

Service Quality in the South African Road Public Transportation Industry - Comparing Bus and Mini-bus Taxi Service

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ABSTRACT Although more than 80% of the commuting public in Johannesburg, South Africa rely on bus and minibus taxi as their primary mode of public transport, very little evidence exists of research in South Africa to compare the two modes of transport in terms their reliability, comfort, availability, safety, and affordability (RECSA). This research is a also deviation from the usual practice of measuring service quality using SERVQUAL, since it uses the RECSA dimensions, because these are deemed to be more relevant for public transportation studies. From a study in a world call African city in South Africa it was ascertained that: bus commuters have a higher perception of the quality of service compared to minibus taxis commuters, who cited amongst others, punctuality and timely arrival at destination as matters of concern. Furthermore, reliability, comfort, service and safety influenced the overall service quality that the public buses provided whereas reliability, affordability and service influenced the overall service quality of the minibus taxis.

INTRODUCTION

Public transport is essential to the well-being of any nation and the benefits of a well-planned and efficiently managed transportation system spreads far beyond the transport field, as it is essential for industry, for people's mobility and for good communications (Matthews 2013; Russell 2012).

Although in South Africa, public transport claims a significant portion of, and is a substantial contributor to the country's Gross Domestic Product (GDP), this industry is unfortunately always overlooked as regards the calculation of the transport sector's contribution to both the GDP and other social and developmental objectives of the country, including, job creation (Ndebele 2011). More specifically, with reference to the Johannesburg Metropolitan Municipalities, the metropole has 800 000 daily commuters – 39.6% use minibus taxis, 27.1% use private cars, 24.1% use buses, and 9.2% use rail. There are 3.8 million people living in Johannesburg, the

majority of who are between 19 and 39 years of age (City of Johannesburg 2012). Thus, a large number of people in South Africa in general, and Johannesburg in particular, depend on public transport for their daily commuting.

In view of the fact that public transport is an important 'commodity' to so many people, it is not possible to overlook some of the main challenges associated with it, more specifically the quality of service (Mokonyama 2012). The users of public transport also have various perceptions of transport and its systems, for example, the different classes, young and old, men and women, or able-bodied and disabled people. It is important to understand the commuters' perceptions of public transport service quality so that public transport organisations are able to provide a service that meets their needs (McKnight et al. 1986).

In light of the above, this paper reports on a study undertaken to assess bus and minibus service quality by exploring commuters' perceptions in terms of McKnight et al.'s (1986) service quality dimensions namely, Reliability, Comfort, Extent of service, Safety; and Affordability (RECSA).

Literature Review

Transport makes a vital contribution to the economic and social development of the country and, as a provider of commuter services, it has and continues to provide mobility to mil-

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lions of people who are dependent on passenger transport, including learners who require transport to and from school, workers who require transport to and from their jobs, as well as individuals who are seeking employment or else access to hospitals and other services (Arrive Alive 2011).

The transport system has been particularly dysfunctional as a result of the previous government's apartheid policies, which resulted in 2.8 million (or 13%) of the urban population being categorised as stranded, which means that the transport system is failing this group than any other, since they lack affordable basic access to motorized transport and therefore have little ability to integrate with the rest of society or participate in the broader economy. It has been predicted that this number will grow by 28% in 2020 if nothing is done to address the needs of this group (Godard and Fatonzoun 2002).

Public transport is generally used by the poorer members of the community, who depend on it for their daily commuting, while the private motor car is reserved for the privileged few who use their cars for their daily commuting needs (Mashiri et al. 2010). Thus, this means that the poor have to use buses and minibus taxis, despite any inefficiencies (Thomas et al. 2010). These (mostly poor) public bus commuters are often faced with inadequate service, poorly arranged schedules, the absence of facilities, including bus stops and shelters, and the infrequency of services, particularly at off peak times, thus the convenience of these services is severely compromised (Mashiri et al. 2010).

Although there is evidence that public transport initiatives, such as the implementation of the Bus Rapid Transit (BRT) system, are being rolled out in an attempt to improve public transport service in South Africa, the process will in all likelihood, take place over an extended period of approximately 10 to 15 years before reaching its final stage (Walters 2007). However, with the introduction of the Bus Rapid Transit (BRT) system in South Africa, existing public transport organisations particularly buses and minibus taxis, will have to adapt to the changes or else they will inevitably fail. In general, faced with changes in the environment, transport organisations are being forced to move from a traditionally operations-driven orientation to a more market-driven orientation (Gubbins 1988). This also means that it is incumbent on public trans-

port operators to improve their service quality, attract new passengers, retain existing ones, and garner as much support as possible for their service (Mashiri et al. 2010; McKnight et al. 1986; Zeithaml and Bitner 2000).

Service quality in the public transport sector has remained an elusive and a much neglected area of study. Data regarding the quality and performance indicators of public transportation services are vaguely determined and, in fact, are practically inexistent (Simona 2010). Much of the debate has centred on the system itself: spatial designs, systems configurations, city network developments, government policies, and engineering services. Service quality has also remained a challenge for the majority of public transport organisations, partly as a result of the challenge inherent in measuring service quality and partly because commuters do not perceive quality as a uni-dimensional concept (Zeithaml and Bitner 2000).

McKnight et al. (1986) maintain that one of the challenges confronting transport organisations is that service quality, in particular, is a complex area of study and measuring service quality, particularly in public transport, is made difficult by the subjective nature of the service. Thus, in the absence of objective measures a useful and appropriate approach to assessing the quality of an organisation's services would be to measure the customers' perceptions of quality (McKnight et al. 1986). However, while instruments have been developed to assist organisations to measure service quality in order to meet the needs of commuters, there has, in the main, been no agreement on the measurement of the concept. The majority of the work to date has attempted to use the SERVQUAL methodology in an effort to measure service quality (Edvardsson et al. 1997; Parasuraman et al. 1988; Sahney et al. 2004). This study therefore explored commuters' perceptions of bus and minibus taxi service in terms of the service quality dimensions of McKnight et al. (1986) namely, reliability, comfort, extent of service, safety and affordability (RECSA).

RESEARCH METHODOLOGY

The sample was selected by considering costs, the need for greater accuracy, speed of data collection, and availability of population elements. The following procedure was followed:

- ♦ A letter was sent to the City of Johannesburg, Transport and Planning Department requesting detailed maps of Johannesburg's bus and minibus taxi terminals, including maps showing the location of the minibus taxi ranks. There was a challenge due to the fact that certain mini-bus taxi ranks were also being utilised as bus terminals and vice versa, for example, the Bree Street bus and minibus taxi rank in the City of Johannesburg.
- ♦ The maps were scrutinised for accuracy to ascertain whether they were correct and whether they highlighted all the bus and mini-bus taxi terminals in Johannesburg. This process validated the maps, which were then utilised in the sampling process.
- ♦ Geographical sampling was used in terms of which the bus and mini-bus taxi terminals were grouped into homogeneous clusters, for example, terminals in townships were grouped together, terminals in the suburban areas were grouped together, and terminals in the CBD were grouped together to ensure the homogeneity of the subjects in each cluster (Cooper and Schindler 2001).

Since according to Forsyth and Smyth (1986) and McKnight et al. (1986), on-bus and terminal interviews achieve a higher response rate than conventional postal surveys, and that personal interviews and on-bus terminal distribution aided willingness to contribute, a 'commuter intercept survey' was used to collect the data.

A specifically designed questionnaire comprising multiple-choice, single-response scales, and a combination of Likert and semantic differential scales was used. It was deemed advantageous to include a semantic-differential scale in order to obtain the required information on the considered importance of service constructs (Forsyth and Smyth 1986). The service quality dimensions, originally developed by McKnight et al. (1986) and reflected in Table 1, were utilised in the development of the questionnaire.

Pretesting was conducted in order to ensure that the measuring instrument meets the objec-

tives of the study in terms of the information to be collected (Aaker et al. 2007). The pilot study was conducted by randomly selecting and interviewing 27 commuters. In addition, experts in the field of passenger transport were also asked to determine whether the items used for each variable were relevant and meaningful as regards measuring the constructs in question, and if so, how important each item was to the variable in question. The aim of the aforementioned exercise was to ensure content validity, which refers to the extent to which the measuring instrument provides adequate coverage of the research questions guiding the study (Cooper and Schindler 2001).

Data Analysis

The data analysis was conducted using both SPSS and SAS both of which are widely used packages in advanced statistical analysis. A total of 690 respondents participated in the two-way conversation initiated by the fieldworker who had been trained to conduct personal and face-to-face interviews. The data was collected through personal interviews as the greatest value of personal interviews as regards passenger transportation studies, lies in the depth of information and the detail that may be secured. The information obtained in this way surpasses the information secured from telephone and self-administered studies via intercepts (Cooper and Schindler 2001; McKnight et al. 1986).

The following factors influenced the selection of the appropriate technique for the purposes of the data analysis: the type of data, the research design, and assumptions underlying the test statistic and related considerations (Aaker et al. 2007). The measurement scales were assessed for internal consistency using the Cronbach's alpha measure. The summary statistics for each of the individual scales as well as the summary statistics for both the Perception of Service Quality (PSQ) Index and the Importance-Weighted Perception of Service Quality Index were assessed.

The Jarque-Bera test was used to test whether the PSQ Index data followed a normal distribution while the non-parametric test, the Mann-Whitney Test, was used to compare the medians. Multiple linear regression was used to analyse the relationship between the Perceived Quality of the Service Index for buses and the de-

Table 1: Internal consistency of scales

<i>Scale</i>	<i>Buses</i>	<i>Minibus taxis</i>
Reliability	0.767	0.832
Service (extent)	0.642	0.820
Comfort	0.712	0.650
Safety	0.734	0.883
Affordability	0.789	0.837

mographic variables. Multiple linear regression was also used to analyse the relationship between the Perceived Quality of Service Index for minibus taxis and the same demographic variables. The study used the test of significance 95% confidence level, with a 5% margin of error. Generalised Linear Regression analysis was also used in the analysis.

The correlation coefficient between certain variables of interest was also determined, while Spearman's rank order correlation coefficient was used to measure the association between each of the individual scales, and the self-stated intention of whether or not to continue using that method of transport in the future.

RESULTS

Biographic Data

It emerged that 29.8% of the respondents used public buses, while 70.2% used mini-bus taxis as their preferred mode of transportation. A fair percentage (30.3%) of public transport users were 19 years old and 28.7% were between the ages of 25 and 34 years. Although public buses and mini-bus taxis are used predominantly by students and scholars, their preferred mode of transport is the mini-bus taxi.

Reliability and Validity of Measurement Scales

Separate scales were constructed for buses and minibus taxis, respectively. The five scales were Reliability (6 questions), Comfort (4 questions), Service (6 questions), Safety (5 questions) and Affordability (5 questions). The five scales were rescaled so that each ranged from 0 to 10, with 0 being the worst possible perception and 10 being the best. The scales were assessed individually for internal consistency

using the Cronbach's alpha measure. As indicated in Table 1, the values were all above 0.64 indicating an acceptable level of internal consistency for all the service quality measurement scales.

Service Quality

The five scales were then combined into a cumulative index which was termed the Perceptions of Service Quality Index (PSQI). Each scale was weighted equally in the index, so that it was possible for index scores to range from 0 to 50. In view of the fact that respondents had been asked their opinions about the importance of each of the five categories, it was also possible to create a cumulative index in which the individual categories were weighted according to their perceived importance for each individual. The result was termed the Importance-Weighted Perceptions of Service Quality Index. The summary statistics for each of the individual scales as well as summary statistics for both the PSQI and the Importance-Weighted PSQI are reflected in Table 2.

Table 2: Summary statistics

	<i>Buses</i>		<i>Minibus taxis</i>	
	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>
Reliability	7.4	7.7	5.8	6.0
Service	6.7	6.7	6.5	6.7
Comfort	7.8	8.0	5.4	5.5
Safety	7.9	8.0	5.1	4.8
Affordability	7.2	7.2	5.6	5.6
PSQ Index	37.1	37.5	28.5	28.3
Importance-Weighted PSQ Index	33.0	33.5	24.6	23.1

The Jarque-Bera Test was used to determine whether the PSQ Index data followed a normal distribution. For both buses and minibus taxis,

Table 3: Conclusions from Mann-Whitney test results

<i>Scale or index</i>	<i>p-value</i>	<i>Decision</i>
Reliability	2.2e-06	Buses are perceived as more reliable than mini-bus taxis
Service	0.572	There is no significant difference in the perceived service level between buses and mini-bus taxis
Comfort	4.6e-14	Buses are perceived as more comfortable than mini-bus taxis
Safety	2.2e-16	Buses are perceived as safer than mini-bus taxis
Affordability	5.5e-06	Buses are perceived as more affordable than mini-bus taxis
Perceived Service Quality Index (PSQI)	78e-15	Buses are perceived as offering better quality overall than mini-bus taxis
Importance-Weighted PSQI	5.4e-14	Buses are perceived as offering better quality overall than mini-bus taxis after weighting each scale according to its perceived importance

the null hypothesis of normality was rejected with p-values of 0.000017 and 0.00015 respectively. It was thus not possible to use a t-test to compare the mean perceived service quality of buses and taxis. The Mann-Whitney Test was therefore used to compare the medians. The p-values and decisions from these tests are presented in Table 3.

For all of the individual scales except "Service", as well as the overall index and weighted index, it was possible to conclude that the perceived quality of bus transport exceeds that of minibus taxis by a significant margin. The multiple linear regression model was used to analyse the relationship between the PSQI for buses and the demographic variables (mode of transport used the most often, age, gender, educational level, and income). In this case, only the coefficient of the mode of transport was statistically significant and was estimated to be -5.43 with a p-value of 2.69e-10. This suggests that those who use buses more often tend to have a higher opinion of the quality of bus transport.

Similarly, multiple linear regression was used to analyse the relationship between the PSQI for mini-bus taxis and demographic variables, namely, mode of transport used the most often, age, gender, educational level, and income. In this case, it was interesting to observe that the coefficient for the mode of transport used the most often was not significant. This may suggest that those who use mini-bus taxis as their primary mode of transport do not do so because they have a high opinion of the quality of the mini-bus taxi experience.

In addition, age, gender and level of education were all statistically significant in this model at the 5% level. Age had a negative coefficient, indicating that, on average, younger people have a more favourable perception of minibus taxis than older people. Gender had a positive coefficient, indicating that, on average, females perceive minibus taxis more favourably than males. On the other hand, educational level had a negative coefficient, indicating that less educated commuters viewed mini-bus taxis favourably as compared to more highly educated commuters.

In view of the fact that the indices did not follow a normal distribution according to the Jarque-Bera Test, the non-parametric Spearman's correlation method was used instead of the Pearson's method. The correlation coefficient between the PSQI for buses and the PSQI for mini-

bus taxis (for those who offered opinions on both modes of transport) was 0.068 and not statistically significant (p-value = 0.41). This suggests that the respondents' opinion of buses was independent of their opinion of mini-bus taxis. Spearman's rank correlation coefficient was also used to measure the association between each of the individual scales, and the self-stated intention of the respondents regarding whether they would continue to use that method of transport in the future. The results of this analysis are presented in Table 4. Table 4 indicates that for each individual scale and mode of transport, the perceived quality of the mode of transport is strongly associated with the intention to continue using that mode of transport.

Table 4: Association of scales

	<i>Buses</i>	<i>Taxis</i>
Reliability	0.59*	0.66*
Service (extent)	0.39*	0.59*
Comfort	0.26*	0.57*
Safety	0.48*	0.73*
Affordability	0.51*	0.61*
PSQ Index	0.66*	0.79*

* indicates that the result is statistically significant

Table 5 presents summary statistics in respect of the importance attached to each of the five dimensions of the quality of service, on a scale of 1 (less important) to 5 (very important). Table 5 reveals that all five service quality dimensions were considered very important, and equally so.

Table 5: Importance of service quality dimensions

	<i>Buses</i>		<i>Minibus taxis</i>	
	<i>Mean</i>	<i>Median</i>	<i>Mean</i>	<i>Median</i>
Reliability	4.3	5.0	4.4	5.0
Service (Extent)	4.3	5.0	4.3	5.0
Comfort	4.4	5.0	4.2	5.0
Safety	4.3	5.0	4.3	5.0
Affordability	4.4	5.0	4.3	5.0

DISCUSSION

Reliability of the Service

Buses were perceived as being more punctual compared with the mini-bus taxis, since only 23% of the passengers perceived mini-bus taxis as being on time. This may be attributed to the bus industry being in a much better position

compared with mini-bus taxis to effectively plan for service interruptions because the formal nature of the bus service results in most bus companies being likely to have systems, skills, and capital to implement effective planning and scheduling systems. Furthermore, bus service organisations are often required by government to implement systems to improve communications with passengers of service interruptions.

The situation is different for the mini-bus taxi service. The almost informal nature of their operations implies that planning and scheduling of routes is not formalised nor is it structured and co-ordinated, and there are no efficient, effective, and systematic planning systems to minimise service interruptions. When service interruptions occur, the industry does not answer to anybody, not even to the transport authorities unlike the bus industry. Mini-bus taxi industry associations are responsible for operational planning and the rules are not the same between the various associations. Implementing a state of the art bus scheduling and planning system such as MICROBUS solutions (Shaibani 2005), could raise efficiency levels.

The majority of respondents (68%) perceived buses as arriving at destination on time compared with the mini-bus taxis. On the other hand, only 51% of the respondents perceived mini-bus taxis as arriving at destination on time. The mini-bus taxi drivers wait for the vehicles to be full to capacity before departing from terminals, whereas buses operate according to a timetable irrespective of the number of passengers aboard.

Another important classification affecting the reliability of the service is the journey length or the distance between departure and destination. It was ascertained that 62% of the respondents were satisfied with the time buses take to arrive at their destination, and on the other hand 48% of the passengers were satisfied with the time minibus taxis take to arrive at their destination. Passengers perceived buses as adhering more to the routes compared with the mini-bus taxis. While 63% of the passengers perceived buses as adhering to routes, only 42% of the passengers perceived the mini-bus taxis as adhering to routes.

Extent of the Service

The extent of service mainly involves taking passengers to their direct location (with no trans-

fers involved) and, the availability of the service during the day (peak and off-peak), in the evenings, weekends, and on public holidays (McKnight et al. 1986). The majority (64%) of the passengers perceived the buses as taking them to their exact destination. On the other hand, 57% of the passengers perceived the mini-bus taxis as taking them to their exact destination.

Most (53%) of the passengers perceived buses as being mostly available on weekdays. On the other hand, 78% of the passengers perceived the mini-bus taxis as being available on weekdays and 67% perceived the mini-bus taxis as being more available on weekends.

Public transport's availability can have a positive effect on the demand since commuters are likely to increase using this service because of the increased availability, especially in the evenings (Hensher et al. 2003).

Comfort of the Service

The vast majority (72%) of the passengers perceived finding a seat in a bus as being easy, whereas only 41% of the passengers perceived finding a seat in a mini-bus taxi as being easy. In order to maintain or improve passengers' perceptions of the comfort of the service inter-alia, the following variables should be considered: availability of seats; load factor; availability of air conditioning; condition of bus shelters. The passengers perceived the condition of bus shelters as being good compared with the mini-bus taxis.

Safety of the Service

Only a minority (25%) of the passengers perceived the rate of bus accidents as being high, whereas the vast majority (64%) perceived the rate of the mini-bus taxi accidents as being high. Because the safety of the service is an important aspect for most public transport commuters, it requires rigorous attention from public transport stakeholders. For example, public transport authorities working together with other stakeholders in the industry can develop effective plans to drastically improve the safety of public transport (McGovern 2005). Perhaps a dedicated national task team that focuses on public bus and minibus taxi safety should be established, since if the issue of safety is not seriously addressed, commuters are likely to resort to private motor cars (McGovern 2005).

The profiteering nature of the public transport industry contributes to the lack of safety, since the minibus taxi service in particular, is driven by the maximization of revenue and the minimization of costs. This often translates to overloading, tension and friction among associations, and a general failure to observe the traffic rules. The aforementioned view is supported by some researchers, inter-alia, Govender et al. (2006: 106) who stated that “the minibus taxis gets most people to their destination, sometimes, in record time and at the expense of other road users, but it also kills many users.”

Regarding driving behavior, another safety of service classification, it became evident that only a minority (12%) of the passengers were dissatisfied with the driving behavior of the bus drivers, whereas a significant majority (54%) was dissatisfied with the driving behavior of the minibus taxi drivers. It has been shown that drivers are the cause of road accidents, with the human factor contributing to the overwhelming majority (82.85%) of fatal crashes during 2009, and vehicle factor contributed only 9.13% and road and environmental factors contributed 8.02% (RTMC 2009). The government’s effort to transform the minibus taxi industry has met with limited success, and the sector’s blatant disregard of laws and regulations continues, with unroad-worthy vehicles, overloading, and reckless driving remain its trade marks (Arrive Alive 2011).

Affordability of the Service

The affordability of the service affects the income/price ratio of commuters. Buses were perceived as being more affordable than minibus taxis. The commuters are exposed to a high income/fare ratio that is more than 10%, therefore, there is need to review the pricing structure of public transport. One method that could be adopted involves the determination of the average monthly wage of the population in the area. However, such an exercise does have its challenges in terms of determining the correct average monthly wage and the ability to obtain the information from the population.

CONCLUSION

Public transport organisations could learn from countries who have implemented efficient bus scheduling and planning software systems.

Mini-bus taxi associations could utilise scheduling systems to improve the efficiency of their operations, and to at least keep a record of fares, drivers, owners, trips, vehicle registration numbers, and any other information they deem necessary. This information is also very important for the proper integration of the mini-bus taxi service into the formal public transportation system since almost no progress has been made in terms of integrating the three main modes of public transport – minibus taxi, bus and rail. Adherence to routes is also important because it improves the predictability of public transport, and allows the passengers to plan effectively. From a supply-side, it is important for public transport operators to maintain a vehicle cycle that is cost-effective and improves operational efficiency.

RECOMMENDATIONS

One of the objectives of any efficient public transport system is taking passengers to their exact destination or as close to their destinations as possible, and this should be done timeliness, safely, and with minimum discomfort to the passenger. One of the challenges with the existing public transport system in Johannesburg, is the lack of proper integration, thereby putting further strain on already stressed commuter, who have to either transfer (at additional cost) or walk to reach their final destinations. Therefore, Johannesburg should have a single road-based public transport system that will allow commuters to travel further without transfers and without additional costs.

Public transport organisations need to consider various options in terms of expansion or contraction of the service. Routes that are not operated in large parts of the general service period (peak services, night services) should not be included in the main network structure, but dealt with as a part of the supplementary access service.

The availability of seats is likely to impact on timely arrival at the destination, since long and uncomfortable journeys are likely to cause high level of negative perception if the passenger is not able to find a seat. Communication, as discussed in the preceding section, is important, and the seat availability should be displayed on vehicles, electronic boards at bus and mini-bus taxi terminals, and other key points

along the route, such as the designated public transport stops. Seat availability also reflects the demand for the service; if vehicles are always full, it means that demand exceeds supply, and more vehicles should be put on the route instead of increasing fares to manage the demand as it often happens in public transport. Furthermore, a load factor for each public transport vehicle should be established, since the mandatory introduction of the load factor is likely to minimize passenger over-loading and somewhat reduce the number of accidents caused by over-loading. The availability of air conditioning is likely to be a contributor to the service comfort. A comfort rating for buses and minibus taxis should be established, and be widely communicated to the users of the service.

Since the condition of the shelters is one of the variables that have an impact on the passengers' perception of the service for both bus and minibus transport, there is need for a continued effort to improve the conditions of the public transport shelters (for both buses and mini-bus taxis users) by the City of Johannesburg, as failure to do so will create a negative perception of the service for bus and minibus taxi passengers. The government, supported by the private sector, has the responsibility to improve the public transport infrastructure in the same way that it has the responsibility to create an enabling environment for the efficient provision of the public transport service.

A consideration to manage the fares involves price discrimination that includes peak and off-peak pricing, as well as discounted weekly and monthly tickets. Scholars, pensioners and the elderly should pay less than the normal adult fare and such a strategy is likely to impact positively on the passengers' perception of the service. However, the collusion in the determination of the minibus taxi fares should be eliminated because of its unintended consequences on fares. The market forces should determine the equilibrium for the fares, quality, and the efficiency of the service. However, in cases where the public transport service needs to meet a social need and therefore have to operate unprofitable routes, proper compensation should be made available from government resources.

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