

SEGMENTING THE BRT MARKET IN UNEQUAL SOCIETIES: LESSONS FOR SOUTH AFRICA FROM LITERATURE

NJW VAN ZYL^{1*}, N CHEURE^{1**}, G HAYES^{1***} and C VENTER^{1****}

¹Department of Civil Engineering and Centre for Transport Development, University of Pretoria, Hatfield 0002, South Africa

Email: *klaasvanzyl@gmail.com; **namacheure@gmail.com; ***u16401868@tuks.co.za
****Tel: 012 420 2184; Fax: 012 362 5218; Email: christo.venter@up.ac.za

ABSTRACT

Developing countries have a history of poor public transport on which mainly lower-income travellers depend. Following the success of Bus Rapid Transit (BRT) systems implemented in several Latin American countries, this mode of transport has enjoyed increased popularity world-wide. It is regarded as an affordable public transport solution for large passenger volumes in a high-quality system. In South Africa, BRT was viewed as a solution for all market segments by providing a high-quality frequent service to attract car users to public transport, as well as to the lower income market, by providing a much-improved quality of service compared to current public transport modes. However, this idealised vision for BRT has not materialised, and its implementation and operation has been met with numerous challenges not least of which is disappointing patronage demand. A key question that arises is whether BRT can accommodate the divergent travel preferences of the different traveller market segments and whether disaggregated segmentation can assist in designing a BRT system that could cater for these divergent needs. The paper summarises the results of a literature review conducted as part of a research project to explore how BRT systems should accommodate the travel needs and preferences of different market segments in unequal societies such as in South Africa. The literature review considered the need and benefits for segmentation; previous methods of identifying market segments internationally and in the South African travel market when planning public transport. In addition, an analysis of the mode choice behaviour of various socio-economic segments of South African commuters is provided and conclusions offered for future segmentation efforts.

1. INTRODUCTION

1.1 Background

Developing countries, such as South Africa, have a history of poor public transport provision on which mainly lower-income users depend to access work, education and social activities. Following the success of Bus Rapid Transit (BRT) systems implemented in South America, e.g. in Bogota, Colombia and Curitiba in Brazil, this mode of transport has enjoyed increasing popularity over the last 20 years and is regarded as an affordable public transport solution to convey large volumes of passengers in a high-quality system as opposed to rail-based systems that are more expensive to build and operate.

In South Africa, BRT was viewed as a solution for large volumes of travellers across the income spectrum by providing high-quality frequent services to attract (higher income) car users, as well as to the lower income market by providing an improved quality of service compared to current public transport modes. However, this ideal vision for BRT has not

materialised, and its implementation and operation in several cities has met with numerous challenges. These include lower than expected passenger volumes and fare revenues. These problems and appropriate solutions are the subject of much analysis and progress is continually monitored by the various transport authorities and the wider transport industry in South Africa. A few of the key issues from a South African perspective are:

- Can BRT accommodate the divergent travel needs of the different trip preferences across the income spectrum in South Africa as part of a wider, integrated public transport network?
- Can improved market segmentation and traveller preference identification assist in designing and operating a system that would successfully cater for these divergent needs? If so, what is the most appropriate way to segment the market?

1.2 Objectives of Paper

The purpose of this paper is to summarise the results of a literature review on market segmentation for public transport systems conducted for the VREF BRT research. The review identified peer-reviewed articles on market segmentation research in the passenger travel market in developing countries (e.g. South Africa, Tanzania, India, China) and developed countries (e.g. USA, UK, Canada, Australia, Taiwan). All the studies involved empirical research based on travel surveys.

Limited research has been conducted on this topic as only 29 papers were identified. The search terms used were “public transport market segmentation” and “transport market segmentation”.

A range of planning contexts were considered in the reviewed studies, mostly in terms of travel mode choice between private and public transport, and in some cases including non-motorised transport (NMT) as part of the choice sets. Two studies investigated the promotion of cycling (Nkurunziza et al., 2011; Li et al., 2013) and another the emerging electric vehicle market (Morton et al., 2017).

The paper describes key results from the literature review on the need and benefits of segmentation, the size and significance of segments identified in transport planning and the methods that have been used. Key aspects of South African practices in segmentation in the market research field and in transport planning is covered. Finally, the mode choice behaviour of various socio-economic market segments of commuters in South Africa from the National Household Travel Survey (Stats SA, 2013) have been summarised.

1.3 Overview of Research Project

The Centre for Transport Development of the University of Pretoria subsequently formulated a research project entitled “Segmenting and Understanding the BRT Market in Unequal Societies”. Funding was obtained from the Volvo Research and Educational Foundation (VREF). The research is done in collaboration with the Pontificia Universidad Católica de Chile (PUC) and the University of Sydney in Australia.

The project intends to explore how BRT systems should be designed and operated to accommodate the travel needs and preferences of different market segments in unequal societies. High levels of traveller preference heterogeneity exist in unequal societies that may impose conflicting objectives on public transport as indicated by a survey of user preferences in Johannesburg (Venter, 2016). For example, on the one hand, social and

equity objectives require that systems accommodate the needs and preferences of lower income groups that are typically captive to public transport. This market segment is more sensitive to issues such as the fare, access to the public transport system and a wide network coverage rather than total travel times. In the global South these segments are large, often dominant. At the same time, BRT systems also need to appeal to higher income car-owning groups that can choose between public transport and their cars. This market segment is less sensitive to fare levels, but more sensitive to total travel times, quality of service and accessibility (Venter, 2016). The goals of BRT systems often target the car-owning market, for example reducing traffic congestion, improving travel times and reducing harmful vehicle emissions, in selling BRT to policy makers and financiers.

It is also important to consider BRT within the context of the larger (multi-modal) transport system, as linkages between BRT and non-motorised or paratransit modes for low-income users, and to park-and-ride and drop-off for the high-income users, would be part of the solution.

Based on experience in South Africa, it is important to maximise ridership and fare revenue levels, as these, to a large extent, determine the system's financial sustainability, perceived value for money, political acceptance and hence expansion potential. Future tasks of this project will develop discrete mode choice models to identify statistically significant market segments, based on a travel survey of Soweto, Johannesburg residents.

2. NEED FOR MARKET SEGMENTATION AND BENEFITS

2.1 Market Segmentation Theory and Need

There is an extensive range of academic textbooks on Marketing Management and Market Segmentation on the role, functions and process of market segmentation. McDonald and Dunbar (2012) view market segmentation as the foundation for the design, marketing and supplying a product or service to its target market. Market segmentation is central to not only marketing, but also to every corporate function. Christensen et al. (2005) indicate that failure of companies world-wide to understand this fundamental principle of market segmentation is the main reason why less than 10% of new products succeed.

Market segmentation is defined as the process of dividing customers and potential customers into different groups within which customers share a similar level of interest in the same set of needs satisfied by a distinct marketing proposition (Krizek 2007). The entity first needs to define what market it would like to serve; then determine the needs customers would like to satisfy and identify the main product or service attributes that drive their choices.

Pre-determined segments based on products and services, socio-economic groups, geographic areas, marketing channels and psychographics are often used as a practical way of market segmentation (Christensen et al., 2005). However, these pre-defined segments are not adequate in fully defining market segments. They only provide insights that are contributors to successful segmentation.

Investigating market segmentation for public transport, or any other transport service, assumes that public transport can be regarded as a commercial product or service that needs to follow a marketing and market research approach. Little evidence was found in SA that public transport planning is based on a thorough understanding of segments and their needs. Possible reasons are that public transport is often viewed as a service

provided by the public sector, or if provided by the private sector, subsidised by government. This is especially the case in South Africa where only recently have marketing principles been applied to public transport systems such as the Gautrain rail system and BRT. For example, the Gautrain Management Agency (GMA) conducted a market segmentation survey in 2017 to improve its services in meeting the needs of current users and attract new users (Plus94, 2017).

2.2 Benefits of Market Segmentation

All the reviewed articles indicated the need for and value of market segmentation in transport planning, especially in heterogeneous markets and even within specific segments. The review highlighted the following benefits of segmentation:

- Reduces the number of entities to address in planning;
- Identifies travellers with homogeneous attitudes, needs and travel behaviour;
- Improves the accuracy of the estimation of passenger demand and fare revenue;
- Provides for improved identification and formulation of policies, strategies and planning to address the needs of the various segments;
- Provides for more effective interventions and design of public transport services as these are more focused to meet the expectations of users; and
- It does not only assist in attracting new users to public transport, but also in keeping current users.

3. DIMENSIONS OF MARKET SEGMENTATION

3.1 Overview

The research studies typically start with a list of variables that are thought to explain differences in the mode choices of the target market. These input variables are subsequently subjected to an analytical method to determine statistically significant variables that explain the differences in the mode choice between different groups of people. Examples of mode choices are the choices between private and public transport, choices of non-motorised and motorised modes, and choices of electric - and fuel-driven vehicles. The groups or market segments are identified in the process that display fairly homogenous choice behaviour within each group and significant differences between groups.

This Section describes the Input Variables investigated by the studies and the Market Segments that had been identified. Chapter 4 describes the Segmentation Methods used.

3.2 Input Variables

The most popular variables identified in the literature review that were used as input into the segmentation process can be grouped into the following three categories:

- 1) Socio-economic variables (e.g. Beimborn, 2003; van Lierop, 2016; Morton, 2017):
 - Income level,
 - Car ownership or availability, and
 - Age

- 2) Travel modes and trip variables (Jacques 2013, Venter 2018, Wen 2012):
 - Measures of mode captivity and mode choice,
 - Trip purpose, and
 - Measures of connectivity between origins and destinations, such as trip distance or travel time.
- 3) Attitudinal variables (e.g. Long Chen, 2016; van Lierop, 2016; Venter, 2018; Krizek, 2007):
 - Ratings of satisfaction of the current and alternative modes,
 - Rating of travel modes on various attributes (e.g. comfort, safety),
 - Preferences for alternative modes,
 - Importance ratings of choice factors (e.g. fare, travel time), and
 - Qualitative statements about travel experiences that closest match those of the respondent.

Five-point or ten-point Likert Scales of satisfaction or importance were often used (van Lierop, 2016) for the attitudinal variables.

The input variables were typically subjected to an analytical process in order to identify the most significant market segments. The analytical methods used are discussed in more detail in Section 4.

3.3 Market Segments Identified

The results indicated a wide range of segments, depending on the context and purpose of the segmentation. The following market segments were identified:

- Mode captives or choice passengers (Beimborn et al. 2003).
- Degrees of captivity and choice:
 - Functional captive, marginal captive, marginal choice, free choice users (Jacques et al., 2013).
- Car Captives:
 - Persistent captives: due to personal, life cycle or activity related factors,
 - Transient captives: due to current unavailability of alternatives, but who can switch later (Venter, 2018).
- Captive travellers with regular and irregular commuting habits versus choice travellers with regular and irregular habits (Krizek, 2007).
- Segments derived from user mode satisfaction, namely true captivity, dedication, utilitarianism and convenience (Jacques et al., 2013).
- Stages of change process in travel behaviour in cycling:
 - Pre-contemplation, contemplation, prepared for action, action, maintenance and relapse (Nkurunziza et al., 2012).

Several studies found that mode captivity and market segmentation is dynamic and context or choice specific (Jacques et al., 2013; Beimborn et al., 2003; Venter, 2018). Researchers concluded that it is not appropriate to assume consistency in market segments over time nor to generalise individual segments in a specific context. The studies recommended more research into segment attributes such as trip purposes and spatial locations, amongst others.

4. METHODS USED TO DETERMINE MARKET SEGMENTS

Market research surveys is a pre-requisite to identify market segments in the target market. Some of the studies were constrained by using only secondary survey data which

might have excluded certain market segments. (Li et al., 2013; Cheng et al., 2017). Studies that conducted primary data collection surveys reviewed various secondary survey data sources to identify potential market segments for inclusion in the primary surveys.

The most popular analytical methods applied to the survey data are factor analysis and cluster analysis. Some studies used stated preference (SP) techniques (Khan et al. 2007). Factor analysis is a statistical method employed to understand how variables relate to each other. This method groups variables (factors) together that capture the variability in the data and therefore aids in reducing the number of variables to be analysed (van Lierop, 2017; Outwater et al., 2003; Tyrinopoulos, 2008; Ye et al., 2018; Beirão, 2008; Shiftan et al., 2008).

Cluster analysis is a statistical method related to analysis of variance (ANOVA), used to identify different groups of the target market with similar socio-economic, attitudinal and travel characteristics. The analysis maximizes the differences between groups while minimizing the differences within groups (Anable, 2003; Beirão, 2008; Gensch, 1980; Shiftan et al., 2008). Various techniques of cluster analysis can be used. K-means cluster analysis is common in the literature and it has been proven to be a good method for segmentation (Ye et al., 2018; Pronello, 2010; van Lierop, 2017).

In cases where the number of potential segmentation variables are large, factor analysis has been used as a first step to reduce the number of variables to be analysed by grouping variables that are highly correlated. Cluster analysis was subsequently used to identify different groups of the target market with similar profiles in terms of their socio-economic, attitudinal and travel characteristics (van Lierop, 2017; Grisé, 2018).

Various forms of discrete choice models were also used for market segmentation, including:

- Stated preference (SP) surveys to identify captive car users who are persistent or transient captive to car based on their willingness to switch to public transport or not (Venter 2018);
- Latent class nested choice models (Koppelman, 1981; Venter, 2018); and
- Multinomial logistic regression to determine the most significant variables in predicting the degree of mode captivity (Khan et al., 2007).

Venter (2018) tested an alternative method to deterministic rules or attitudinal variables for identifying choice-set based market segments based on surveys of travellers in the City of Johannesburg. The study made use of the actual and hypothetical mode choice made by the traveller in a revealed (RP) and stated preference (SP) survey in reference to the traveller's actual choice situation. From the SP responses, car captivity was self-identified by the respondent instead of by the analyst. Car captivity was grouped into two segments, namely, persistent car captives (i.e. non-traders) and transient car captives, based on whether the respondent was willing or unwilling to switch to public transport in at least one SP game.

The choice-based market segmentation produced different results compared to conventional deterministic segmentation. This finding supports previous research indicating that simply identifying market segments based on deterministic rules about household car ownership or transit access might lead to erroneous forecasts regarding the willingness to use alternative modes (Venter, 2018).

5. MARKET SEGMENTATION PRACTICES IN SOUTH AFRICA

The first solid move towards establishing a more customer-oriented transport planning basis following the 1994 White Paper was the valuable work done on segmentation during the 1999 Moving South Africa strategy of the DOT. Stanway (2001) referred to the segmentation defined by the Moving South Africa strategy in his paper on the possible impacts of the National Land Transport Transition Act (Act No 22 of 2000) on the urban poor. Six segments of the urban poor was defined, ranging from “Striders” who do not require motorised transport, to “Survival” who are captive to one public transport mode and are cost-sensitive, to “Stubborn” who are unwilling to use any mode other than private motor car. Other segments are “Stranded”, “Sensitive” and “Selective”, relating to notions of affordability and access to public transport, sensitivity to the quality of public transport, car ownership and willingness to use public transport.

The Living Standards Measure (LSM) tool has become the most widely market research tool used in South Africa as a convenient way to distinguish different segments (Langschmidt, 2017). The LSM is a multi-attribute segmentation tool based on 29 variables relating to access to services and durables and is essentially a measure of wealth rather than income. Apart from ownership of durables, such as radio and TV, and access to services, such as water, some variables relate to transport/land use i.e. vehicle ownership and residential location/housing type.

However, Langschmidt (2017), motivates a new Socio-Economic Measure (SEM) that provides a much-improved segmentation of the South African consumer landscape. He demonstrates how the SEM is a more accurate reflection of South African society compared to the LSM in terms of how people live. The SEM is more dependent on socio-economic “structural” items, such as type of dwelling unit and access to social services, and less on household durables and technology. It is based on 14 variables instead of the 29 variables of the LSM, hence is easier to administer, and is more stable over time. SEM has not been applied to transport market segmentation and will be valuable to explore. The travel survey in Soweto, Johannesburg, forming part of the VREF market segmentation research has been designed using the SEM classification.

The Gauteng City-Region Observatory (GCRO) has conducted Quality of Life (QoL) Surveys, which measured the socio-economic circumstances, perceptions of service delivery, attitudes, and transport characteristics of residents in the Gauteng City-Region (Venter, 2014). The survey found significant differences in the socio-economic and mobility patterns between eight urban settlement typologies. Settlements were differentiated according to the general locational, housing, and neighbourhood characteristics. In a South African context this can be regarded as a key segmentation factor as it captures aspects of spatial location, accessibility to land use activities, level of mobility, affordability of transport, quality of infrastructure, and public transport. It also illustrates the high degree of heterogeneity in societies in South Africa.

The Gautrain Management Agency (GMA) has also conducted market research to obtain a comprehensive profile of the characteristics and behaviour of their target market (Plus94, 2017).

Apart from travel characteristics, lifestyle and attitudinal factors were found to be key variables in the segmentation of the Gautrain market. A few interesting variables were household composition or stage in the family life cycle, attitudes towards life, access to

Gautrain, loyalty towards the Gautrain brand and regularity of use, and access to the internet.

Travel demand models in South Africa typically segment demand by income group (low, middle and high groups) and by trip purpose (home to work, educational, business or social purposes). The income bands are a broad proxy for socio-economic factors, mode captivity, and spatial integration. Income has a significant impact on mode choice and other travel choices on which the trip generation, trip distribution and route choice are based (Hayes, 2016).

In most of the models, mode captivity is not a consideration. This is a modelling flaw in a society with a large proportion of households with low car ownership levels and hence public transport mode captivity. Only the City of Johannesburg addressed car and public transport captive users separately from choice users (Venter, 2018), which indicated significant differences in mode choice parameters between these groups. This research indicated that models can be improved significantly by distinguishing between various categories of mode captivity and choice users.

6. ANALYSIS OF NHTS 2013

6.1 Introduction

This section presents a preliminary analysis of the South African National Household Travel Survey (NHTS) data collected in 2013 (StatsSA, 2013) to gain insight into the extent of heterogeneity in the passenger travel market, with a view to future segmentation for planning purposes. The NHTS data was analysed to determine the extent to which pre-defined socio-economic parameters influenced traveller transport mode choice, and more specifically, the choice of the BRT mode.

The survey was conducted amongst 51 341 households across South Africa. A sub-sample was analysed of people residing in Gauteng Province in the Metropolitan Municipalities of the City of Tshwane, City of Johannesburg, and City of Ekurhuleni. The Gauteng sample consisted of 7 160 households with a person sample size of 22 362. The analysis was done for two trip purposes namely home-to-work and home-to-education trips, although only the results for work related trips are reported in this paper.

The following socio-economic/demographic market segments were included in the analysis:

- i. Household Income - The monthly per capita household income was divided into five quintiles, with Quintile 1 being the 20% households with the lowest income, and Quintile 5 those with highest income;
- ii. Gender;
- iii. Age - The age group bands were defined as: Young children = 0-5 years, School going = 6-18 years, Young workers and tertiary = 19-34 years, Older workers = 35-64 years, Pensioners = +65 years;
- iv. Vehicle availability - This was defined as a binary parameter, firstly with households with at least one vehicle available for private use (1), and secondly those with no vehicle available (0);
- v. Highest level of education - The highest level of education that was successfully completed was used; and

- vi. Urban location - The spatial location of households was divided into three zonal categories: Central zone (within the core of the city i.e. the CBD area), Inner zone (within the area outside the CBD but closer to the central area), Outer zone (the peripheral areas of the metropolitan city).

The travel modes are distinguished by Main Mode. The concept of “Main Mode” is required for ease of analysis in cases where people used more than one mode for their trip to work. The Main Mode was considered as the mode with the highest rank order in the following hierarchy: 1) Gautrain, 2) Train, 3) BRT, 4) Bus, 5) Minibus Taxi, 6) Car (Driver or Passenger) and, 7) Walk.

Only 20% of commuters used more than one mode to travel to work for which the Main Mode concept had to be applied.

The analyses consisted of two types of cross tabulations. Firstly, the modal shares for each socio-economic segment were summarised, and secondly, the socio-economic characteristics for each mode was determined.

6.2 Modal Shares of Various Socio-Economic Segments

Figures 1 to 6 give bar charts of the modal shares per category for each of the six socio-economic segments. It should be noted that in 2013 the BRT was only in its early stages of being rolled out in Gauteng and therefore its share was rather small, 0.9 percent.

In terms of income group, Figure 1 shows a declining proportion of people walking to work from the lowest to highest income group (declining from 35% to 14%), whereas an increased use of car is indicated from the lowest to the highest income group (increasing from five percent to 30%).

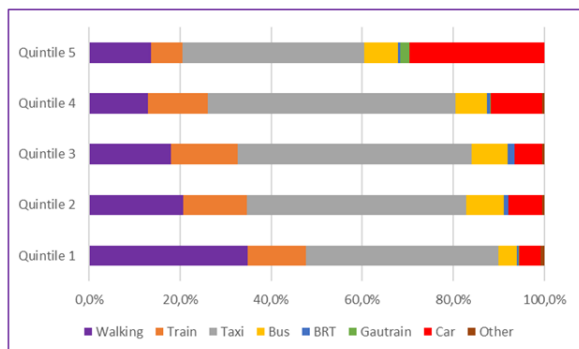


Figure 1: Distribution of main mode choice by quintile income group

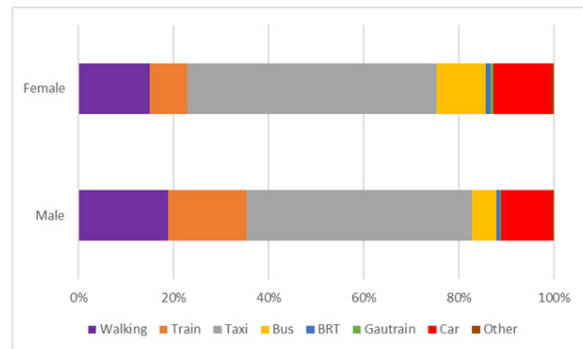


Figure 2: Distribution of mode choice amongst gender groups

The BRT share increases from 0.3 percent in the lowest income group to 1.5 percent in Quintile 3, and then declines again to 0.5%.

In terms of gender (Figure 2), a much higher percentage of males use PRASA train compared to females (17% versus eight percent). The opposite trend occurs for all the other motorised modes, which is most significant for bus - five percent for males to ten percent for females. This trend is possibly as a result of females’ greater sensitivity towards safety and security and perceptions of safety and security issues relating to various modes of transport. The BRT shares indicate a similar trend, albeit very small, with 1 percent for females and 0.9 percent for males.

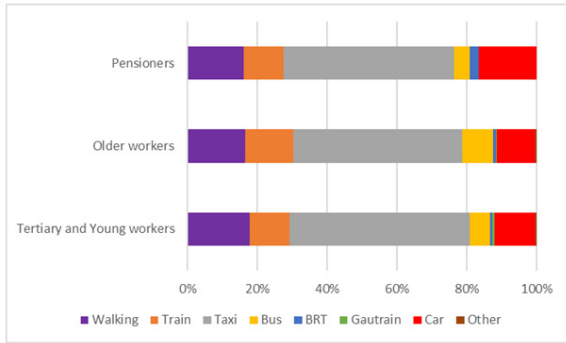


Figure 3: Distribution of mode choice by age group band

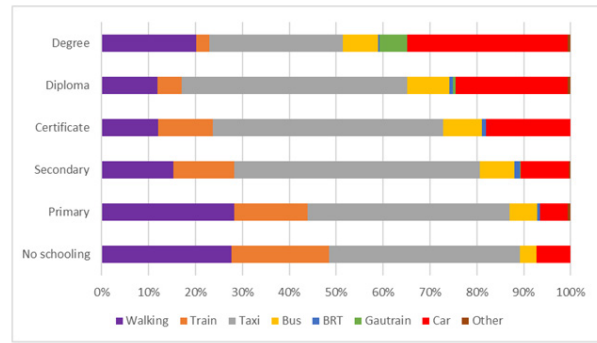


Figure 4: Distribution of mode choice by highest education level

The influence of age group on mode shares is less profound (Figure 3). Students and young workers walk somewhat more (18%) than older workers and pensioners (16%), while pensioners' makes slightly more use of car (17%) compared to students and young workers (12%). Physical fitness, income and car ownership are possible reasons for these trends. There is an increasing trend of BRT use with increasing age, increasing from 0.8 percent amongst young people and 1 percent amongst older workers, to 2.8 percent amongst pensioners. Comfort and convenience are possible underlying factors for this trend. In terms of level of education (Figure 4), there is a strong trend of increasing car use with higher levels of education, increasing from six to eight percent amongst people with no schooling and primary school to 34% amongst those with a degree. Gautrain use increases with education level from less than 0.1 percent amongst the lower education groups to six percent for those with a degree. Such a trend is not evident for BRT. The income and car ownership effects of education level is possibly one of the reasons for these trends.

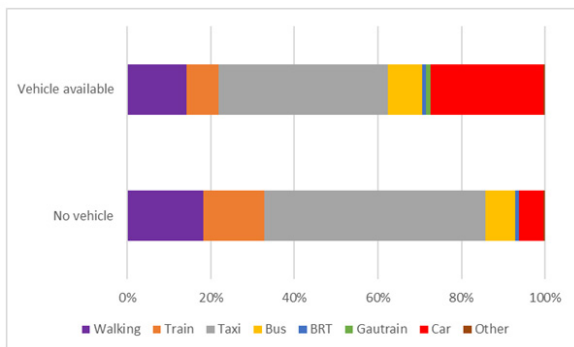


Figure 5: Distribution of mode choice by vehicle urban ownership group

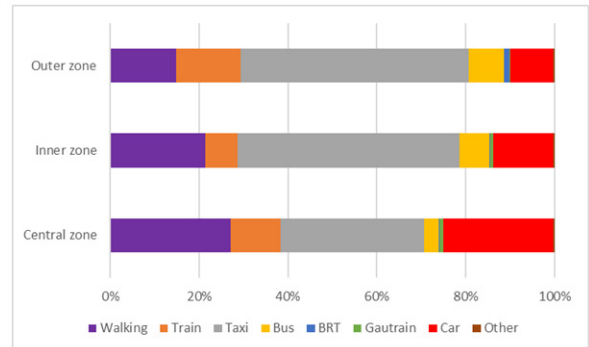


Figure 6: Distribution of Mode Choice by location group

Availability of a private vehicle (Figure 5) in the household impacts directly on its usage as expected - increasing from 6 percent amongst households with no vehicle to 27% amongst those with a vehicle available. The vehicle usage of households without a vehicle can be explained by ride sharing with friends or work colleagues. The impact of vehicle ownership on public transport mode shares is most evident for train, declining from 15% amongst households with no vehicle to 8% amongst those with a vehicle, followed by taxi declining from 53% to 41%. BRT and bus indicate only slight increases in shares, with the share of BRT increasing from 0.8% amongst households with no vehicle to 0.9% for those with a vehicle.

Availability of a vehicle for private use does not necessarily imply that it will be used for travel to work. Households with only one vehicle will share its use on some basis leaving one or more members without a car. Affordability of using the car is another factor that may limit its use.

In terms of urban location, Figure 6 indicates that the closer people are to the CBD the higher the share of car - increasing from 10% in the outer zones to 25% in the central zones. Walking shows the same trend, increasing from 15% in the outer zone to 27% in the central zone. Public transport (taxi, bus, train and BRT) indicates a decreased usage closer to the CBD. For example, the share of taxi reduces from 51% in the outer zone to 32% in the CBD, while the BRT share decreases from 1.2% in the outer zones to 0.1% and 0.2% in the central and inner zones. A wide range of factors influences modal split in terms of urban location, such as proximity to economic and commercial activities which makes walking more likely, the availability of public transport within walking distance, and the spatial distribution of income and subsequently car ownership.

The spatial distribution of income was shaped by the inequitable spatial policies of the former government that pushed the poor, public transport captive people to the outer zones. Over the last 25 years market forces and government's integrated development planning influenced this spatial distribution of income to some extent (Venter, 2014). However, decentralised housing for low-income households is a continuing trend due to its cheaper costs (Bruun et al., 2016).

The quality of life survey of the GCRO (Venter, 2014) found similar mode choice patterns based on eight urban settlement typologies, which also explained some of the underlying factors. Suburban areas (old and new) have the highest employment and income levels, while households in informal dwellings have the lowest income and employment levels. Urban core residents are relatively affluent and well employed, indicating that the centres of cities still manage to concentrate household capital. Informal dwellings are distributed almost equally between inner and outer areas, but also appear in urban core settlements.

6.3 Socio-Economic Profiles of Modes

Another insight into the NHTS data is given by considering the socio-economic profile of the users of each mode. BRT users are mostly from the middle- and middle-high income groups (Quartile 3 and 4 with 44% and 24% of users respectively), similar distribution between male and female (54% male), mostly older workers (59%), mostly with highest education of secondary school (82%), mostly with no vehicle available in the household (71%) and mostly living in the outer urban zone. In contrast, train users are mostly male (73%), while Gautrain users are mostly female (71%). Generally, most public transport users have no private vehicle available in the household (between 70% and 83%), except for Gautrain users who mostly have a vehicle available (73%). Public transport users are mostly living in outer zones (75 to 93%), except for Gautrain users who live mostly in the inner zones (43%). It seems BRT serves the same market as that of conventional public transport users, while the Gautrain's market is distinctly different.

7. CONCLUSIONS AND RECOMMENDATIONS

The paper summarises the results of a literature review conducted as part of a research project to explore how BRT systems should accommodate the travel needs and preferences of different market segments in unequal societies, such as in South Africa. The literature review covered various aspects including the need for – and benefits of

segmentation, significant market segments and methods to determine significant segments for public transport planning purposes. South African experience in market segmentation have been reviewed and the mode choice of various socio-economic segments of a sample of commuters in Gauteng metropolitan areas have been assessed.

It is concluded that improved market segmentation is worth the additional market research effort in public transport planning and indeed, should be a pre-requisite to understand the needs of various users and to plan, design and operate public transport systems with these needs in mind. The inadequate identification of market segments and associated travel preferences has probably contributed to the disappointing levels of BRT ridership and fare revenues. The literature review provides guidance on the important variables to consider in the market segmentation research. A wide range of variables have been used as inputs into market segmentation including socio-economic, travel and attitudinal variables. The market segments identified based on various types of statistical analysis indicated a wide range of categories, depending on the context and purpose of the segmentation.

Key analytical methods used include factor and cluster analysis, as well as different types of discrete choice models using stated preference surveys. The macro-travel demand models used by cities to evaluate BRT services can be improved significantly by distinguishing various categories of mode captive and choice users, as well as using behavioural choice models.

The analysis of the mode choice of various socio-economic groups of a sample of commuters in the Gauteng metros indicated different choice behaviour patterns between groups. The limited segmentation used in transport demand models seem to miss critical segments as indicated by the NHTS data analysis, such as age, gender, availability of a private vehicle and urban location. A wider range of segments would improve the accuracy of the models, although a balance needs to be sought between higher accuracy and the cost of model development and application. During the next phase of the research statistical analysis and stated preference techniques will be applied to determine the statistically significant market segments and the magnitude of their influence on mode choice.

8. ACKNOWLEDGEMENTS

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