

RAIL COMMUTER SERVICE QUALITY IN SOUTH AFRICA: RESULTS FROM A LONGITUDINAL STUDY

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ABSTRACT

Rail transport is a critical mass transit mode in South Africa performing in excess of 400 million passenger trips per annum. Within a high density metropolitan region it is expected that rail passenger transport form the backbone of the public transport system, however in the Gauteng region it is estimated that only 8% of public transport commuting trips are completed by train; approximately 2% of total commuting trip. Total rail passenger trips have declined by nearly 20% since 2013/14. This suggests that the passenger rail service provider, PRASA, is not providing the service levels that commuters require. If rail is to fulfil its expected role, it is crucial that service levels are improved. The 2014 Gauteng Household Travel Survey suggests that train users were generally dissatisfied with train services, citing availability, overcrowding on trains, punctuality and reliability of services, geographical coverage and frequencies of services as key limitations. To more accurately assess the extent of service dissatisfaction, this research applied an adapted SERVQUAL model to determine the gap between commuters' perceptions of service quality and their expectations. The study utilised a longitudinal approach to determine whether customer perceptions of five dimensions of service quality, i.e. reliability, the extent of the service, comfort, safety and affordability had changed over a two-year period. The results indicate changing gaps in most of the dimensions and a number of attributes were identified as having influenced the perception of service quality significantly enough to lead to customer dissatisfaction.

This research provides transport authorities and public transport operators responsible for the provision and subsidisation of public transport with a tool characterised by a good degree of openness and flexibility, to fit individual needs. It might also be of interest for practitioners wishing to explore the main drivers of satisfaction among transport users.

Keywords: Rail transport, SERVQUAL, public transport, service quality, South Africa

1. BACKGROUND

The provision of reasonable levels of public transport is critical in developing economies, particularly in major cities with high population growth rates like Johannesburg (World Population Review, 2018). As the city grows at double figure

rates annually, so too does the need for appropriate public transport become increasingly important. In Johannesburg, where private motor cars are the dominant form of commuting transport (Luke, 2018; Gauteng Province Roads and Transport, 2016) and the population growth rate is extremely high, the city, which is already congested (TomTom, 2017), will become gridlocked. Associated with the congestion problems are issues such as pollution, accidents, public transport decline, environmental degradation, climate change, energy depletion, visual intrusion and lack of accessibility for the urban poor (Poiani & Stead, 2015). In South Africa, urban transport problems are exacerbated by the past, where the system of apartheid left a legacy of social exclusion and a highly distorted separation of people from both their places of work and the majority of social services required to live a productive life (Thomas, 2016). O'Neill (2010) claims that, amongst others, urban transport problems severely hamper mobility and accessibility, thus impacting social and economic activities and that the poor are the worst affected. Ngqaleni, deputy director-general: Intergovernmental Relations (Petterson, 2016) states that "The main point is to remember that public transport is essential to creating and growing competitive economies. This in turn is critical for poverty alleviation and also for environmental issues in reducing both carbon emissions and fuel consumption."

Despite the assertion that public transportation systems could remedy many of the problems faced by major cities in developing countries (capacity4dev.eu, 2017), Lucas (2011, p. 1320) claims that "In general, there has been a very poor post-apartheid government response to the escalating mobility needs of low income travellers, who constitute the vast majority of South Africa's urban population." Ngqaleni (Petterson, 2016) supports this by stating that "public transport is a challenge for the majority of users, but more so for the poor". Given this, public transport should be given a very high priority, both within budget expenditure as well as policy as a whole. It is estimated that South Africa spends approximately 2% of the national expenditure on public transport (derived from Walters (2014) and National Treasury (2013)). From a policy perspective, although policies (Department of Transport, 2015; Department of Transport, 1996) describe the need for modal shift from private to public transport, household travel surveys (Gauteng Province Roads and Transport, 2016; Statistics South Africa, 2014) reveal that the majority of commuter trips are made on foot or by private motor vehicle, whilst the majority of public transport trips are made by minibus taxi, which is largely operated by the private rather than public sector. Less than 5% of commuter trips in Gauteng are performed on government subsidised public transport (Gauteng Province Roads and Transport, 2016), clearly indicating a failure of government to supply public transport that commuters are willing to use.

Much of the reason why commuters are unwilling to use public transport relates to the quality of the service (Luke, 2018; Gauteng Province Roads and Transport, 2016; Statistics South Africa, 2014). The National Household Travel Survey indicates that only 9% of commuters had not experienced transport problems with transport, implying that a large 91% had. Rail transport, which is typically a good solution for moving large numbers of people in urban areas, is known to be problematic in terms of service quality in South Africa. This service is provided by Metrorail, which claims to transport up to 2 million people on a daily basis across South Africa (Metrorail, n.d.)

Metrorail started 2018 embroiled in a mesh of problems. Within the first two weeks of the year a locomotive had been involved in a collision with a truck and a light motor vehicle killing 18 and injuring approximately 100 people (Mkhonza, 2018; Motau, 2018)

in Kroonstad; two Metrorail trains had collided in Germiston with an estimated 226 passengers being injured (Mkhonza, 2018a); the Cape Town Central Line was suspended after a security guard was robbed and shot dead (Isaacs & Palm, 2018); a train commuter died after jumping out of a fast-moving train while fleeing alleged robbers (Mzantsi, 2018) and, just as the Central Line services were to be restored, a train derailed in Cape Town (Saal, 2018). These events highlight some of the issues typically facing commuters; i.e. security, safety, delays and lack of services.

The National Household Travel Survey (Statistics South Africa, 2014) indicates that the main issues pertaining to train services are that they are not available or that they are not reliable. Almost 25% of the respondents from this survey however indicated that the reason that they did not use train services was related to the service attributes. The Gauteng Province Household Travel Survey (Gauteng Province Roads and Transport, 2016) emphasizes the issues with the rail service as crime, overcrowding, delays, train frequencies, lack of information, costs and need to transfer. A review of the Hello Peter (a reviews company) website highlights delays, staff issues, safety, the condition of stations and rolling stock, overcrowding and lack of information (Hello Peter, 2018).

From the above surveys, reviews and news articles, it is clear that the Metrorail service quality is not adequate to meet the needs of commuters, much less entice them to swap from other forms of transport. It thus becomes evident that, if modal shifts are to be effected, service levels need to be improved. As transport policy in the country is aimed at improving the modal balance, it is crucial that a transport system is created that favours public transport over the private motor vehicle (Department of Transport, 1996). However, it is also evident from the above that there are numerous issues with the Metrorail service. It is therefore imperative that consumer needs and expectations are understood, so that it becomes possible to provide public transport services that consumers believe to be viable alternatives to their own cars. To improve the service, it is important that the perception of the quality of the current service be established and to determine the factors that commuters value and those where they believe that service expectations are not being met.

There are numerous methods to determine the quality of a service. There are a number of national and international indexes that have been developed based on customer perception and expectations (Johnson, et al., 2001; Andreassen & Lervik, 1999). A Service Quality Index (SQI), based on random utility theory and discrete choice models is centred on choice data as opposed to the use of customer judgments ratings (Hensher & Prioni, 2002; Hensher et al., 2003; Eboli & Mazzulla, 2007). Another approach is a Customer Satisfaction Index (CSI), which measures service quality based on user judgements conveyed through numeric scales (Hill et al., 2003; Eboli & Mazzulla, 2009).

The SERVQUAL (service quality) methodology, developed and refined by Parasuraman et al. (1985, 1988, 1991), has been used extensively by researchers to study and measure service quality. This methodology is one of the most commonly used approaches, across a broad range industries, to measure and compare customers' service quality expectations with their perceptions of actual service experienced. Because of the extent to which the SERVQUAL methodology has been applied to a number of industries including transport, it is considered appropriate for

measuring the quality of service in the train industry, as the survey instruments tend to be robust and are adaptable to local circumstances and particular industries.

The SERVQUAL instrument, as refined by Parasuraman et al. (1985, 1988, 1991) is based on two sets (measuring perceptions and expectations) of 22 items, grouped into the five dimensions of service quality. These are shown in Table 1.

Table 1: SERVQUAL Dimensions (RATER)

Service quality dimension	Definition
Reliability (R)	Ability to perform the promised service dependably and accurately
Assurance (A)	Knowledge and courtesy on the part of employees and their ability to convey trust and confidence
Tangibility (T)	Physical facilities, equipment and the appearance of personnel
Empathy (E)	Caring, individualised attention which the organisation provides to its customers
Responsiveness (R)	Willingness to help customers and provide prompt service

Source: (Parasuraman, Valarie, Zeithaml, & Berry, 1988)

The model to determine service quality is based on identifying and measuring the gaps between the expectations and perceptions in the five dimensions that may cause customers to perceive the quality of service as being poor (Parasuraman et al. 1985). In general, most SERVQUAL research that measures service quality of transport services uses the RATER dimensions of service quality or an adaptation thereof (Barabino et al., 2012; Muthupandian & Vijayakumar, 2012; Verma et al., 2013; Ojo et al., 2014).

Parasuraman et al. (1991) however believed that the SERVQUAL instrument formed a guideline and that it could be refined and revised to fit specific contexts. This is supported by Too & Earl (2010) who state that, while SERVQUAL is extensively used to measure service quality across various industries, the specific contexts within which they are applied vary considerably, implying that the model frequently needs to be adjusted so that it is appropriate to particular circumstances. They further assert that the original SERVQUAL model should simply provide a framework that should be adapted to specific services and circumstances.

Although the SERVQUAL model is considered to be an appropriate instrument for the measurement of service quality in public transport, as previously stated, the instrument should be adapted to specific circumstances. Randheer et al. (2011) added culture to their study of customer expectations in public transport. In an exploratory analysis of various forms of road based public transport modes in South Africa, Vilakazi and Govender (2014) found the RECSA dimensions (reliability, extent of service, comfort, safety and affordability) appropriate in their determination of the service quality perceptions of public transport users. Khuong & Dai (2016) also found RECSA to be appropriate for measuring taxi services in Vietnam as did Horsu & Yeboah (2015) in Ghana. McKnight et al. (1986) assert that the quality of transport services is influenced by five main elements, i.e. reliability, extent of service, comfort, safety and affordability (RECSA). The results of the State of Transport Opinion Poll indicates that, according

to respondents, commuter transport is not yet safe, reliable, effective or affordable (Heyns & Luke, 2016). Based on the findings that affordability is a key component of the service level offered to customers, particularly in developing countries, RECSA is considered fitting for measuring service quality in public transport in South Africa. The SERVQUAL instrument was thus adapted to include items that address the specific service quality concerns of the users.

2. RESEARCH METHODOLOGY

The aim of this paper is to determine rail commuters' perceptions of service quality in the Greater Johannesburg and whether these have changed over a two year period. To measure the potential gap that might be present between rail customers' expectations of service quality and the perception of actual service quality presented by Metrorail, a modified SERVQUAL model was used to determine service quality and customer satisfaction of Metrorail services. This study utilises a longitudinal approach to determine customer perceptions and expectations of five dimensions of service quality, i.e. reliability, the extent of the service, comfort, safety and affordability, the gap between perceptions and expectations and whether these have changed from 2016 to 2017.

To acquire an understanding of the commuters' perceptions and expectations of service quality, a survey was conducted amongst waiting Metrorail passengers using Park Station in Johannesburg. The structured interviewer-administered questionnaires consisted of three segments. The first segment requested information on characteristics such as age, gender, employment status and frequency of usage; the second segment gauged the respondents' expectations regarding service quality of the rail transport service and the third segment surveyed the respondents' perception of service quality actually provided by the Metrorail service. The last two segments (i.e. expectations and perceptions) of the research instrument each contains 25 item statements, which typify the service quality elements of public transport and are evenly distributed between the five dimensions. To record the respondents' level of agreement with the item statements, a five point Likert scale, anchored by strongly disagree (1) and strongly agree (5), was used. Convenience sampling was used in both years when trained research assistants conducted the surveys amongst waiting Metrorail commuters at Park Station in Johannesburg. The surveys were completed by 99 and 250 respondents in 2016 and 2017 respectively. Convenience or availability sampling was used because of the accessibility, geographical closeness, availability at a given time and the willingness of respondents to participate in the survey (Etikan et al., 2016). A disadvantage of convenience sampling is that generalisation from the results of this research is impaired (Zikmund et al., 2013).

3. RESEARCH RESULTS

The survey data was analysed using the Statistical Package for the Social Sciences (SPSS) for Windows version 24. The reliability of the measurement scale was assessed to establish the internal consistency. For both years, the internal consistency was evaluated for the perception and the expectation items alike. For the 2016 Metrorail data, the Cronbach's α values were 0.813 and 0.901 for the perception and expectation segments respectively. Similarly, for the 2017 Metrorail data, the

Cronbach's α values were 0.863 and 0.969 for the perception and expectation segments respectively. The results indicate that the two questionnaire segments of the two annual surveys are reliable (Field, 2013). Also refer to Table 3, which indicates that the overall Cronbach's α values for the different surveys are acceptable (Pallant, 2016). The profiles of the two response groups are shown in Table 2 below.

Table 2: Profile of respondents

	Characteristics	Respondents (%)	
		2016	2017
Gender	Male	53	56
	Female	47	44
Age	Below 20 years	5	9
	21 - 30 years	35	44
	31 - 40 years	30	26
	41 - 50 years	24	15
	51-60 years	5	6
	Above 60 years	1	0
Occupation	Scholar/student	22	27
	Full time employed	33	56
	Part time employed	16	10
	Unemployed	22	6
	Retired	7	1
Frequency of travel	1-2 times per day	27	25
	3-4 times per week	27	36
	1-2 times per week	16	6
	1-2 times per month	12	7
	Seldom	18	26

The SERVQUAL gap scores at dimension level for both 2016 and 2017 is illustrated in Table 3 and identifies the negative gaps between rail service quality perceptions and expectations. For the Metrorail service the biggest gap, for both years, refers to the ability to provide an on-time and dependable rail service, with the reliability dimension obtaining a gap score of -1.654 and -1.549 in 2017 and 2016 respectively. The results also indicate that for 2017, the service perceptions and expectations are noticeably higher for all the dimensions. The negative gaps between the perceived perceptions and expectations of rail commuters are also illustrated in Figure 1.

The overall average scores for Metrorail commuters' perceived level of service quality are 2.728 (2016) and 2.932 (2017) out of a possible score of 5. The respondents' expectations of rail service quality have average scores of 3.866 (2016) and 4.162 (2017), which indicate an overall rail service that is perceived to be less than acceptable. In general, the scores for 2017 expectations are higher than for 2016, however the same can also be said for the perceptions of the actual service.

Table 3: SERVQUAL gap scores at dimension level (Metrorail)

SERVQUAL dimensions	Expectation (E)		Perceptions (P)		Gap (P-E)		Service Gap Comparison	
							Independent-samples T-test	
	2016	2017	2016	2017	2016	2017	t-value	p - value*
Reliability	3.857	4.032	2.307	2.378	-1.549	-1.654	0.923	0.357
Comfort	3.814	4.094	2.513	2.650	-1.301	-1.445	1.360	0.175
Extent of Service	3.739	4.018	2.632	2.733	-1.107	-1.286	1.734	0.084
Safety	3.883	4.203	2.729	2.794	-1.154	-1.410	2.130	0.034
Affordability	4.038	4.462	3.459	4.106	-0.580	-0.357	-2.124	0.035
Total SERVQUAL	3.866	4.162	2.728	2.932	-1.138	-1.230		
Cronbach's α	0.901	0.969	0.813	0.863				

* $P < 0.05$: Statistically significant difference

The higher scores could be indicative of changing perceptions and expectations amongst users, however the larger sample size in 2017 could also have influenced this view. An independent-sample t-test was conducted to compare the dimensional service gap scores for 2016 and 2017. The results however show that the differences between the two years are statistically not significantly different for reliability, comfort and the extent of service. However, the dimensional gap score for safety is considerably higher, most likely indicating growing dissatisfaction with the safety aspect of the service. The affordability dimension is also statistically significantly different, which is closer than before, indicating that this aspect of the service is close to being met.



Figure 1: Gap between perceptions and expectations

Table 4 provides the detailed scores within the different dimensions of rail service quality for Metrorail and highlights the areas of inadequacy and agreement. The key service shortcomings for Metrorail are punctuality and adherence to rail schedules, the protection provided on trains as well as at stations, breakdown of trains, inadequate operational times and the cleanliness of trains. An independent-sample t-test was conducted to compare the service gap scores for 2016 and 2017 (refer to Table 4). The results show that, for the most part, there are not significant difference between the findings across the two years, most likely implying that no real differences have been effected in the service quality, despite the commuters' dissatisfaction with the service levels. Areas in which differences are noted are:

- Trains are clean and well maintained
- Train services in the evenings are adequate
- There are adequate safety measures against crime on trains
- There are adequate safety measures against crime at waiting areas
- Fares are affordable

Aside from the last point, all other aspects indicate a significantly higher gap than before, most likely indicating a growing dissatisfaction with these aspects of the service.

4. CONCLUSION

The study has presented the findings of two surveys that examined the gap between the expectations and the perceptions of rail transport passengers in the Johannesburg area. The study demonstrates the application of a modified SERVQUAL instrument for the measurement of transport service quality of a public railway operator, namely Metrorail. The SERVQUAL methodology, as initially presented by Parasuraman et al. (1985), which typically makes use of the RATER (reliability, assurance, tangibility, empathy and responsiveness) dimensions was adapted to include the RECSA (reliability, extent of service, comfort, safety and affordability) dimensions with 25 items evenly distributed across the five dimensions. For both years, the overall perception scores of all the dimensions were less than the expectation scores. This indicates that Metrorail commuters are not content with the service quality they experience and that their dissatisfaction with the service appears to be increasing. In particular, the areas where railway services fell short were in the reliability and safety dimensions. In terms of reliability, all dimension items exhibited considerable gaps between perceived service levels and expected service levels, indicating that Metrorail has not effectively addressed the reliability concerns of the commuters. In particular, rail passengers feel that trains are not punctual and tend to break down too often. From a safety perspective, rail users highlighted their personal safety concerns, both on trains and at stations.

The limitations of this study are primarily related to the short time period over which the study was conducted as well as the variability in sample size. As it is intended to conduct the study over a longer period, the limitation of the study is therefore that significant differences cannot be assumed to be trends until the study has been conducted for a longer period of time. From a managerial perspective, these findings offer clear directions for future interventions aimed at improving service levels in the industry. It is evident from the study that Metrorail needs to prioritise its service improvement focus on the basic issues of reliability and safety in order to better align their service offerings with customer expectations. Aside from extending the study for a longer period of time, another area for future research would be to consider actual service levels and compare these to customers' perceptions and expectations.

TABLE 4: Metrorail service quality scores

SERVQUAL attributes	Metrorail (2016)			Metrorail (2017)			Service Gap Comparison (between 2016 & 2017)	
	Expectation (E)	Perceptions (P)	Service Gap (P-E)	Expectation (E)	Perceptions (P)	Service Gap (P-E)	Independent-samples T-test t-value	p - value *
Reliability								
Trains always arrive at the destination on-time	3.85	1.79	-2.06	3.92	1.88	-2.04	-0.109	0.914
Trains never break down on the track	3.97	2.32	-1.65	3.86	1.97	-1.89	1.466	0.144
There are train timetables and other user information	3.81	2.43	-1.37	4.17	2.96	-1.21	-0.973	0.331
Metrorail always inform people of availability of services	3.70	2.52	-1.18	4.15	2.68	-1.47	1.902	0.058
Staff are always willing to help passengers	3.96	2.47	-1.48	4.07	2.40	-1.76	1.215	0.225
Comfort								
Trains are clean and well maintained	3.46	2.31	-1.15	3.99	2.23	-1.76	3.753	0.000 *
Trains have ample legroom and foot space	3.84	2.66	-1.18	4.11	2.88	-1.22	0.259	0.796
A smooth ride is enjoyed for the journey	4.00	2.39	-1.61	3.97	2.42	-1.54	-0.371	0.711
Waiting areas are sheltered	3.98	2.63	-1.35	4.25	3.09	-1.16	-1.106	0.270
Waiting areas are clean and well maintained	3.79	2.58	-1.21	4.15	2.62	-1.53	1.794	0.074
Extent of Service								
Train services on weekdays are adequate	3.96	2.44	-1.52	4.07	2.66	-1.41	-0.620	0.536
Train service availability on weekends / public holidays is adequate	3.40	2.33	-1.07	3.86	2.49	-1.38	1.897	0.059
Train services in the evenings are adequate	3.63	2.71	-0.92	3.90	2.45	-1.45	3.508	0.000 *
Trains are available to most areas in the city	3.83	2.75	-1.08	4.10	3.06	-1.04	-0.239	0.811
Train stations are conveniently located	3.88	2.93	-0.95	4.15	3.00	-1.15	1.167	0.244
Safety								
There is a low probability of accidents	3.74	2.99	-0.75	4.27	3.21	-1.06	1.841	0.066
Drivers are well trained and safety measures are used	3.73	2.87	-0.86	4.30	3.34	-0.97	0.715	0.475
There is a low possibility of personal injury due to reckless driving	3.85	2.91	-0.94	4.28	3.22	-1.06	0.790	0.430
There are adequate safety measures against crime on trains	4.02	2.40	-1.62	4.07	2.09	-1.98	2.011	0.045 *
There are adequate safety measures against crime at waiting areas	4.08	2.47	-1.61	4.09	2.12	-1.97	1.995	0.047 *
Affordability								
Fares are affordable	4.00	3.26	-0.74	4.54	4.27	-0.26	-3.120	0.002 *
Fares are good value for money	4.06	3.15	-0.91	4.40	3.74	-0.65	-1.806	0.072
I can buy weekly / monthly / season tickets	3.95	3.60	-0.35	4.46	4.16	-0.30	-0.355	0.723
Fares are cheaper than other transport modes	4.11	3.81	-0.30	4.52	4.38	-0.14	-1.172	0.243
Fare increases are reasonable	4.07	3.47	-0.60	4.40	3.97	-0.43	-0.979	0.329

* $P < 0.05$: Statistically significant difference

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