on income insecurity, low levels of education and low participation in socio-economic as well as political activities by members of a community (Lucas 2012). Social exclusion brings mobility disadvantages to vulnerable social groups in society: children, the elderly, people living with disabilities and low-income households. Limited mobility reduces accessibility to activities for disadvantaged groups – travel for job hunting, education, work and health facilities further increases the physical isolation of these groups throughout their lives (Lucas 2012).

Besides social inclusivity, all stakeholders should be included in the planning of an urban transportation system, particularly in cities whose public transportation businesses are privately-owned and unsubsidized. Inclusivity during the planning of transportation systems should also cater to all the stakeholders. Transportation systems are complex, and their planning usually involves a multi-stakeholder planning process that should cater to the requests, grievances and inputs of all the stakeholders involved (Lucas 2012). Governments are largely responsible for transportation policies and their implementation, but the operation of passenger transportation systems depends on the operators (private owners). The stake held by public transportation taxi and bus owners and companies carries proxy of the overall operation of public transportation system. Therefore, integration of any ICT solutions should first be accepted by and be beneficial to the operators.

Governments should not create legislation and policies without involving operators who are the service providers. Planning also needs the involvement of the public, users and customers of the system, to assess the feasibility of policies. Prior to implementation, policies need to be subjected to scrutiny by all stakeholders involved.

Thereafter, once policies have been adopted, successful implementation depends on users' participation. Willing participation is crucial for the inclusivity of all users, which is essential to an ICT - enabled public transportation system.

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