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Financial implications of specifying service quality in public transport service contracts with a large captive user base – The case of South Africa

***Mathetha Mokonyama**[a] and Christo Venter[b]

[a] *CSIR, P O Box 395, Pretoria, 0001*
[b] *University of Pretoria, Private bag X20 Hatfield 0028*

* Corresponding author: CSIR, P O Box 395, Pretoria, 0001, +27 (0)12 841 4732, *mmokonyama@csir.co.za*

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ABSTRACT

Improved service quality is increasingly acknowledged as critical for increased patronage of public transport services. However, in markets characterised by large proportions of captive public transport users, typically found in developing or emerging economies with low car ownerships rates, the marginal benefits of improved service quality are not apparent. The paper uses historical financial and patronage data from existing bus contracts in South Africa and a conjoint-analysis based behavioural model to estimate the budgetary implications, and marginal benefits, of specifying service quality in public transport contracts, where marginal benefits are defined in terms of nominal welfare benefits to society. It is shown that the marginal benefits of improved service are significant and may outweigh the marginal cost of improved service quality or the business as usual alternative. Practical implications of the findings on contract planning and designs are also discussed in the context of markets with characteristically large proportions of captive public transport users.

1. Introduction

Captive public transport users make use of public transport services for reasons that include being unable to afford alternative transport modes, psycho-physical limitations, and regulatory restrictions. In some sectors, such as telecommunication and banking, customers may become captive to services for reasons that include perceived high cost of switching to alternatives (Royley, 2005). The Department of Transport in South Africa distinguishes between two types of public transport captive customers: (i) *survivals*-who are captive to a single public transport mode, and (ii) *sensitive*-who, while can only afford to use public transport, they can nonetheless afford to use the best available public transport mode (DoT, 1998).

By virtue of being captive public transport users, these customers may become susceptible to receiving poor services given their characteristic inelastic demand. For a cost-conscious public transport operator, therefore, it may be more convenient and logical to keep service

improvements at a bare minimum, if any, in order to reduce operating costs. However, the dynamic nature of the composition of a captive market as well as the possible interaction effects with all other user segments warrants an improved understanding of longer term impact, particularly financial impact, of improved service quality on services with a large proportion of captive users. Social capital theory also advocates improved valuation of non-tangible assets such as trust and social cohesion emanating from the sharing of spaces with the use of public transport services (Currie and Stanley, 2008). Customer satisfaction can also be considered an asset (Ilieska, 2011).

The paper estimates the budgetary implications, and marginal benefits, for specifying service quality in public transport contracts where a large proportion of users is made up of captive users. It answers the question: Is it worthwhile to maximise customer satisfaction for services with a large captive customer base? Analysis in the paper is limited to a typical subsidised bus service in the urban areas of South Africa.

2. Background

Customer satisfaction is judgement exercised by a customer, following a service encounter, in respect of the extent to which the service fulfilled customer needs or expectations (Grigoroudis and Siskos, 2010). Be they tangible or non-tangible, the perceived performance of service attributes by the customer is used as a basic input in the measurement of customer satisfaction (Ramaswamy, 1996; Wirtz and Bateson, 1995), and the actual relationship between service attribute performance and customer satisfaction, even for public transport services, is non-linear (Mokonyama and Venter, 2013).

While customer satisfaction has been shown to be positively correlated with improved business performance, mainly due to increased patronage and customer loyalty, customer dissatisfaction on the other hand may lead to outcomes other than refusal to use the service again. Artis (2004) shows, through the matrix presented as Table 1 that once dissatisfied, not all customers resort to the switching of service providers. Rather, customers react on the basis of a combination of the dissatisfied customer's chosen coping tactic and the customer's response goal. For example, a combination of "external self-directed coping strategies" and "retaliation goal" results in private vindictive behaviour, which could be exhibited, for example, by service captive customers. The generic model by Artis (2004) is especially relevant for identifying possible reactions from captive public transport customers. Although not directly quantifiable, the manifestations of customer dissatisfaction as shown in this model are illustrative of the inherent negative impact dissatisfaction has on both the service provider's business and the customer's well-being.

Table 1: Possible responses from dissatisfied customers Source: Artis (2004)

	Prevention goal Prevents a future dissatisfying event	**Accommodation goal Accommodates a current or past dissatisfying event**	**Redress goal Seeks redress for a current or past dissatisfying event**	**Retaliation Goal Retaliates because of a current or past dissatisfying event**
Internal self-directed coping tactics	**Anticipate problems** Customer mentally braces self for dissatisfaction.	**Modify expectations** Customer modifies their desired outcomes to fit situation.	**Resolve to act** Customer mentally commits to dealing with injustice.	**Hold a grudge** Customer feels deep resentment towards seller.
External self-directed coping tactics	**Risk reduction** Customer acts to minimise potential problem by taking action.	**Accept situation** Customer acceptance of seller offer.	**No repurchase** Customer refuses to support seller in the future.	**Private vindictive behaviour** Customer anonymously attacks seller.
Voice-coping tactics involving the seller	**Informative voice** Customer tells wants and concerns to seller in advance.	**Refuse to complain** Customer elects not to complain.	**Complaining** Customer openly communicates dissatisfaction with seller.	**Public vindictive behaviour** Customer attacks seller publicly.
Voice-coping tactics involving peers	**Seek advice from non-experts** Customer seeks advice from family, friends and co-workers.	**Avoid discussing with peers** Customer elects not to discuss with peers.	**Negative word of mouth** Customer shares negative experience with others.	**Sabotage word of mouth** Customer encourages other customers to hurt seller.
Coping tactics involving third parties	**Use experts** Customer seeks advice in advance of purchase.	**Avoid assistance from expert** Customer elects not to use experts when assistance is offered.	Use of mediators Customer uses third party to restore equity.	Consumer activism Customer seeks regulatory and legal remedies to restrict and punish the seller.

A framework to estimate the value of customer satisfaction, particularly for services with large captive users, is necessary to assess the marginal benefits of service improvements. This approach could also facilitate the estimation of the asset value of customer satisfaction.

3. Case study

The case study comprises a selection of subsidised bus contracts in the urban areas of South Africa. This is because buses are the only mode of public transport that are delivered in terms of contracts, and these contracts make provision for the specification of public transport service quality.

The use of contracts to manage public transport services in South Africa, specifically subsidised bus services, was formally introduced in 2006 through model and contract documents (Department of Transport, 2006). The South African model and contract documents make provision for the monitoring of contractor performance, with a specific focus on service reliability, punctuality, driver quality, bus availability, vehicle quality, safety, revenue protection, contract compliance, and user (customer) satisfaction. Customer satisfaction itself is supposed to be measured through surveys that are carried out annually, in which a sample of customers are asked to rate the service in terms of information quality, safety, security, cleanliness, reliability and staff behaviour. Operators are given a target of 95% overall customer satisfaction. The contractor's historical performance with regard to customer satisfaction is used when the contract is due for renewal, where good performance counts in favour of the contractor. Other than this consideration, customer satisfaction is not used in any other way. Nonetheless, South Africa also has a piece of legislation referred to as the Consumer Protection Act (RSA, 2011), which provides consumers, including public transport users, with some recourse against service providers for poor services. In terms of the act, the consumer has the right to claim against the service provider for loss suffered, including economic loss.

4. Approach

A rating-based conjoint analysis experiment was carried out in metropolitan areas of South Africa, on a sample of 64 respondents. The respondents comprised 40 public transport users (of a train service referred to Tshwane Business Express or TBE), who have access to personal cars (choice users), and another group of 24 non-users of public transport, using their personal cars and sharing similar work-based trip origins and destinations with the first group of public transport users. Respondents were requested to rate different packages of public transport service that were defined in terms of service attributes that include reliability, security, and payment convenience. The actual experiment is reported in more detail by Mokonyama and Venter (2013).

Based on the outcomes of the conjoint analysis experiment, the relationship between service rating and probability of using the service (used as a proxy for customer satisfaction), shown in Figure 1, was subsequently estimated. The relationship shows, for example, that existing users are easier to satisfy than non-users for every marginal improvement in service quality. Further, based on this relationship, as well as historical transactional data for selected subsidised bus services in South Africa, inferences are made on patronage-based financial implications of service quality for captive public transport customers. The reason for making inferences using non-captive customers is because such a relationship for captive customers would not be practical to produce.

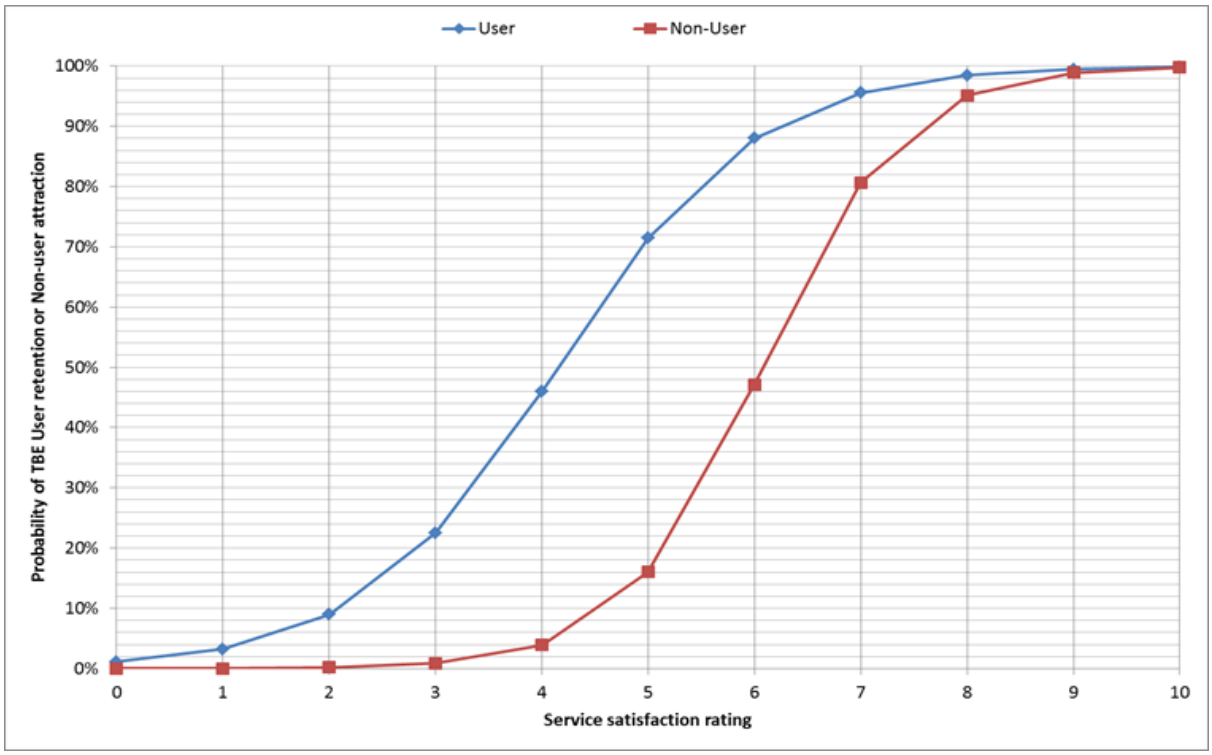

Figure 1: Relationship between perceived service quality and probability of retaining exiting choice users and attracting non-users

5. Financial implication analysis

Due to the largely non-quantifiable nature of the financial benefits of improving service quality for captive public transport customers, these benefits are likely to be grossly underestimated. Some of the benefits include: guaranteed revenue for operators, which can be used to offset financial risks, increased patronage resulting from word of mouth, offsetting of road infrastructure capacity enhancement costs, and the reduced environmental impact from not using more polluting alternatives.

What follows is an estimation of some of the financial benefits of improving service quality for services with a large captive customer base. The departure point is that a customer, whether captive or not, should be regarded as an asset. Therefore, the approach followed here, effectively explores ways of estimating the asset value of customers, be they captive or not.

Figure 2 shows, for subsidised bus services in South Africa, the relationship between passengers carried and subsidy per passenger trip, where each point represents a subsidised bus service. The relationship is approximated by a logarithmic relationship shown in Figure 2 with R^2 of 0.5. Using this relationship, Figure 3 is constructed on the basis of having a synthetic population consisting of 50 000 choice users already using public transport and another 50 000 not using public transport but willing to do so if it meets their requirements. Each point in Figure 3 represents for each different customer satisfaction ratings, from 0 to 10, the relationship between passenger numbers and the amount of subsidy per passenger.

Satisfaction level 0 is associated with high levels of subsidy because the number of users is at a minimum to cover-operating costs. Notwithstanding the Mohring effect (not taken into account in this analysis), which postulates that additional public transport demand introduces increases in marginal operating costs (Gómez-Lobo, 2011), increased satisfaction results in increased patronage and reduced subsidy payments per passenger trip. For existing users, when the satisfaction levels increase the amount of subsidy per passengers also reduces to an extent that a service rated at satisfaction level 10 is equivalent to halving of subsidy per passenger, because there are more users to offset operational costs. When a greater number of non-users is attracted through improved perception of service quality, the subsidy payment per passenger at satisfaction rating of 10, for example, is equivalent to reducing subsidy per passenger by two thirds. Such savings could be used to further finance accessibility for low income captive customers.

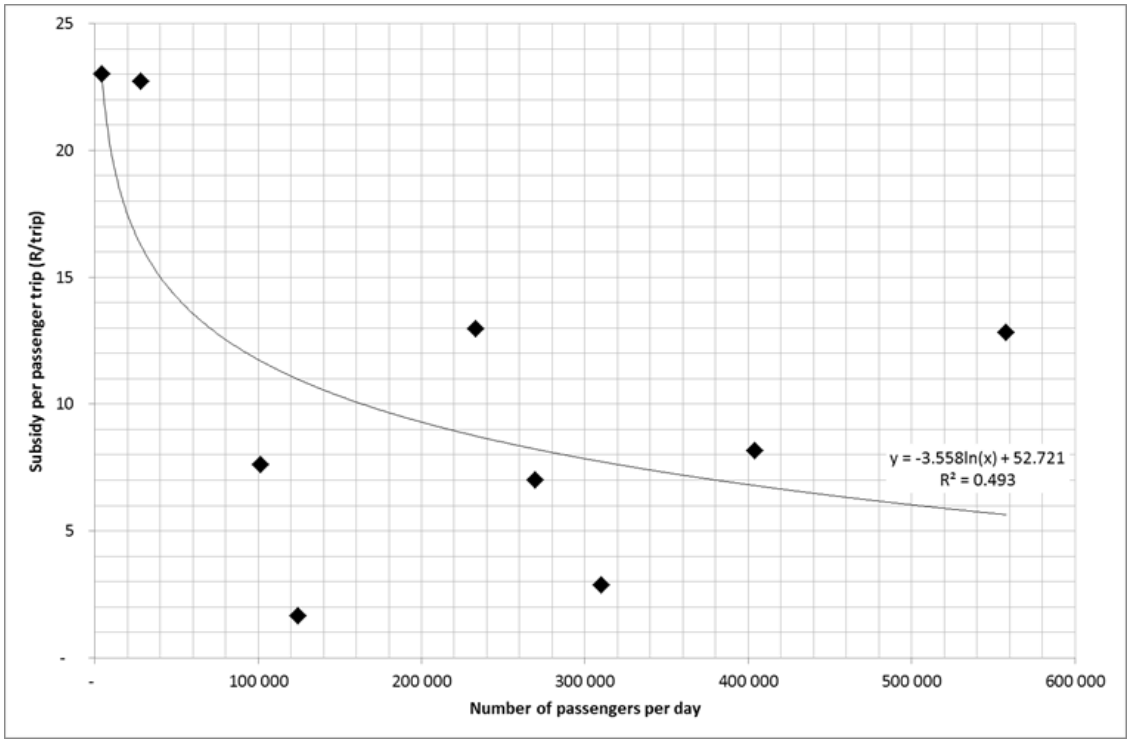

Figure 2: Estimated relationship between passengers serviced per day and subsidy per passenger trip

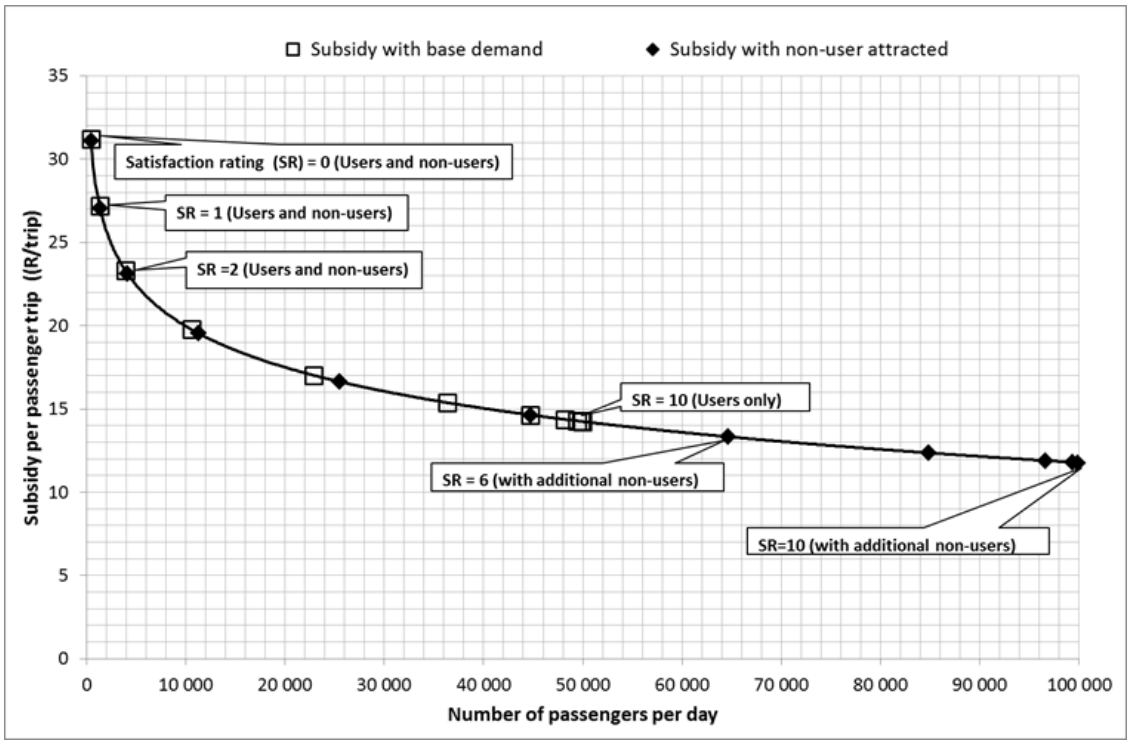

Figure 3: Subsidy and the levels of customer satisfaction

Figure 4 shows financial performance metrics of a typical subsidised bus contract in a South African city, in which almost all users are captive to the service. A number of observations are made:

- The passengers per km metric tends to be low. This is because most of the trips are made from historically isolated settlements and destined to the centre of cities, with very little passenger boarding/alighting activity along the routes.
- The level of subsidy on these contracts can be as much as five times the revenue. Such a relatively high level of subsidy puts a strain on the country's finances and reduces the capacity to expand the network, especially for cities experiencing large volumes of in-migration of low income households. Any opportunity to reduce subsidy commitments per passenger trip may therefore improve the capacity to extend the service.

In resource constrained countries like South Africa financial efficiency gains would be welcome. Apart from public transport efficiency gains, other benefits include potential savings from reduced household transport costs, reduced expenditure on energy imports, and emission reductions. The cost savings would be directly proportional to the number of trips that would have otherwise used individualised travel. An increase in passengers per km and a reduction in subsidy would certainly increase the financial viability of the contract depicted in Figure 4.

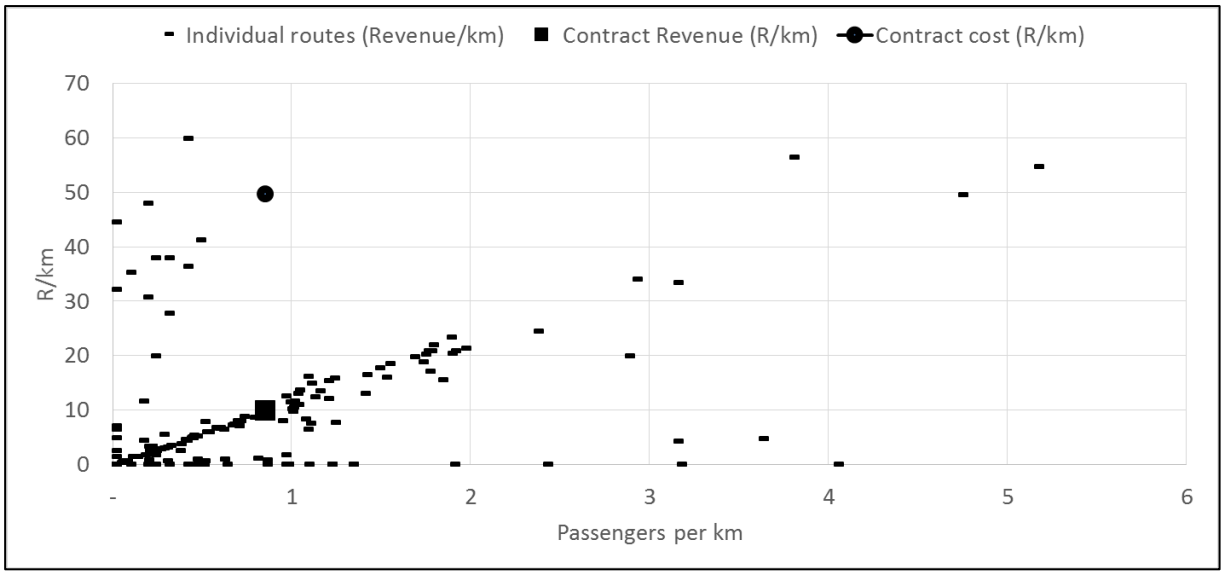

Figure 4: Financial performance metrics for a typical subsidised bus contract in a South African city

Table 2 presents data from a different operator whose routes are mainly located within the core of a city in which most of its users are also captive. The table shows parts of the operator's income statement and other service performance attributes. Apart from actual performance figures, the table also estimates the operator's income statement for a scenario where the peak capacity utilisation of the fleet is a maximum. The passenger demand for this scenario would be equivalent to attracting new passengers at a satisfaction rating of level 4 in Figure 1. The size of the fleet as well as the operating costs under this scenario should not necessarily have to change because the same resources are being used, only better than was previously the case (assuming relative low cost of service improvements). In this scenario the service margin is reduced by 16% and cost recovery changes from 0.26 to 0.37. The passenger trips per vehicle km performance metric increases from 1.01 to 1.61. All these changes result from a perceived performance rating of 4 out of 10 by non-users. The operator in this scenario makes an annual saving of R25.7 million, which is equivalent to fully financing about 14 buses, and in this case increasing the fleet size by 4%.

Table 2: Projected operator performance of with marginally improved service

Income statement			
Item		**Actual Value (R)**	**Scenario-based values (R)**
Revenue (R)	Fare Revenue	47 757 592	76 412 148
	Other income	14 322 849	14 322 849
	Subtotal	**62 080 441**	**90 734 996**
Major Operational Costs (R)	Vehicles	45 957 146	45 957 146
	Licences	3 368 223	3 368 223
	Fuel	30 076 971	30 076 971
	Subtotal	**79 402 340**	**79 402 340**
Major Overhead Costs (R)	Salaries	55 480 494	55 480 494
	Overtime salaries	7 667 000	7 667 000
	Service bonus	4 135 561	4 135 561
	Pension and provident fund	10 602 206	10 602 206
	Medical aid fund	7 097 809	7 097 809
	Depreciation and amortisation	11 510 965	11 510 965
	Cleaning services	1 700 654	1 700 654
	Electricity	2 373 684	2 373 684
	Buildings	2 042 320	2 042 320
	Lease vehicles	46 689 372	46 689 372
	Other employee allowances	2 439	2 439 468
	Subtotal	151 739 534	151 739 534
	Other costs	11 753 581	11 753 581
Total cost		**242 895 455**	**242 895 455**
Margin		**(180 815 014)**	**(152 160 459)**
Other performance parameters			
Passengers per annum		9 096	14
Operated km per annum		9 025	9
One-way network size (km)		2 142	2 142
Staff (filled vacancies)		380	380
Staff (all vacancies)		573	573
Number of buses		350	350
Fare revenue per km (R)		5.29	8.47
Total income per km (R)		6.88	10.05
Total cost per km (R)		26.91	26.91
Annual kilometres per bus (km)		25 787	25 787
Average passenger trips per vehicle km		1.01	1.61
Cost recovery ratio		0.26	0.37
Annual business cost per vehicle (R)		693 987	693 987
Total annual revenue per vehicle (R)		177 373	259 243
Annual revenue per staff (filled vacancies)		163 370	238 776
Annual business costs per employee (filled		639 199	639 199
Annual revenue per staff (total vacancies)		108 343	158 351
Annual business costs per employee (total		423 901	423 901
Annual fuel per vehicle (Litres)		10 892	10 892
Estimated annual passengers per vehicle		22 855	22 855
Staff cost as a percentage of total costs		36%	36%
Average vehicle fuel consumption		50	50
City density (persons per square kilometre)		476	476
% of demand in peak hour		20%	20%

6. Discussion

The foregoing analysis shows that services characterised by a large proportion of captive users can benefit from improved service quality, although the extent of the benefits would be context dependent. Of significance is that even at relatively low perceived quality levels by non-users the benefits can be significant. The non-linear response surface characterising the relationship between probability of using a service and the quality of the service also implies that much higher service ratings would produce disproportionately higher benefits. However, due consideration should be made of the dynamic nature of the individual importance of service attributes that make up the entire service package, especially as perceived by non-captive customers in the light of competing alternatives.

The estimation of financial benefits from improving service quality in services characterised by large proportions of captive users in this paper was done from a narrow perspective. Improved approaches to estimate such benefits should be the subject for future research. More fundamentally, further research should develop improved methods for estimating the asset value of passenger trips.

7. Conclusions

Captive public transport users are susceptible to receiving poor services given their characteristic inelastic demand. While increasingly poor services may not lead to the switching of services by captive customers, the many manifestations of customer dissatisfaction are illustrative of the negative impact that increased dissatisfaction has on both the service provider's business and the customer's well-being. Some of the manifestation of customer dissatisfaction include violent outcomes.

Through social capital theory it is apparent that improved valuation of non-tangible assets such as trust and social cohesion, emanating from the sharing of spaces with the use of public transport services, customer satisfaction can also be considered an asset. However, the value of this asset appears generally underestimated.

The paper narrowly focused on the benefit of improving the overall service quality and estimated the financial implications for the services. Using the case of captive and non-captive public transport customers in South Africa, it was shown that perceived public transport service quality can increase service productivity, even with relatively low service ratings by the non-captive customers. Public transport services characterised by high proportions of captive customers in South Africa, with characteristically low cost recovery ratios would significantly benefit from improved service quality. The captive user base remains an asset on which improvements should be made. It is for this reason that further research should develop improved methods for estimating the asset value of passenger trips, regardless of being from captive or non-captive customers.

8. References

Artis, A.B. (2004). A taxonomy of customer dissatisfaction-related coping tactics based on dissatisfaction-related goals. Unpublished PhD Thesis, University of Tennessee, Knoxville.

Currie, G. & Stanley, J. (2008). Investigating links between social capital and public transport. Transport Reviews, 28:4, 529-547.

Department of Transport (DoT). (1998). Moving South Africa: Urban Transport Module. Project report. Pretoria, South Africa.

Department of Transport (DoT). (2014). Results of the National Household Travel Survey. Pretoria, South Africa.

Gómez-Lobo, A. (2011). Monopoly, subsidies and the Mohring effect: A synthesis and an extension. Department of Economics, University of Chile, Chile

Grigoroudis, E. & Siskos, Y. (2010). Customer Satisfaction Evaluation, International Series in Operations Research & Management Science 139, DOI 10.1007/978-1-4419-1640-2_1, Springer Science & Business Media, LLC, London.

Ilieska, K. (2011). Knowledge for customer satisfaction – As a base for new strategic management. Škola biznisa. pp.144-156.

Mokonyama, M & Venter, C. (2013). Incorporation of customer satisfaction in public transport contracts – A preliminary analysis. Research in Transportation Economics. Vol. 39, pp. 58-66.

Ramaswamy, R. (1996). Design and management of service processes: keeping customers for life. Engineering process improvement series, Addison-Wesley Publishing Company, Inc. Massachusetts.

Republic of South Africa (RSA). (2011). Consumer Protection Act, Act 68 of 2008. Cape Town, South Africa.

Rowley, C. (2005). The four Cs of customer loyalty. Marketing Intelligence & Planning, Vol. 23 Issue: 6, pp. 574-581.

Wirtz, J. & Bateson, J.E.G. (1995). An experimental investigation of halo effects in satisfaction measures of service attributes. International journal of service industry management, Vol. 6, No.3, pp. 84–102.