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AN APPLICATION OF THE RAIL-SERVQUAL MODEL FOR IMPROVING SERVICE QUALITY AT A SELECTED RAIL ORGANISATION IN SOUTH AFRICA

by

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DECLARATION

I, Zuko Lukrozo, Student Number 213094991, declare that the contents of this thesis represent my unaided work and that the dissertation/thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

29 March 2021

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ABSTRACT

Transport availability and accessibility impact global development designs and can be a lift or a snag to the financial development of the country. Therefore, it's important to continuously evaluate the service quality of any transport service to increase customer satisfaction. Customers are becoming more conscious of their needs. Customer preferences and attitudes are rapidly changing, making it more difficult for service providers to effectively and efficiently assess and operate services. The purpose of the study was to measure the quality of service delivered by the railway organisation, using the modified SERVQUAL approach (RAILSERVQUAL), in South Africa for passenger rail to monitor and improve its services and increase competitiveness among the transport industry. The study discussed the importance of service quality within public transport, particularly the railway industry. The methods and instruments applicable to evaluate the level of service quality within the railway industry were also addressed.

This study employed a quantitative methodology to investigate the phenomena being investigated. This research was undertaken ethically to protect all participants as well as the integrity of the University which granted the ethical clearance before data collection proceeded. A survey method was used to collect quantitative data from 110 respondents at different junction stations. The survey aimed to identify the participant's opinions regarding the service quality of the passenger railway. The questionnaires were administered to conveniently selected respondents based on their willingness to participate in the study. The data were stored on the Microsoft Office Excel sheet before being imported into the statistic software kit SPSS version 26. Thereafter a factor analysis and one-sample *t-test* were used to analyse datasets for this study.

The key finding is that passengers perceived that the rail transport network in the Western Cape did not meet their expectations. Passengers identified variables such as reliability, safety and comfort which they perceive are of poor service. The RAILSERVQUAL measuring instrument was tested in this study and it can be used for all the railway organisations in various regions of South Africa. It further provides railway managers guidelines on how to monitor, control, and enhance the service quality or performance and attractiveness. The study, therefore, recommends that the railway organisation put strategies in place to address these variables to improve customer satisfaction.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

ABBREVIATIONS AND ACRONYMS

AVE	Average Variance Extracted
CFA	confirmatory factor analysis
CFI	Comparative Fit Index
RMSEA	Root Mean Square Error of Approximation
HTMT	heterotrait-monotrait ratio
EFA	exploratory factor analysis

GLOSSARY

Terms/ Acronyms/ Abbreviations	Definition/Explanation
Customer satisfaction	A customer fulfilment response, which is an evaluation as well as an emotion-based response to service (Hundal and Kumar, 2015:83, citing Rust and Oliver, 1994).
Efficiency	Entails maximizing the outputs from a set of inputs (technical efficiency) or creating an optimal mix of inputs to maximize output (allocative efficiency) (Makovsek *et al*., 2015:4)
Railway operations	Is mainly about the effective movement of passengers and goods from one point to other and the associated services (George & Rangaraj, 2008:602).
Perceived service quality	The degree and direction of a discrepancy between consumers' perceptions and expectations (Shainesh & Mathur, 2000:16)
Skewness	Skewness is, thus, a measure of asymmetry and shows how the items are clustered around the average.
Kurtosis	Kurtosis is the humpedness of the curve and points to the nature of the distribution of items in the middle of a series.

CHAPTER 1: SCOPE OF STUDY

1.1 Introduction

Studies have shown that the standard of service has become a distinct and important feature of the provision of goods and services to enhance an institution's customer satisfaction (Wisniewski. 2001; Miranda, 2018; Rozaq, 2018). The statistics have shown a decline in customer satisfaction, revenue collection, and the number of customers transported. The number of passenger travels in November 2019 decreased by 16.6% compared to November 2018 (Statistics SA, 2020). This chapter highlights the importance of public transport especially rail transport on improving the economy of the country. It also points out various railway parameters to be evaluated to increase its customer satisfaction and its competitive advantage against other public transport modes. This chapter also introduces the research focus, research framework and service quality methods. Furthermore, the research design and research methodology used, and finally summary of key procedures and chapter layout of the thesis were provided.

1.2 Background to service quality

Over the past years, the passenger railway system in South Africa has come under scrutiny and criticism in the media and society with many people complaining in the media about its service delivery. According to Adriaan Kruger (2019), the latest report from the Passenger Rail Agency of South Africa reveals that it is worse than we thought. One useful approach to improving service quality is to determine the level of customer's satisfaction with services rendered. The current service provided has also led to a decrease in customer satisfaction and passenger journeys. Prasa (2019) reported that the Customer Satisfaction Score representing the success of Metrorail and Autopax products decreased by 8.89 per cent in 2018/19. Transport availability and accessibility impact global development designs and can be a lift or a snag to the financial development of the country (Ranjan et al, 2016:79). Therefore, it's important to continuously examine the service quality of any transport service to increase customer satisfaction. This also allows for critical input from customers as the main stakeholder into a new service package thereby making the product more customer-centric in design and delivery. According to Awasthi *et al*. (2011:637), all transportation organisations continuously carry service quality evaluation. Various parameters such as efficiency, reliability, safety comfort, responsiveness, etc. are evaluated.

Customer satisfaction is a mission all service organisations strive to achieve. To attain this, the business strives to continuously provide high-quality services to its customers as well as new customers. The Passenger Rail Agency of South Africa (2019:41) stated that by placing the customer needs at the centre of the organisation's activities it would increase the rail share of public transport. It is therefore critical to assess the administration of this nature of an association from the client's perspective. The customer experience and expectations of service quality help organisations to define and package their services close to the one expected by the customers. Gupta and Datta (2010:223) claimed that service providers are faced with two important issues and challenges, that is, providing excellent service quality and high customer satisfaction.

Studies in service quality have been undertaken by many researchers worldwide in the railway industry but scant evidence has been found on studies done in a South African context. The SERVQUAL approach, which was developed by Parasuraman in 1985, is the most popular instrument used to measure and evaluate service quality. According to Parasuraman *et al*. (1988), the model is about measuring the difference between the customer's expectations and the evaluation of the perceptions about the service (Miranda, Tavares and Queiró, 2018:371). Cronin and Taylor (1992) developed the SERVPERF approach which measures the quality of service by only using the customer's perception of quality. Maruvada and Bellamkonda (2010) developed a comprehensive instrument RAILQUAL which was a modification of SERVQUAL to be used in measuring rail transport quality. Three of the models/instruments have been mostly tested internationally on both passenger rail and freight rail. However, there are scant studies that have been done in a South African context.

Vilakazi and Govender (2014) note that the standard of service in South Africa's public transport sector has remained an elusive and often overlooked area of study. The data on quality and performance metrics of public transport services in South Africa is largely defined and, in fact, virtually non-existent according to their argument. Thus, this study examines the service quality of the commuter rail in the Western Cape Region in South Africa from the passenger's experience on the journey. The significance of the study can be clarified in the way that it will help the commuter railway operator in examining service quality of various sections, monitoring and improving its services, and increasing competitiveness based on customer perception.

1.3 Problem statement

Rail transportation is considered one of the most effective and efficient means of public transportation. The main objective of the commuter rail is to guarantee, in line with the

Department of Transport, the reliable, available, safe and quality rail services inside, to and from the Republic in the public interest. However, the quality of service rendered by the railway system in South Africa has declined and the public has complained about the media, and studies are published in the extant literature as well. The National Household Travel Survey indicates that only 9% of commuters had no transportation problems, meaning a significant 91% have transportation problems (Heyns & Luke, 2018:472). They further argued that rail transport, which is usually a successful option for moving large numbers of people in urban areas in South Africa is considered to be problematic in terms of quality of service. Shainesh and Mathur (2000:15) claimed that the biggest headache of service providers is to control quality and offer consistent service. The image of the railway service in South Africa has been painted very badly due to poor service delivery. Lack of service quality can lead to loss of revenue and customers. Monsuur *et al*. *(*2017:3) noted that disappointed travellers may change to elective travel modes if they are available or generally choose to quit travelling. However, satisfied customers will always be loyal to railway transport.

Transport and the requirement for transport are a fundamental need of the day to day lives of South Africans. The expanded rate of movement and population development has a huge impact on urban infrastructure and transport benefits, particularly rail transport as it is the least expensive and moderate method of transport. The fuel value climbs likewise have a huge effect in the transport system where individuals use train services. A successful and quality public transport system that adds to the development of individuals, encourages work and work drive investments along these lines expanding worker and traveller numbers and social socioeconomics. Transport availability impacts worldwide advancement designs and can be a lift or a deterrent to the monetary development of the country (Ranjan *et al*., 2016:79).

The decrease in service performance of the passenger rail came because of increased analysis by the media and workers. The decrease in service performance of the railway system additionally expands the traffic on the road and influences the nation's economy. It along these lines that this current study examines the quality of service of railways in South Africa becomes significant particularly as the railway plays a definitive and noteworthy job in the general development of the economy. Sharma *et al.* (2016:642) indicate that, instead of merely comparing performance and scorecards which will not produce new insights, railway organisations should strive to understand the reasons behind any superior or inferior performance. The South African Railway system must understand the desires for the customers and to what degree their desires are met. According to Yuda Bakti and Sumaedi (2015:534), public transport operators should focus on service quality to improve their competitiveness. It is in this regard that the evaluation of service quality in the railway transport

service becomes important. Hence Eboli and Mazzulla (2012:97) claimed that consumer loyalty is the key determinant to quantify service quality. The problem this study seeks to address is the decline in both service quality and customer satisfaction.

1.4 Rationale and significance of the study

The study seeks to examine the service quality of a commuter rail in the Western Cape Region in South Africa. The strategic intent of a commuter rail is to be a modern organisation and to become a leader in the public transport industry by being able to give excellent traveller benefits on a feasible premise (Passenger Rail Agency of South Africa, 2019:12). However, the current state of the service is so dire that the user statistics have declined. By examining the passenger experience in terms of service quality the organisation will know the customer needs and will be better able to service them.

Extensive research has been conducted in evaluating and examining the service quality using the SERVQUAL instrument (Barabino, 2012; Siami, 2012; Hundal, 2015; Priyadharshini, 2016). The other purpose of studying service quality is to gain a wider perspective of customer satisfaction by surveying the extant literature to learn about it from the work of other researchers.

1.5 Aim and objectives of the study

One useful approach to improving service quality is to determine the level of customers' satisfaction with services rendered. This allows for critical input from customers as the main stakeholder into a new service package, making the product more customer-centric in design and delivery. According to Maruvada and Bellamkonda (2012:42), the degree of satisfaction which the passengers develop from the services offered should be determined to evaluate service quality for improvement. Examining customers' satisfaction, therefore, is critical to determining the areas needing improvement for service firms. This is possible because satisfaction or otherwise reflects the gap between expectation and experience of service. This study applies the derived RAIL-SERVQUAL model to ascertain the areas needing improvement in the rail services rendered by the commuter rail between 2018 and 2019.

1.6 Research Objectives

To address the research problem, this study aimed at achieving the following research objectives:

- To identify the determinants of customer satisfaction on service quality.

- To find out the level of customer experience of the service quality provided by the commuter railway organisation.
- To determine the areas that need the most improvement in service quality offered by the commuter railway transportation in South Africa.

1.7 Research questions

In seeking a better understanding of the phenomena, the study addressed the following three questions:

- What are the determinants of passenger satisfaction on service quality?
- What is the level of customer experience of the service quality provided by the commuter railway organisation?
- What are the areas that need the most improvement in service quality offered by the commuter railway transportation in South Africa?

1.8 Research process

The research process offers insight into the cycle of 'how' the study should be done from the proposal creation to the final dissertation submission. "Research phase consists of a sequence of actions or steps needed to carry out research effectively and the appropriate sequencing of those steps" (Kothari, 2004). According to Kothari (2004), the research steps are:

- Formulate research problem and research question;
- An extensive survey of literature;
- Hypothesis developing;
- Determining sample design;
- Data gathering;
- Project execution;
- Data Analysis;
- Hypothesis testing;
- Generalisations and interpretation; and
- Formal write-up of conclusions reached

Mouton (2001), argued that all empirical analysis is compatible with normative theory, irrespective of the study and independent of the methods employed. Mouton (2001) refers to the logic as the social science ProDEC framework, which stands for:

- Research problem (Pro);
- Research design (D);
- Empirical evidence (E); and

- Conclusion (C)

The research method that the current study will follow is introduced by (Greener, 2008), based on the two work processes mentioned above. The research process chosen focuses on this research analysis as a type of Business management research, which offers knowledge to direct management in various service delivery decision-making processes and is outlined below:

- Analysis and identify a research issue;
- Recognize study limitations;
- Literature read-up and review;
- Creation of a research process;
- Designing the research methods
- Sampling and Conducting the research
- Data preparation and analysing data
- Data interpretation; Conclusions and recommendations.

1.9 Research design and methodology

The term paradigm of research and philosophy of research is used interchangeably. Saunders, Lewis and Adrian (2016:134) refer to the term philosophy of study as a set of creeds and assumptions about knowledge creation. In this study sense, a paradigm refers to the entire set of beliefs, principles, and techniques expressed by the train's commuters. They note that ontology explores the type of truth that exists, what this reality looks like, how the entities live inside the reality and how they interact.

Ontology offers researchers a tool for formulating research. The ontological approach taken by the researcher was the position of objectivism, as he claims that he is normally an objective observer. In the positivism paradigm, the researcher utilised the quantitative approach to conduct the research. The literature claims that the main weakness of such quantitative research design is that even if it is important, reliable, and effective, it cannot determine the deeper inner meaning and explanation of social phenomena. Therefore, the choice of which method to use most of the time reflects the interests of the people who conduct the research or benefit from the research, and the purpose of the application of the research results. Positivism is important to research methods that focus on quantitative analysis, investigation, and experimentation.

Methods of research are often divided into two main types: quantitative and qualitative. Bhawna & Gobind, (2015) citing (Creswell, 1994) described qualitative research as a model of

development that takes place in a characteristic setting that empowers the scientist to build a degree of detail from the high association in genuine meetings. Quantitative work includes studies that use statistical analysis to obtain their conclusions, where main features include formal and systematic calculation and statistical application (Marczyk *et al*., 2005:17). Quantitative analysis has been used to collect facts and statistics as it uses quantitative methods like SPSS for data analysis and hence is less time-consuming.

The quantitative approach was found appropriate for this study, as its purpose was to determine the need and capture participant's views on the quality of service provided by the selected railway operator in the Western Cape Province. The quantitative method was also chosen because of the researcher's epistemological, that is, positivist position. Saunders *et al*. (2016:166) note that quantitative analysis is generally linked to positivism, especially when used with predetermined, highly organized data collection techniques.

1.10 Population and sampling

Etikan (2016:1), describes a population as the total amount of items or cases that are the study subject that the researcher wants to test. The sample population was the entire train users in the Metropolitan Cape Region. According to Etikan (2016:1), a sample is the subset of the entire population currently being analysed by a researcher, and the features of which would be generalized to the entire population. Sampling techniques may be probability and nonprobability sampling. The probability of inclusion of every element of the population can be calculated for probability sampling. In comparison, non-probability sampling cannot determine the likelihood that each variable of the population will be included in a sample. The reason for choosing non-probability sampling over probability sampling was related to cost, human resources and time. According to Saunders *et al*. (2016:304), more planning and repeated follow-up calls are required for probability sampling to ensure each member in the selected sample is contacted. This has the potential to become expensive.

Convenience sampling was used for study purposes, and a test survey was taken to assess client perception. At various times various classes of passengers were surveyed on multiple service quality attributes offered by the passenger rail company. Specifically, the three categories times for data collection focused on were an off-peak hour, regular hour, and peak time. According to Etikan (2016:1), convenience sampling is often chosen due to accessibility, geographic proximity, availability at a given time and willingness of the respondents to participate in the survey. A disadvantage of convenience sampling is that generalisation from the results of this research is impaired. "This approach has clear benefits in terms of cost and

convenience but suffers from serious bias problems because the sites to which they have easy access do not reflect the population" (Watson, 2015:40).

Only primary sources of data were used and analysed for study purposes. The questionnaire, therefore, was the primary data collection tool to obtain primary quantitative data for further analysis. The purpose of the survey was to obtain the opinions of participants regarding the passenger railway's quality of service. The research tool was developed using established literature, observations, pilot testing, and expert opinion.

1.11 Ethical consideration

The researcher ensured that the permission to conduct the research was granted by the organisation. All the participants, customers, in this case, remained anonymous and their opinions are confidential and their privacy is protected. The researcher advised the participants of the type of study and the purpose of the research being conducted and signed consent was provided as requested. The information will only be used for its intended research purpose. The research was also conducted following the ethical and professional guidelines as specified in the Cape Peninsula University of Technology (CPUT) ethical policy.

CPUT and The Passenger Railway Company granted ethical approval for this work. The study followed the rules and guidelines laid down by the Ethics Committee of the Cape Peninsula University of Technology. The following procedures were observed to maintain high ethical standards:

- Voluntary participation, i.e., no participant was required to participate, and participants were told that the study was for academic purposes only and that their involvement was entirely voluntary.
- Right to privacy, i.e., participants' identities and views were handled confidentially, and no names were registered during the data collection process.
- Integrity, i.e., ensuring that: the integrity of all participants has been upheld and not been exposed to humiliation or improper behaviour.

1.12 Demarcation/Limitation of the study

The study was conducted in the Western Cape Region of South Africa. Railway stations and railway sections are of several categories. There are railways sections located on the either the Northern, Central and Southern section as shown in the legend in Figure 1.1 and denoted with different line colours.

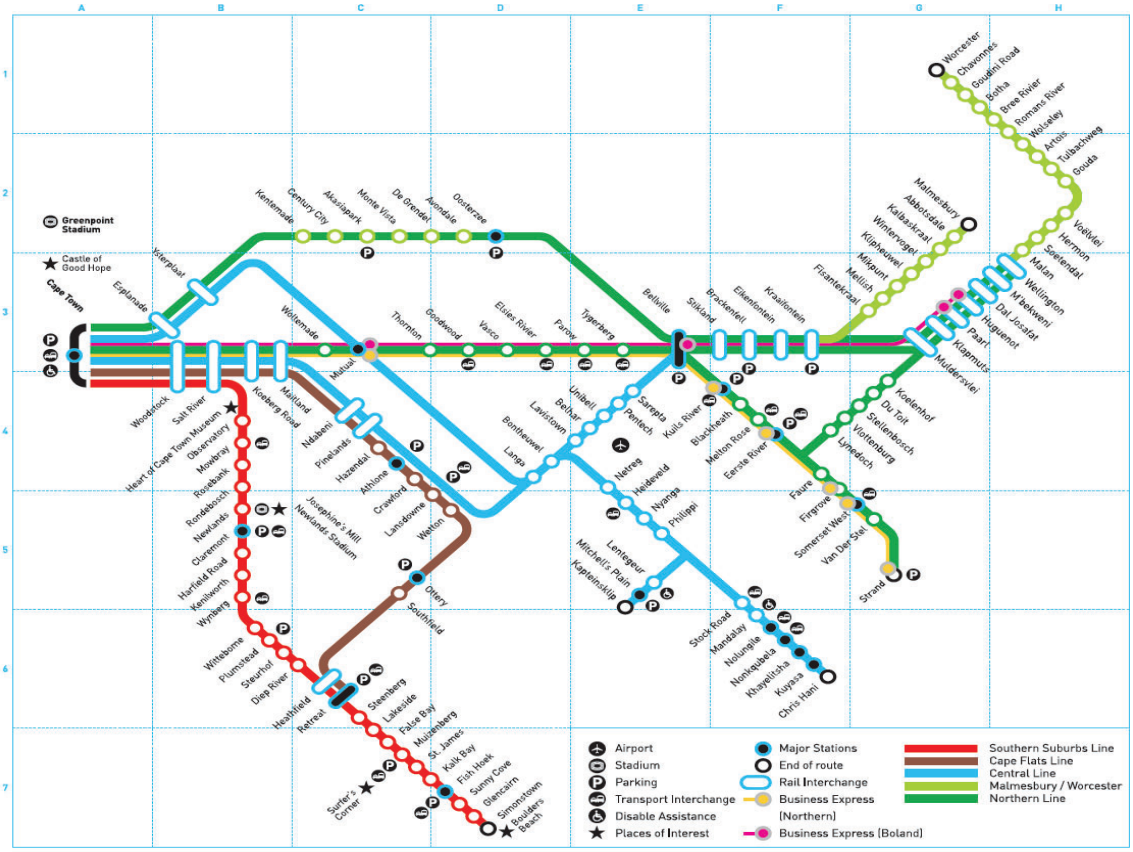

Figure 1.1: Western Cape Region railway network

These different sections have different characters or commuters requiring different types of service and with different priorities. The population who participated in this current study were passengers who travel by commuter trains during the survey period on the Southern, Central and Northern sections or lines in the Western Cape Region in South Africa.

1.13 Theoretical contribution

Studies in service quality have been undertaken by many researchers (Parasuraman, et al.,1991; Celik, 2014; Thompson, 2014; Teffo, 2019) worldwide in the railway industry but scant evidence has been found on studies conducted in a South African context. The study examined the service quality through a modified SERVQUAL model (RAIL-SERVQUAL) at a selected railway organization in South Africa to improve the quality of passenger services for the organization. The instrument (RAIL-SERVQUAL) tested in this study, could later be used for all the railway organisations in various regions of South Africa. It can further provide a guide to the railway managers to monitor, control, and enhance the service quality or performance and attractiveness.

1.14 Chapter Outline

- **Chapter One:** indicates the research aim and objectives as well as the primary questions to be addressed by the study. This chapter also suggests the purpose and goals of the analysis, as well as the study's primary issue. The chapter outlines the importance of the research project, describes some ethical considerations, and offers a chapter breakdown of the study as a whole. It presents the study context and describes the statement of the issue. The research design and methodology is briefly discussed, and an outline of the project is presented. The research is delineated, ethical matters clarified and the proposed analysis was established.
- **Chapter Two:** outlines the recent and past conference papers, government documents, reports and journal articles on service quality particularly for public transport mainly in the railway industry. The chapter served as a source of information to drive the research further. It concluded with a review on areas for improvement and ways to improve service quality offered by railway transportation. The researcher collected knowledge about the research questions and a questionnaire through a study of previous research on the quality of service in the railway industry and related fields. In this section, the researcher surveyed literature relating to areas needing change and ways of enhancing the level of service delivered by rail transport.
- **Chapter Three:** This chapter (research methodology) outlines the research design and the research strategy, including the methodology (sampling). The philosophical principles for describing and predicting the level of service were those of positivism. Hence the writer adopted the quantitative method for this current study and used a positivist model. The researcher followed a quantitative approach and explored in-depth on how to use research methods, and an explanation of the development of the questionnaire used. Data were gathered through a survey. The simplest and quickest way of gathering data has been by questionnaires. The questionnaires were limited to train passengers on the Western Cape Metrorail. Ethics, Trust and Validity were also be discussed in this chapter.
- **Chapter Four:** In this chapter, the statistical data is analysed, presented and discussed. The results were interpreted with the aid of tables, graphs and maps after calculations in confidence intervals were conducted. Whilst the presentation of the findings is also in the form of tables and graphs which summarise the responses of the respondents. This chapter was devoted to the presentation and interpretation of the results where the statistical data were analysed and presented. The responses collected from the survey were analysed using Factor analysis and a one-sample test. SPPS version 26 (IBM, date) was used to perform one-sample t-test. Data analysis

was preceded by case and variable screening. The experience and attitudes of respondents were evaluated by a developed RAIL-SERVQUAL instrument which consists of six dimensions.

- **Chapter Five:** Drawing of conclusions and recommendations based on the entire research study is made in this chapter. The conclusion offers answers and practical solutions to the research problem. Whilst recommendations offer what the next studies could focus on.

1.15 Conclusion

This chapter covered various research sections, including the research summary, research history, research problem statement, research goals, research intent and reasoning, research methodology, research significance, and delineation. The next chapter addresses current and past customer satisfaction studies from the extant literature specifically on the quality of service and service quality improvement programmes.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction and Background

The literature informs that excellent quality of service is where most companies have and will achieve a competitive edge in the market in recent times and in the future. It is important to have a theoretical or conceptual framework for assessing a railway organization's quality of service in terms of what it has to offer the public. Therefore, in this section, a brief literature review is presented, considering service quality in public transportation and customer satisfaction in public transportation viewpoints. Included in this literature review are common ways to improve service quality in identified areas in the railway industry. Therefore, as a point of departure understanding public transportation in South Africa is required.

2.2 Public Transportation

As with other developing countries, South Africa is experiencing rapid population growth, with a growing demand for travel or transportation. To gain access to economic, financial, educational, medical, recreational and cultural activities, most residents still rely on public transportation. Public transport remains an absolute necessity for low-income residents. However, Teffo *et al*. (2019) assert that parts of the South African public transport system are in a bad state. Furthermore, Teffo *et al*. (2019) elaborate on four key causes for the level of transport poverty in South Africa today, namely; (a) poor access to public and private transport services, (b) affordability problems related to over-reliance on minibus taxis, (c) the impact of apartheid policy on contemporary housing projects and (d) over-reliance on walks. Urban transport problems in South Africa are exacerbated by the past, where the apartheid system 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 needed to lead a productive life (Heyns & Luke, 2018).

Although the public transport system in the South might be seen as bad, the transport quality and safety in the public transport system is significant in a variety of ways in the daily lives of low-income earners. Ugo (2014:1) concurs that, regardless of how bad or potentially dangerous the public transport system might be in South Africa, it is equally important to recognize the important role it plays in the daily lives of low-income earners and the poor. The governments of developing countries should concentrate on developing specific analysis techniques in this field because public transport services are an important element for a nation's economic and social development (Machado-León *et al*., 2017:175).

2.2.1 Railway public transportation

Railway transport is one of the alternative modes of transportation. It has become a priority for developing countries to improve the environment, economic and social well-being to improve the quality of urban life. Many officials, countries and researchers see rail transport as one of the most significant ways of public transportation. It is regarded as a natural, energy-saving, viable alternative to private car use (Haron *et al*., 2016). The significance of the railways has been how vast quantities of goods and passengers are transported over long distances. However, security and customer satisfaction, as well as punctuality and reliability, are critical criteria for success in the railway industry. Thus, it is crucial to ensure that the railway organisation provides excellent service quality to achieve success.

Some of the most critical problems for public transport companies is to introduce higher service quality rates of public transport to minimize discontent arising from the immoderate use of private cars in urban areas. Improving the efficiency of the commuter rail transport services will significantly reduce the number of people commuting by car and support passengers as a result. According to Isikli *et al*. (2017:66), operators of public transport services aim to reduce the use of private cars by implementing quality management strategies that will promote higher satisfaction of customers.

Analysis of the quality of service in rail transport is vital for operators and public transport authorities alike. Guirao *et al*. (2016), opine that the improvement in the quality of public transport services has been shown to play a key role in attracting new passengers from private cars to the public transport network and, as a consequence, in reducing road pollution. Increasing customer satisfaction or service quality levels of commuter rail transportation contributes to higher service usage, new customer engagement and a stronger public image (Isikli *et al*., 2017:66). Van Hagen and van Oort (2019) note that the objective of quality service in rail transport is to provide services that allow passengers to experience their travel time in a comfortable and friendly manner; they will experience positive emotions and even be enthusiastic about the journey by train.

2.3 Description of services

Products are intangible because they are ultimately used and cannot be preserved for future usage. The distinction between a product and a service is that all the services are delivered and consumed simultaneously (van Hagen & Oort, 2019). Moreover, each service is special and particular to a service provider, making it truly difficult to define service. However, many authors believe that there is a sufficiently clear distinction between services and real objects to encourage people to think that goods and services are multidimensional.

Berry and Parasuraman (1991:15) state that services rendered must be executed accurately and reliably all the time as this will lead the passenger to know what to expect as they use provided services. Correctly rendering the services will also allow the passenger, when faced with the decision making, to easily choose what form of public transport to use regularly. A major concern in the service sector is recognizing the needs and expectations of the customer, and being able to deliver the right service (Zeybek, 2018).

When the customer has patronized a specific mode of public transport and the service delivery is acceptable or has surpassed their standards, there is a good likelihood that this particular mode of public transport will once again receive his patronage. If service quality is not consistent or dependable, this loyal customer could quite easily be lost to competition. It is therefore required that service quality standards presented to the passengers is consistent.

2.4 Description of quality

Quality is one of the fundamental principles used for characterizing the success of human beings, organisations and communities in many ways. The ISO (2015a) defines quality as the “degree to which a set of inherent characteristics of an object fulfils requirements”. According to Anttila and Jussila (2017), the concept refers to all interested parties' needs and desires and the fulfilment of such quality is based on the logical, non-rational and irrational interpretation of the persons. This implies the satisfaction of both parties in a clear situation of contact between two people, that is, the rail commuter and a railway organization. Quality is one of the elements of almost all service products that passengers need most.

High and exclusive quality in public transport is a way of attracting passengers and ensuring their loyalty into perpetuity. From a Japanese perspective, Parasuraman *et al*. (1985) describe quality as having zero defects; thus, quality occurs when a function or service is performed correctly the first time. This refers to the fact that quality is achieved when the service is seen as being per requirements, in particular customer specifications. There is seemingly an attitude among service providers of public transport in Cape Town that good customer service is not crucial to their survival or success in the competitive business environment in which they operate. They tend to believe that there will always be passengers who will be willing to use their services, irrespective of the quality of service that they provide. This leads to service providers often offering ordinary, if not dissatisfactory service.

2.5 Conceptual framework of service quality

Service quality is the subject of this study and so it is important to understand what it means, why it is needed, and what benefits it can offer. Krishnamani (2015), describes service quality

as service conformance to the requirements and estimates of the customers. On the other hand, perceived service quality can be described as the passenger's assessment of the overall excellence or uniqueness of the service provided by the commuter rail operators. Therefore, the level of service depends on the ability of the railway organisation to meet the passenger's needs or to satisfy perceptions. Satisfactory service experience not only allows consumers to have pleasant memories but draws more consumers as well. According to Taghavi *et al*. (2020), managing service experience clues are critical to creating a satisfactory service experience to influence the rational and emotional expectations of customers of the services. Nonetheless, in the realistic assessment of consumer satisfaction, the complexity and ambiguity of the subjective emotions and experience of the consumer in the decision-making process makes it difficult for them to judge concrete aspects with accuracy (Wang *et al*., 2018). Given that this study revolves around public transport, in particular railway transportation, knowledge of service quality within the context of railway transport is also discussed in the section below. It is also important to have a theoretical or conceptual framework to evaluate the service quality of a passenger railway organisation as it provides services to the millions. The section will commence by defining service quality.

2.5.1 Defining service quality

Service quality is the degree and direction of a discrepancy between consumer perception and expectation (Shainesh & Mathur, 2000:16). Wisniewski (2001:381) defines service quality as the difference between customer expectations of service and perceived service. If expectations exceed performance, then perceived quality is less than satisfactory and customer unhappiness occurs (Parasuraman *et al*., 1985). According to Monsuur *et al*. (2017:4), the quality of service is defined as an attitude; a long-term evaluation of the service provided to the client. The authors also differentiate the quality of service from that of satisfaction. Where he claims that satisfaction is seen as a measure on the latest use of the service provided and the customer assesses the degree of consistency between the expected quality of service and the actual service provided.

Alzaydi *et al*.'s (2018) analysis of service quality and service delivery showed that service delivery is both complex and challenging, especially when considering the specific characteristics of the service and the high degree of customer participation in its development. Effective service is more than standardization activities, it's a state of mind. It is important to inform the individual service provider of the need to provide quality, both individually and in the larger organizational sense. In general terms, the quality of service can be defined as the ability of transit operators to provide a service based on current and potential users' wishes (Kuo & Tang, 2011:820).

2.5.2 History of service quality

The evaluation of the quality of railway public transport service has been of academic interest for more than thirty years, and since the beginning of the new millennium, many research studies have been mentioned in the scientific literature. According to Eboli *et al*. (2018), the growing interest of transit companies and authorities in this topic is due to the awareness that transit service performance knowledge can be used to monitor services and identify potential weak points. The goal is to increase passenger satisfaction and ultimately attract new transit users and retain regular users.

Before addressing whether a service that has been rendered should be graded as either "good service" or "quality service," it must be noted once again that this is simply a perception, and this perception of the essence of service quality differs from person to person. Therefore, service providers are led by the perception of what good quality is by the customer and this is not an easy task as the quality is always measured against expectation. Without quantitative tests, a useful and acceptable approach to evaluating the quality of the services of a company would be to evaluate the expectations of the quality of the customers (Vilakazi & Govender, 2014). If the expectations are surpassed then the service is viewed as excellent, but if the expectations are not met, the service is viewed as poor. The basic concept, according to Zeybek (2018), is that customer perceptions of quality arise from the difference between results and expectations, where the quality of service is calculated by subtracting perception scores from customer expectation scores (Q = P – E).

2.5.3 Service quality gap model

Parasuramann *et al*. (1985) proposed a new model for measuring service quality by measuring the difference between service perceived and service expected. The development of their theory for use of the service quality gap analysis is shown in Figure 2.1 and the gaps will be explained. These gaps are:

- The difference between what management perceived the client was expecting and what clients expected;
- The difference between consumer expectations perceptions of the management and the conversion of those perceptions into service quality specifications;
- The difference between proposed service quality requirements and the delivery to customers;
- The difference between customer service deliveries and external company communications; and
- The difference between customer expectations and perceptions.

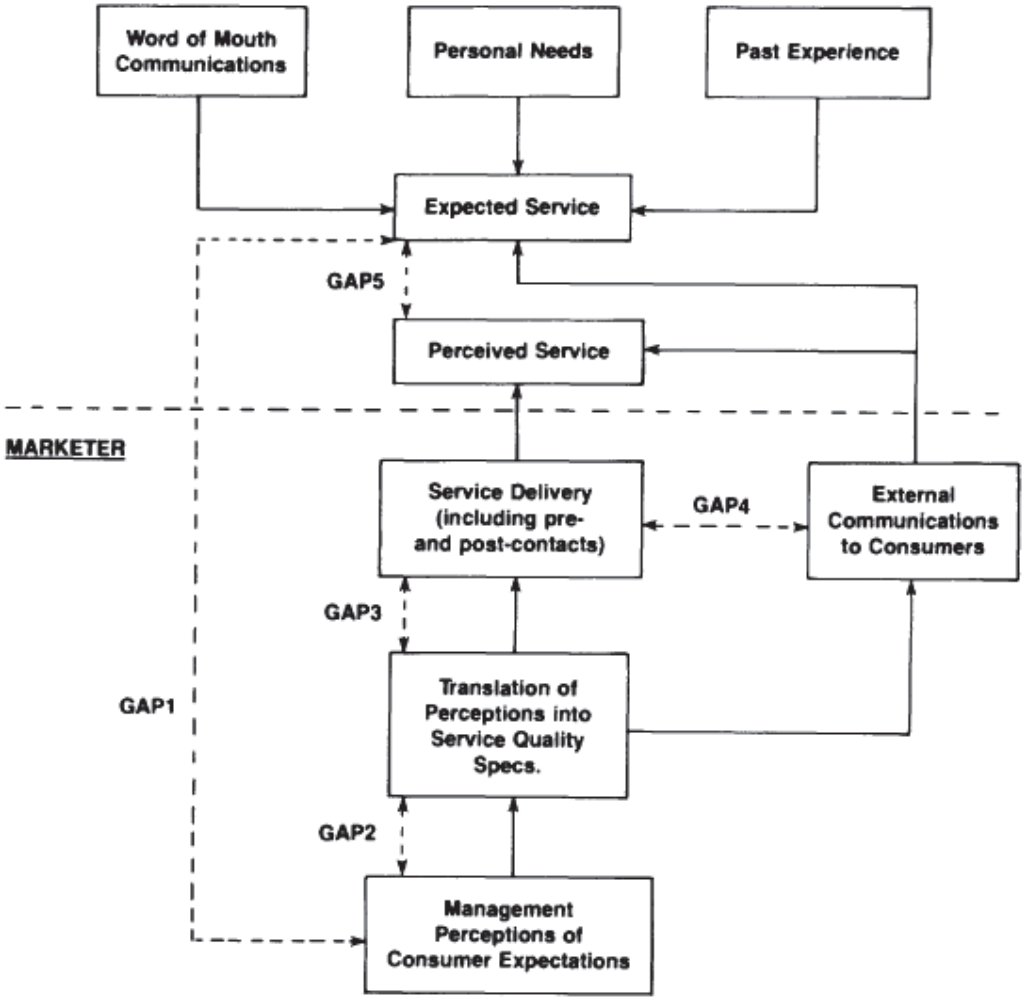

Figure 2.1: Service Quality Gap Model

(Adapted from Parasuraman, Zeithaml & Berry, 1985:44)

Furthermore, Parasuraman *et al*. (1991) argue that information on service quality gaps can help managers diagnose where performance improvements can best be targeted. Combined with an assessment of where expectations are highest, the largest negative gaps facilitate prioritization of performance improvement (Wisniewski, 2001). Similarly, if gap scores in some aspects of the service turn out to be positive, implying that expectations are not only met but exceeded, this allows managers to examine whether this particular feature of the service can be "over-supplied" and whether there is potential for resource redeployment into under-performing features.

2.5.3.1 Gap 1: Customer expectation vs management perception

Gap 1 stems from the scenario where the providers of the intangible and tangible services, that is, management, don't perceive customers wants or needs correctly. This results in inconsistencies between customer expectations and management perceptions of those

expectations. According to Parasuraman *et al*. (1985) managers of services do not always understand what features necessarily indicate high quality to consumers in advance, what features a company needs to provide to satisfy customer expectations, and what performance standards are required to offer high-quality service on those features. According to Rahimi and Kozak (2017), management plays a critical role in customers' overall satisfaction within organisations. Furthermore, Hult *et al*. (2017) indicate that it is important for managers to have a good understanding of the customer's expectation. For instance, in the railway industry, railway operators may think that railway passengers want comfortable rides or clean trains, but the passengers may be more concerned with the reliability of the trains on timekeeping or their safety whilst in the train. Therefore, it is important for management to find out about such consumer preferences to convert these opinions into requirements or levels of service quality, which should then in turn be implemented.

2.5.3.2 Gap 2: Service quality specification vs management perception

According to the second gap, management has a clear understanding of what consumers want, but it is not converted into efficient, understandable standards for customer service. Alzaydi *et al*. (2018) say that managers should understand that co-production is one of the drivers that improve the quality of service. This lack of clarification about customer service expectations can lead to faulty service delivery by employees. Parasuraman *et al*. (1985:45) note that the difference exists as a result of resource constraints, market dynamics, and failure to regularly update service level standards and a lack of commitment by management to the quality of service. They were also of the opinion that the level of service rendered by an organisation's employees is fundamentally determined by the criteria by which the employees are measured or paid. When there are no service standards in an organisation or they do not reflect the expectations of customers, the quality of service will suffer as perceived by customers.

2.5.3.3 Gap 3: Service delivery vs service quality specifications

According to Sharma *et al*. (2016) to achieve quality service delivery, public transport systems need to become more user-focused, market-oriented, and competitive as public transport services are increasingly been viewed by users and scholars as a service product. Also though there are requirements for the good delivery of services and fair treatment of customers, high Quality of quality service cannot be a guarantee (Parasuraman *et al*., 1985). This disparity is a result of the organisation's workers' inability or reluctance to meet quality expectations. This may be due to problems with lack of capacity, poorly trained staff and insufficient internal processes. Wang *et al*. (2018) note that rail industry worldwide considers service quality to be

critical to their performance and increase their patronage, and is calculated to assist managers in decision-making, thus increasing overall productivity and benefit.

2.5.3.4 Gap 4: Service delivery vs external communication

External contact is a vital determinant of how consumers receive a specific service. The external steps are collected directly through questionnaires from the customers. External feedback to consumers helps to build an understanding of what is being made available to customers (Lwesya & Jaffu, 2017). According to Akbarzade *et al*. (2016), there are two types of measures in the service assessment, internal and external, in which internal measures are taken from the process's technological and operational records. This discrepancy in the inconsistencies between service delivery and what the company promises through external communications and/or lack of information on service delivery aspects will influence the expectations of customers about service quality (Parasuraman *et al*., 1985:46).

Internal factors within the system railway lead to the discrepancy between external communication and delivered service. These internal factors create a discrepancy between perceived service and planned service and eventually disappointment among customers. The discrepancy between the promised service and the actual service harms the way customers perceive service quality. Furthermore, the absence or lack of contact contributes to commuter dissatisfaction, which the result of commuters not having what they were told. The worst-case scenario is when the passenger turns to another mode of public transport. Because customers are the key part of service delivery, the combination of internal and external measures affect customer satisfaction of quality assurance of service (Zeybek, 2018).

2.5.3.5 Gap 5: Perceived service vs expected service

The gap between perceived and expected services is identified by Lwesya and Jaffu (2017) as a gap which occurs when customer misperceives quality. The appropriate respondents to determine Gap 5 are customers, the target population of this study. Therefore, it will be necessary to manage the differences between expectations and perceptions on the part of management, employees and customers to improve the quality of the service. According to Ghotbabadi *et al*. (2015), service quality management means matching the perceived quality with expected quality and keeping this distance as small as possible to reach customers' satisfaction. However, Hartono (2019) acknowledges that the Customer expectations and perceptions of services are volatile and subjective. Gap 5, the largest gap, can be considered a function of the first four gaps. The customer's perceived quality of service depends on the degree and nature of the difference between the expected service and the perceived service.

According to Siami and Gorji (2012), to satisfy the customer, the difference between Gap 5 needs to be shortened. The service provider should close Gap 5 by referring to the gap model, but to do so it is necessary to close the four other gaps that obstruct the delivery of quality service within the organisation.

2.5.4 Indication of service quality

Great service is a highly effective way of distinguishing your organization from similar competing organisations. Many organisations, however, do not know how to do this. The use of courtesy is in itself not appropriate, even by claiming in advertisements that the company provides great service. Perceived quality of service can be characterized as the judgment of the customer regarding the superiority or excellence of a product. Hence Caruana *et al*. (2001) claimed that customer satisfaction or dissatisfaction is the product of experience with service quality and the contrast of that experience with what was expected. Globally, the railway industry is a complex concept (Makovsek *et al.*, 2015:4). It is therefore difficult to describe customer satisfactory from an equal understanding from different viewpoints. Understanding contextual factors which cause customers to be dissatisfied is important. Monsuur *et al*. (2017:9) agreed that when evaluating service quality of a transport system, a customer's point of view must be considered as the key component. In their study, Celik *et al*. (2014) presented a new system that incorporates statistical analysis, SERVQUAL, type-2 fuzzy sets interval and VIse Kriterijumska Optimizacija kompromisno Resenje (VIKOR) to assess the level of customer satisfaction for the Istanbul rail transit network. To increase the customer satisfaction level, they found that there were several attributes requiring improvement, such as crowdedness and density of passengers.

2.5.4.1 Customer satisfaction

Understanding and clarifying the concept of customer satisfaction is critical. Hundal and Kumar (2015:83), citing Rust and Oliver (1994) define customer satisfaction as a measure and emotional based response by a customer to service offered by a service provider. Satisfaction means that a customer or passenger of public transport has a good feeling (Esmaeili *et al*., 2013:348). While Eboli and Mazzulla (2012:97) regard customer satisfaction as the major variable to evaluate the quality of service. Both definitions are generic definition which applies to any industry. Sumaedi *et al*. (2016) define customer satisfaction from the context of public transport. "Commuter satisfaction is the favourable/unfavourable feeling of a commuter that emerges from his / her evaluation of the difference between the overall performance of public transport services and his / her expectations" (Sumaedi *et al*., 2016:578). Nonetheless, such sentiment is generated by fulfilled consumer demands and good output of suppliers. Whenever the consumer's expectations and the services provided are at the same point, or the service

falls higher or lower than customer expectations, a feeling of anticipation or disappointment is observed. The definition of customer satisfaction applies to both a content customer and more challenging ways of satisfying the passenger.

Throughout the private sector, customer satisfaction and loyalty are seen as necessary for sustainability and growth, secured by high-quality goods and services that satisfy consumer expectations and offer value for money. Unlike in a private company where it has only the commercial undertaking that matters, the public sector has both a commercial role and delivery of public utility service (Wisniewski, 2001:380). Public sector organizations have to ensure that their services are soundly based on the needs and expectations of their stakeholders, communities, citizens and customers and are seen as providing quality service (Wisniewski, 2001:380). The performance measurement system is focused on factors associated with customer satisfaction. In modern-day organizations, in particular, in public transportation, customer satisfaction has become a commonly known concept. Some authors refer to customer satisfaction as a typical measure of the level of business performance concerning the products and services of a company, and a particular focus on the consumer. Consumer satisfaction is seen as a vital part of the company's business strategy in a competitive environment and often used as a key performance measure (KPI).

2.5.5 Determinants of service quality

Parasuraman *et al*. (1985) developed a service quality structure by defining ten main determinants of quality of service as viewed by customers and service providers, namely: reliability, responsiveness, competence, access, courtesy, communication, reputation, protection, customer understanding and tangibility. Later in 1988, the structure was updated to five determinants: reliability, assurance, tangibility, empathy and responsiveness.

Monsuur *et al*. (2017) investigated factors that impact passenger satisfaction in a railway organisation. They identified various factors such as crowdedness, reliability, and speed and train cleanliness as the impacting factors of customer satisfaction. Similar to those factors were factors identified by Eboli and Mazzulla (2015), which included punctuality, regularity and frequency of runs, and cleanliness. Miranda *et al*. (2018) investigated the different combinations of service quality dimensions, that is, comfort, connection, and convenience which affected customer satisfaction in the Portuguese railway company. Miranda *et al*. (2018) found that customer satisfaction is highly captured by both comfort and connection. The combination is also a reflection of what was suggested by Maruvada and Bellamkonda (2012) including the travel cost, convenience, comfort, reliable travel time and security. The general consumer loyalty is inferred by three unique blends of the service quality dimensions.

The determinants of the quality of service are not just tested on the quality of service encountered during transit or inside the train. Geetika and Nandan (2010) conducted studies on the identification of Indian Railways service quality components at railway platforms. Researchers found that the determinants of quality of service are availability and quality of refreshments, information system efficiency and railway staff behaviour, basic platform facilities, and safety and security. Refreshments and factors of conduct were deemed more significant than other factors, however.

2.5.6 Need for service quality

In this current competitive environment, most companies promote service quality as an integral component of their corporate strategy. Business organizations are now continually searching for sources of competitive advantage, but as product quality improves and products are less distinguishable from each other, businesses are finding competitive advantage through their product's service elements. Organizations delivering intangible services compete with each other to achieve greater profits by supplying their existing clients with excellent service in a highly competitive climate. This has contributed to a greater emphasis on the standard of service. Machado-León *et al*. (2017) stipulate that providing affordable, high-quality public transport facilities ensures the sustainability of the networks with a view to financial growth and social inclusion. It needs a detailed evaluation of the programmes that are offered based on perceptions and preferences of the users. Improving service quality means not only investing resources in new technology but also prioritizing behaviour that affects the level of quality that customers perceive. Customers' needs are generally changing and their expectations are also increasing as service providers compete with each other for the patronage of these customers to maintain their market share. All organisations (including the railway organisations) need to keep enhancing their programmes. In general, programmes that constantly and reliably satisfy consumers are assumed to keep them happy and fulfilled. They are loyal customers in such a situation and will continue to seek the service that will in turn result in an organization's income and development (William *et al*., 2016).

When customer services are not enhanced continually, the company may lose them to another organization that offers excellence in service. The railway organisations like any other organisation that provides services, must continually ask their customers including their employees how it can improve its services. Service providers should then implement the answers, suggestions and recommendations. The use of these techniques will ensure continuous improvement in service quality. The weight given by passengers to each of the attributes, and the measure of their satisfaction with them, helps improve the quality of service and prepare better investment plans; this aim is increasingly important lately due to the growing worldwide cost reduction trend (Eboli & Mazzulla, 2012:104).

2.5.7 Benefits of service quality

It is important to consider customer needs and expectations so that it becomes possible to provide public transport systems that consumers perceive to be viable alternatives to their vehicles. Improving the quality of service is one of the ways the Railway Passenger Business can improve its competitiveness (Banu, 2018:359). George and Rangaraj (2008:599) agree that the key goals of performance evaluation in the public sector, as stated by Radnor and McGuire (2004), are to enhance public services through improved competitiveness and service delivery capacity and to strengthen transparency such that organizations are explicitly accountable for the tools they use and the results they achieve. Organisations have perceived numerous potential benefits obtained from actualising service quality ventures, including increasing customer fulfilment, company maintenance, customer dependability, representative benefits, enhanced corporate image, revenue picks up, and monetary execution. The value of customer and customer loyalty in public transportation is often ignored. However, the entire field revolves around the passengers. Therefore, the focus of any customer service approach will be required to be on the passengers of public transportation.

2.5.8 Detriments of poor service quality

To make service quality measurement an effective management tool, the organization must clarify why such measurements are being carried out and what the benefits of measurement are to them. The decrease in customer satisfaction hampers the performance of the organisation both financially and its image as confirmed by Monsuur *et al.* (2017:10). Research has demonstrated that poor satisfaction is a qualification of long-term reputation damage. They further argued that, in the long term, it may harm patronage levels. Ranjan *et al*. (2016:94) recommended that, in improving customer satisfaction, decision-makers of railway organisations must focus on building proper infrastructure. The passengers require better service than they experience. If public transportation service is not successful, it will be able to temporarily decrease the level of satisfaction, in the end, thereby reducing the quality of life (Putra & Sitanggang, 2016).

2.6 Measuring service quality

Managing and measuring the quality of service is different from managing and measuring the quality of a tangible product. When measuring the quality of a product, the technical specifications of the product are considered. However, services quality is more complicated; service attributes are not tangible (Khorshidi *et al*., 2016).

The first step towards increasing customer satisfaction in any system starts with assessing the quality of the service. The evaluation process, therefore, plays a very important part in increasing customer satisfaction (Aydin *et al*., 2015:63). Hundal and Kumar (2015:87) note that quality assurance of service is one of the important factors to be established to improve the competitiveness of the railways. There are various explanations for why companies often want to measure service quality such as knowing their consumer expectations and experience over the service provided. Ugo (2014) investigated customer satisfaction levels with 30 service quality variables on a self-rated questionnaire, using a quantitative research methodology and found that passengers are no longer satisfied with the transport fare and the availability or accessibility of ticket sales outlets.

Customer Satisfactory Surveys are very important to assist the decision-makers. Various instruments such as SERVQUAL, RAILQUAL, RECSA, etc. which will be discussed in the subsection below, have been utilised in public transportation to collect data to measure customer satisfaction. The results of Customer satisfactory surveys help managers choose from a long list of service attributes (e.g. cleanliness, on-time performance, quality, comfort, or security) so that they can more efficiently focus their organization's attention and resources (Guirao *et al*., 2016:69). The concept of services quality is measured in various ways.

2.6.1 Five dimensions of service quality

The most used method to evaluate service quality across the service industry is the SERVQUAL, developed by Parasuraman *et al*. (1985). SERVQUAL offers a conceptualisation of service quality based on gaps. Actual service performance and customer expectations are specifically calculated to determine the 'gap'. Conceptually, this gap measurement suggests that a customer tests the assertion of the desired value rate for the performance of the service.

As described in Figure 2.2, the SERVQUAL instrument comprises of 22 statements used to assess service quality across five dimensions (Tangibles, Reliability, Responsiveness, Assurance, and Empathy) with each statement used twice. One to measure expectations and one to measure perceptions. Parasuraman *et al*.(1991), argued that SERVQUAL could be adapted to any service organisation, including public transport, with slight modifications.

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

Figure 2.2: SERVQUAL Dimension

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

It has been suggested that the SERVQUAL instrument requires considerable adaptation for certain services and that items used to measure service quality should reflect the particular service setting under investigation (Prasad & Shekhar, 2010). In this regard, it is appropriate to change some of the items and add or remove items as required (Ashok, 2020). Many researchers in the logistics and transport field have applied the gap model by adapting the SERVQUAL measure to the particular context under review either by removing or by adding measurements (Zeybek, 2018).

2.6.1.1 Reliability

Reliability represents the service provider's ability to perform the promised service reliably and accurately (Celik, Aydin & Gumus, 2014). Ugo (2014) argues that reliability differs from service reliability in that it refers to the service provider's ability to deliver the promised service reliably and accurately. A systematic review showed that this dimension focuses on timeliness, availability of service information; and providing services as stated/promised. It means that the organisation performs the service right the first time. It also means the company is delivering on its pledge. In particular, it includes consistency in the billing process, accurate record-keeping and delivering the service at the time specified.

2.6.1.2 Responsiveness

Responsiveness indicates the service provider's ability to be supportive and to provide prompt support (Celik, Aydin & Gumus, 2014). The model of Cavana et al. (2007) present three items to describe this dimension, namely; willingness to help a customer; prompt service; and availability of staff in handling your request. All these attributes relate to employees' attitude, responsiveness & appearance of employees.

2.6.1.3 Assurance

Assurance is the degree of learning and graciousness held by an organisation's employees. According to Celik *et al*. (2014), assurance concerns staff's awareness and politeness and their willingness to disclose confidence, faith and trust. Assurance refers to employees' knowledge and courtesy, and their ability to inspire confidence and trust (Khathutshelo & Mudzanani, 2019:159).

2.6.1.4 Empathy

Cavana *et al*. (2007) described empathy as dealing with customers in a caring fashion when you make inquiries, understanding customer needs when they make inquiries and having customer's best interests at heart. These items relate more to customer care service and/or a customer-centric ethos. Empathy signifies customer service and the employees' attention (Celik *et al*., 2014). Service consumers want empathy; this service aspect means that customers want a service company's loving, individualized attention (Ugo, 2014).

2.6.1.5 Tangibles

Tangibility is the condition of physical facilities owned or used to a service, such as physical facilities, equipment, and appearance of personnel. Tangibles include the physical design of the service station, the equipment, personnel, and the means for communication (Celik *et al*., 2014:284). First, we see that these items are more of attributes of physical items, but in actual sense and not tangibles because they are simply attributes. Thus, with respect to semantics, the word tangible is not considered most appropriate.

2.6.2 Limitations to SERVQUAL

While the SERVQUAL instrument has been used in studies of different types of service industries (Wisniewski, 2001; Prasad, 2012; Siami, 2012; Khorshidi, 2016; Miranda, 2018), it has been criticized in terms of certain aspects, as shown below:

- SERVQUAL model has some drawbacks over other methodologies because it uses the preferences and opinions of passengers at the same time (which can be frustrating for passengers) and it is important to increase the length of the surveys to obtain this information (which could reduce the overall response rate and the accuracy of the survey) (Machado-León *et al*., 2017).
- SERVQUAL is much more humanistic, or customer-related, while most of the methods used in the public transportation sector are much more mechanistic, or technologically oriented, or more objective (Cavana, Corbett & lo, 2007).

- Kuo and Tang (2011) conclude that definitions of consumers' desires may be ambiguous, as consumers can use various meanings of desires.

The general SERVQUAL instruments (one or two-column formats) have been tested and used by many researchers in various research settings, including public transportation, in the area of service quality. Barabino *et al*. (2012:240) claimed that the SERVQUAL technique, developed and improved by Parasuraman *et al*. (1985, 1988, 1991), is the most commonly used approach for assessing the perceived quality of customers across the service sector. According to Maruvada and Bellamkonda (2012:479), SERVQUAL is much more humanistic or customer-related, whereas most of the interventions used in the public transport sector are much more mechanistic, technological, or more objective.

2.7 Measuring service quality in railway public transportation

Gupta and Datta (2010:225) note that the level of service rendered by rail service providers can be assessed by measuring the health of the services and facilities offered to its passengers at the railway stations. Both the control boundary model and categorical judgment law were used to determine the level of importance and satisfaction from data collected using a five-point Likert scale. The researcher found that the use of a categorical assessment provides a real measure of the degree of disappointment by translating the rating scale data into an interval scale. The research conducted by Aydin *et al*. (2015) presented a hierarchical structure for customer satisfaction to assess the efficiency of rail transit lines in Istanbul, by proposing a hybrid statistical analysis, FAHP, trapezoidal fuzzy sets, and integral system of Choquet. Figure 2.3 presents the proposed methodology utilised by Gupta and Datta (2016) to evaluate the component-level contributions for individual attributes of service quality at Indian railway stations.

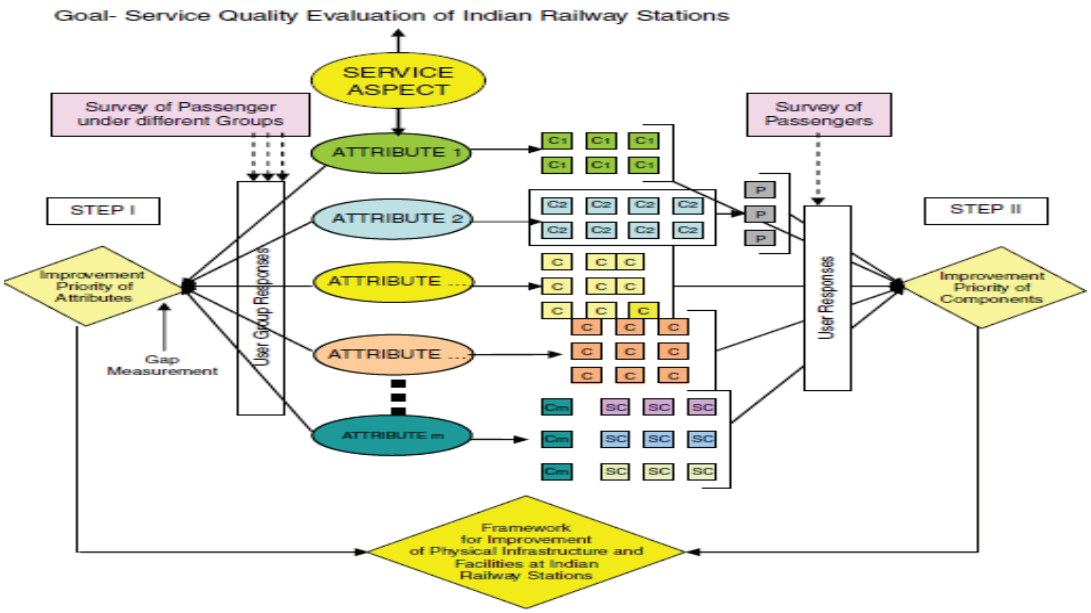

Figure 2.3: Structure of the proposed methodology

(Source: Gupta & Datta, 2016)

The research by Pal (2012) aimed to understand the level of satisfaction of passengers in terms of the quality of service offered by the Southern Railways and also to examine the perspective of passengers on the quality of service rendered by the Southern Railway.

Cavana *et al*. (2007) proposed to incorporate three further dimensions which are important for the rail passenger service into the original SERVQUAL. The expected service was further broken down into two levels in the expanded model, Figure 2.4: desired level and adequate (minimum acceptable) level.

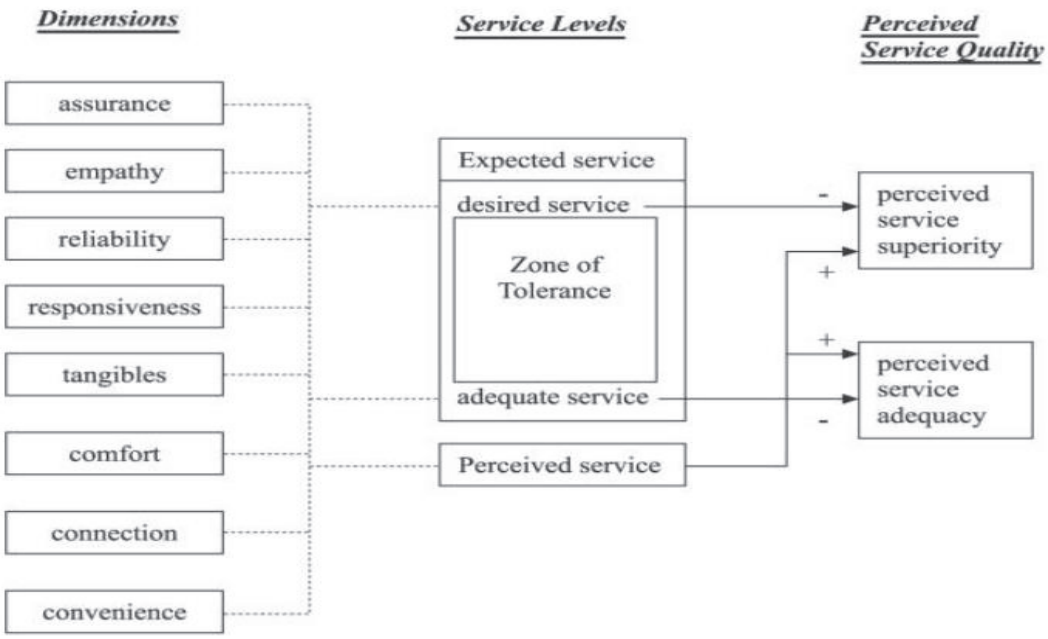

Figure 2.4: Conceptual framework for measuring railway passenger service quality

(Source: Cavana *et al*., 2007:12)

2.7.1 Measuring service quality using SERVQUAL

Prentkovskis *et al*. (2018) developed and tested a new Delphi-FUCOM-SERVQUAL methodology to improve the service quality measurement process in an express post business. The benefits of the approach developed are reflected in the fact that it allows for a detailed treatment of input and output parameters and produces more accurate performance. According to Prentkovskis *et al*. (2018:22), the methodology is very helpful to craft the strategy of the company to improve its efficiency. Awasthi *et al*. (2011) presented a hybrid approach based on SERVQUAL and Fuzzy TOPSIS for assessing the quality of service of urban transport systems. They claimed that the strength of the approach was the ability, under partial or lack of quantitative information, to perform quality of service assessment of transport systems. Rozaq and Istiantara (2018) followed the common process, using SERVQUAL instrument, to determine the level of quality of customer service at Lempuyangan Yogyakarta station as seen from rail passenger's perception and expectation of customer service only. The research analysed customer service only at a selected station, rather than the entire service offered by the railway organization.

2.7.2 Measuring service quality using RAILQUAL

Vanniarajan and Stephen (2008) defined the attributes customers use to determine Indian railway quality of service and created a systematic instrument called Railqual. Railqual's relationship with customer satisfaction was also measured using data obtained from Southern

Railways customers in which the following variables were listed as relevant to customers, which is reliability, assurance, and empathy.

Maruvada and Bellamkonda (2010) also developed a comprehensive instrument RAILQUAL which was a modification of SERVQUAL used in measuring rail transport quality. This was done by grouping together attributes used in SERVQUAL, the public transportation industry and the railway service sector to form a pool of measurement items.

2.7.3 Measuring service quality using RECSA

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. Heyns and Luke (2018) also accepted that the SERVQUAL methodology has been extended to several industries, including transportation. It is therefore considered appropriate to measure the quality of service in the railway industry because survey instruments appear to be robust and adaptable to local circumstances and particular industries. In adapting it to their situation, the study conducted by Gupta and Datta (2010) concentrated only on six separate dimensions, i.e. accessibility, waiting time, availability of information, passenger amnesty, safety, and travel-related facilities rather than the entire SERVQUAL. The aim of the study done by Heyns and Luke (2018) in the Greater Johannesburg was to determine rail commuters' perceptions and expectations of service quality using a modified SERVQUAL. They adapted dimensions suitable for public transport in South Africa, that is, reliability, the extent of service, comfort, safety, and affordability. In their analysis, they cited the work of Vilakazi and Govender (2014) on various forms of road-based public transport modes in South Africa, which considered the RECSA dimensions (reliability, the extent of service, comfort, safety, and affordability) relevant in assessing the quality of service expectations of users of public transport. Khuong and Dai (2016) also found that RECSA was suitable for measuring taxi services in Vietnam, just as Horsu and Yeboah (2015) did in Ghana. According to the RECSA model, the quality of transportation services is influenced by five main elements, i.e. reliability, the extent of service, comfort, safety, and affordability.

2.7.4 Six dimensions of the RAIL-SERVQUAL model

Upon reviewing the literature and studying different models, some commonalities were critically reviewed. All of these were restructured or merged as derivative dimensions of service quality in a model consisting of six (6) dimensions we call: the RAIL-SERVQUAL Model, shown in Figure 3.1. To thoroughly measure the quality of service, the attributes used

in SERVQUAL, the public transport industry, and the rail service sector should be grouped to form a pool of measuring items (Cavana, et al., 2007:11).

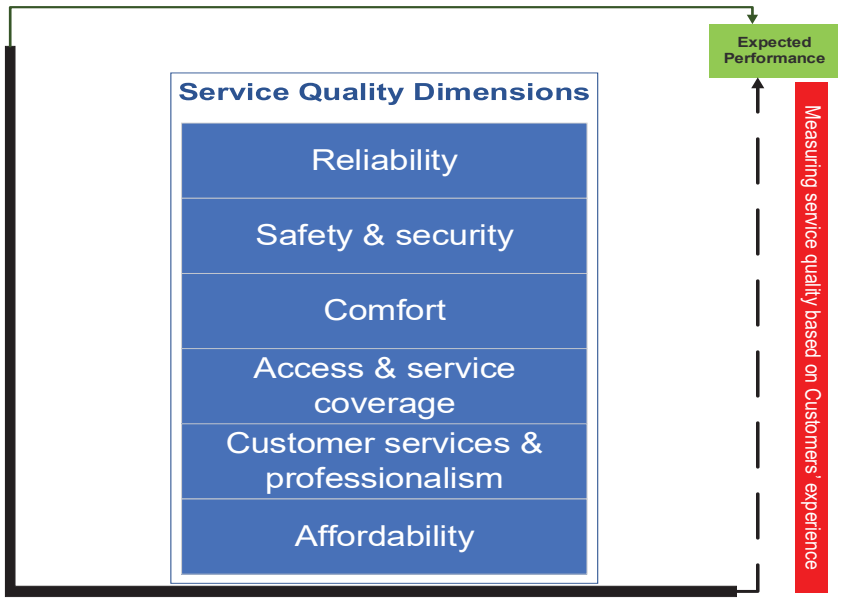

Figure 2.5: Railway Service Quality (RAILSERVQUAL) Model

2.7.5 The modifications of the SERVQUAL model

The researcher used the above approach with some modifications to attain the study goals. Parasuraman *et al*. (1991:176) note that the SERVQUAL approach is a robust and accurate multi-item scale that can be used to better understand customer service needs and attitudes across a wide variety of services, including public transportation A downside of SERVQUAL's three-level questionnaire is that 22 questions need to be answered in three separate ways, making it a total of 66 things to answer. Morrison (2004:28) argues that one of the difficulties in measuring the difference between the expectations and actual service quality is predicting consumer expectations because typically consumers demand more than they get and it takes too long to complete one questionnaire. Therefore, some academics argue that the most effective way to measure service quality is to determine only customer perceptions of service quality (Jain & Gupta, 2004:26; Jayawardhena, 2004:51).

Wisniewski (2001) criticises this method of determining customer satisfaction. "Such an approach does not measure customer service delivery expectations and an adequate understanding of customer expectations is essential for performance improvement". This is because all of these studies tend to concentrate exclusively on customer service expectations measuring just what the consumer perceives of the service at their disposal, provided by the

service provider at present. However, the study attempts to measure customer perception levels (Morrison, 2004).

In line with this perspective, the purpose of this study was to determine only one side of the quality of service gap – perceptions of customers, in this study known as customer experience, and the method of calculating gaps *per se* was not used. Instead, they used cumulative frequency tables to analyse the data. The changes to the SERVQUAL model were made in such a way that the model would be suitable for evaluating the level of service in railway organisations. The original SERVQUAL model structure has been retained with only the Reliability Dimension held to its original name. The model measures the experience of a customer upon the service received from using the passenger rail service. There is a theoretical opportunity to decrease the number of questions while the questionnaire remains reliable (Khorshidi *et al.*, 2016). The RAILSERVQUAL dimensions applied in the study are discussed below.

Reliability

Reliability indicates the degree to which passengers get the service that they expect (van Hagen & van Oort, 2019). This dimension focuses on timeliness of train services, availability of service information; and providing services as stated/promised. Reliability implies output continuity and dependability. This indicates the organisation's first time delivering the service correctly. This also means the company is delivering on its pledge. In particular, it includes consistency in the billing process, accurate record-keeping, and delivering the service at the time specified.

Safety and security

- Trains are driven carefully according to speed limits and other safety rules publicly displayed.
- Visible security features to prevent, detect, and/or control criminal activities/individuals in waiting areas and on coaches.
- Other safety rules, signs, signals publicly displayed.
- Safety gadgets, fire alarms are installed in case of unforeseen circumstances

Comfort

Comfortable seating, drive, the temperature on coaches and in waiting areas

Access & service coverage

Availability, flexibility, and a wide range of service options with respect to time, stations, and connections. Accessibility to services/stations as well as other supporting services. Access

and service coverage requires simplicity and ease of access to railway services. It ensures the service is readily accessible for people with disabilities, similar to many public transit links and malls.

Customer service and professionalism

Professionalism focuses on the neatness of physical facilities, appearance, and attitude of staff, cleanliness of trains, etc. Customer care service includes willingness to support customers; attention to customer needs, customer-centric operations; availability and ability of staff to handle customer inquiries, etc. Customer service and professionalism include courtesy, loyalty, consideration, and friendliness of contact staff (including security, ticket verifiers, ticket sales staff, etc.). It requires consideration of passenger grievances and managing issues relating to customer relations. It includes explaining the service itself, explaining the quality of the service, explaining the trade-offs between value and product, and ensuring that an issue is addressed.

Affordability

- Daily, weekly, monthly, seasonal, or yearly train fares/tickets can be afforded by all categories of income earners.
- Train fares/tickets are relatively cheaper compared to other modes of transportation
- Increases in fares/tickets can be afforded by all categories of income earners.

2.8 Areas to improve service quality

Service organizations generally strive to achieve customer loyalty, thereby ensuring a more sound long-term future for the organization, while also enjoying the repeat business offered by loyal customers. Building customer loyalty, however, is not an isolated task and is an integral part of every business.

Railways have to revolve around passengers for the customers to be satisfied with the service (Maruvada & Bellamkonda, 2012:45). Railway passengers must be seen as consumers with privileges instead of being treated as a captive user with limited choices. Prioritising customers when designing public transport policies may align passengers' and managers' qualitative perceptions (Barabino *et al*., 2012:239). Once organizational objectives are set based on the needs and desires of their passengers, the company must publicly evaluate their success against those objectives. Heyns and Luke (2018:473) suggest that 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. Improvement in service quality comes from the organization knowing where it is, compared to where it wants to be or should be and then taking steps to

improve service performance, based on the measurements. Therefore, a holistic approach to improving the quality of service in the public transport systems is needed, particularly in identifying the needs and expectations of customers, including the use of complaints and feedback to determine the appropriate indicators of service quality (Ugo, 2014:3).

Perhaps the most critical element of enhancing customer service is the right people or workers and that opinion is held by many writers. First of all, if an organization is to be successful in changing its ways, someone must prove that this is feasible, and secondly, a motivational factor must be sufficiently strong to encourage commitment.

The understanding of service by the consumer is often more influenced by how staff treats their grievances. Under these circumstances, the customer is more likely to formulate a perception of service quality based on how the incident is being handled. These conditions appear to linger for a longer period in the customer's mind, as opposed to others. Hundal and Kumar (2015:87) suggest that for the railway operators to be more responsive towards passenger's requirements & needs, they need training of time management of trains. The improvements in operational performance dimensions, especially quality and reliability will result in improved business performance that may lead to sustainable organisation performance (Maruvada & Bellamkonda, 2010) citing (Nabass & Abdallah 2018:7).

According to Thompson and Bente (2014:12) efficiency in railway can change only if the railways are willing to do so and the political will exists. The most popular way to improve efficiency which will then improve service quality is through increasing investments. Celik, Aydin and Gumus (2014) advised that adding a new rail transit line, increasing the number of carriages per trip can reduce the crowdedness. A methodology for improving the quality of the service, shown in Figure 2.4 was verified in an express post company by (Prentkovskis *et al.*, 2018).

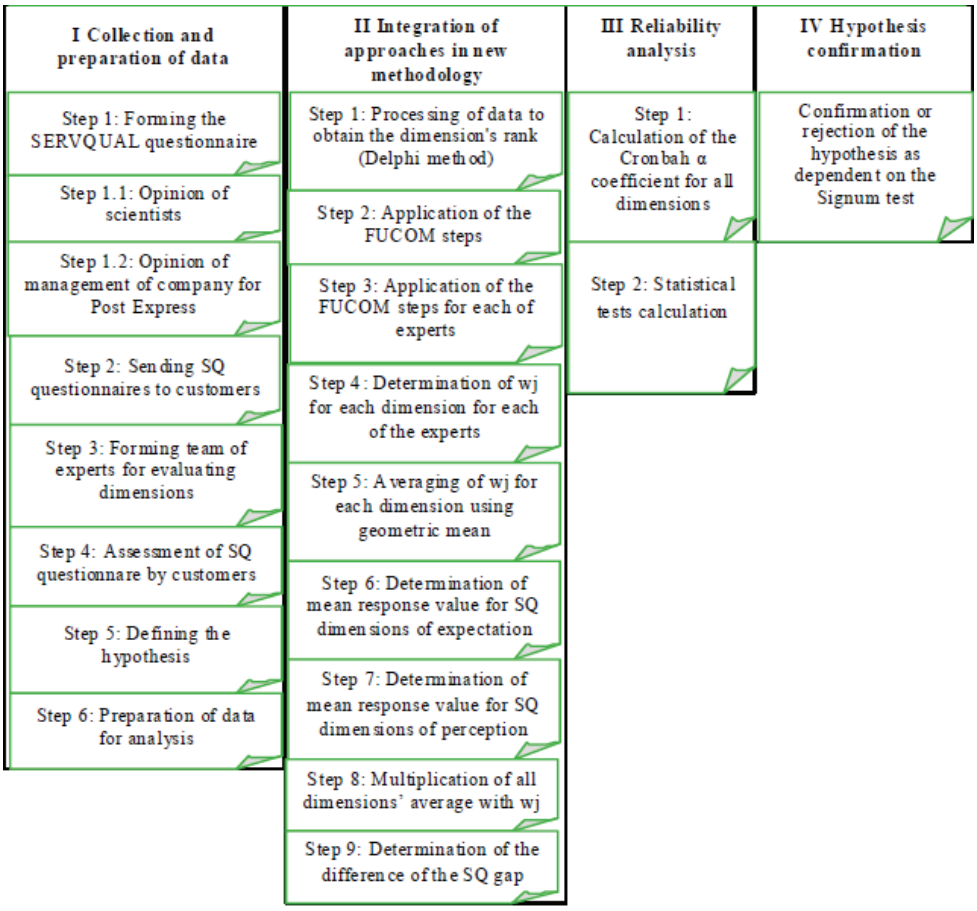

Figure 2.6: Model for improving service quality measurement

(Source: Prentkovskis *et al*., 2018)

To improve service levels and reduce costs for both train operators and infrastructure managers, incentives need to be set within the railway to promote such behaviour (Beck, Bente & Schilling, 2013). Encourage the reduction of train delays caused by infrastructure-related problems, which benefits the efficiency of the entire railway, infrastructure managers and operators, passenger and freight railways.

2.9 Conclusion

Firstly, the chapter defined customer satisfaction as a measure and emotionally based response by a customer to service offered by a service provider. It also provided an understanding of service quality and how service quality is measured in public transport. Moreover, the determinants of service quality have been discussed in length. The chapter also highlights the importance of improving the service quality in the railway industry. The chapter concluded by stating that the first step towards increasing customer satisfaction in any system starts with assessing the quality of the service. The next chapter outlines the research design and methodology.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

In the previous chapter, the researcher reviewed the literature relevant to the study following the research questions and problem statement. This chapter undertakes a description and discussion of the design and methodology of this research. A survey method was employed to collect quantitative data from the passengers of the railway organisation in the Western Cape region. This chapter will clarify further the study design, methodology of science, study method, population, sampling process, data collection, validity, reliability, and ethical considerations.

3.2 Research Paradigm, methods, and methodology

The term research paradigm and research philosophy are used interchangeably. Saunders, Philip, and Adrian (2016:124) refer to the term research philosophy as a system of beliefs and assumptions about the development of knowledge. A paradigm in this context of the study refers to the entire constellation of beliefs, values, and techniques shared by the commuters of the train. Ontology relates to issues such as whether there is an objective reality; described as the science of being (Tronvoll *et al.*, 2011) citing Burrell and Morgan(1985). They note that ontology examines the form of reality that exists, what this reality looks like, the entities reside within the reality, and how these entities interact (Tronvoll *et al.*, 2011). Ontology provides researchers with a lens to formulate their research questions and helps guide their selection and use of theories and research methods. The ontological position that the researcher took was the objectivist position as he believes that he is ideally an objective observer that does not participate or rather influence what is being studied. According to Saunders *et al*. (2016:128), objectivism argues that the social reality that we research is external to us. The ontological position was taken because the researcher has no influence on what consumers of the product perceive about the quality of the product.

On taking an objectivist approach, the researcher's epistemological position was a positivist rather than an interpretivist lens. According to Schulze (2003:9), positivists believe that there is an objective real world beyond the individual's body which can be known and described. All conclusions about reality are based on empirical observations that can be publicly verified (seen, heard, touched, smelled, and measured). Positivism gives importance to research methods focusing on quantitative analysis, surveys, and experiments. Tronvoll *et al*. (2011:468) described service research as positivist when using formal proposals, quantifiable

variables tests, testing hypotheses, and inferences about a phenomenon from a representative sample of the specified population.

3.3 Research approach

Research methods are often divided into two main types in education and the other social sciences: quantitative and qualitative methods. Bhawna & Gobind (2015) portrayed qualitative research as a developing model that happens in a characteristic setting that empowers the scientist to build up a degree of detail from the high association in genuine encounters. Quantitative research involves studies that make use of statistical analyses to obtain their findings where key features include formal and systematic measurement and the use of statistics (Marczyk *et al*., 2005:17). Quantitative research was used to collect facts and figures as it uses mathematical tools such as SPSS and it is less time-consuming. The quantitative approach was also chosen due to the epistemological position taken by the researcher, i.e., positivist. Saunders *et al*. (2016:166) note that quantitative research is generally associated with positivism, especially when used with predetermined, highly structured techniques of data collection.

3.4 Research population and selection of the sample

Etikan (2016:1) defines a population as the total quantity of the items or cases that are the focus of the study that the researcher wishes to test. The population for sampling was the whole train users in the Cape Metropolitan region.

3.4.1 Sampling

According to Etikan (2016:1), a sample is the subset of the entire population that a researcher is currently studying and the features of which will be applied to the entire population. For the study, convenience sampling was used and a research sample was taken to measure the interpretation of the clients. Different groups of passengers were surveyed at different times on several attributes of service quality delivered by the passenger rail service. The three groups were specifically selected based on off-peak hour, normal hour, and peak hour. 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, 2016:1). A disadvantage of convenience sampling is that generalisation from the results of this research is impaired. Watson (2015:40) notes: "this approach has clear cost and convenience benefits but suffers from severe bias issues, as the sites to which they have easy access may not be representative of the population". Since the sample of this study only involved the passengers from a commuter rail in the Western Cape region, thus, the study results do not represent the service quality of entire commuter rail sector of the country.

3.4.2 Sampling technique

Sampling techniques may be classified as probability and nonprobability sampling. The probability of inclusion of every element of the population can be calculated for probability sampling. In comparison, non-probability sampling cannot determine the likelihood that each variable of the population will be included in a sample. The reason for choosing non-probability sampling instead of probability sampling was related to cost, human resources, and time. According to Saunders *et al*. (2016:304), more planning and repeated follow-up calls are required for probability sampling to ensure each member in the selected sample is contacted. This has the potential to become expensive.

3.4.3 Sampling size

It would be superfluous to use the entire population in any type of research, but in most cases, it is not feasible to include every subject because the population is nearly finite (Etikan, 2016:2). Studying a representative sample allowed the researcher to draw valid population inferences. A sample size of 100 respondents was selected. However, due to several available respondents, the actual number was 110 respondents.

3.5 Data collection

Only primary data sources were used for study purposes, and/or analysed. Consequently, the questionnaire was the primary data collection tool to obtain quantitative primary data for further study. The survey aimed to identify the participant's opinions regarding the service quality of the passenger railway. The questionnaire was developed using information from existing literature, findings from the pilot research, and expert opinion.

The questionnaire is better for this type of study since it minimizes the researcher's involvement. A survey using questionnaires is common because they provide a highly economical way of collecting standardised data from a large population, allowing for easy comparison (Saunders *et al*., 2016:181). The SERVQUAL model was adapted and modified to form the RAIL-SERVQUAL as a questionnaire to collect data. The SERVQUAL model may be the most appropriate tool for service quality measurement because it is extremely easy to understand. The key reason it was chosen for use in this study is that it was designed for measuring the quality of service in a variety of industries. The model's reliability and precision are also among the reasons why it was chosen as a method to assess the level of service in railway organisations. A five-point Likert scale ranging from "poor service" quality to "excellent service" was used to get the level of experience associated with each service quality criterion.

- Section A consists of demographic questions about the purpose of riding, the characteristics of travel, etc.
- Section B contained 31 items that measured the responses on a five-point Likert scale for customers' experience on the service quality provided by the passenger rail.

3.5.1 Pilot study

The modified RAIL-SERVQUAL model was tested to make sure the respondents understood the different statements beforehand. A pilot study was conducted with 30 participants to ensure the data collection method was in no way ambiguous. The pilot study was also to test the questionnaire and ensure the study was validated, for accuracy and ease of interpretation. The length of the survey was also tested. Several questions that are assumed to have some overlap with others in the questionnaire were omitted to reduce the time required to fill in the questionnaire so that a better response rate and better response quality could be obtained. Furthermore, some rewording of questions was necessary to raise the interest of the respondent in completing the questionnaire. After focus group discussions, 43 attributes were established while 12 were removed after expert opinions were solicited.

3.5.2 Data collection for the main study

After making the relevant adjustments in the instrument of data collection as indicated by the results of the pilot study, the researcher proceeded to collect data for the main study. The data were gathered through an on-board survey and assessing passengers on the platforms at different times of day, on every day of the week, over four weeks. One hundred questionnaires were administered manually. The three categories of passengers are incoming passengers, outgoing passengers, and on journey passengers. The survey was carried out in November 2019 at various major junction stations in both the Southern and Northern sections. After the survey was conducted all the questionnaires for tabulation and interpretation were collected. More questionnaires were then completed leaving a total of 110 questionnaires classified as complete and accurate for review.

3.6 Data Analysis

Factor analysis and one-sample t-test were used to analyse the dataset for this study. The next step after conducting the study and gathering the data included analysing the data, which generally requires the use of statistical techniques. The primary data are those that are new and therefore original (Kothari, 2004). Primary information was collected from the completed questionnaires which were distributed and administered manually on paper. The data were entered on the Microsoft Office Excel sheet before being imported into the statistic software kit SPSS version 26 (IBM, 2019). Statistical methods often mean that the analysis is considered

reliable, suitable for situations where systematic, standardized comparisons are necessary. Marczyk *et al*. (2005) note that statistics help researchers reduce the probability of arriving at a false conclusion about the relationship between the variables being studied. Data analysis was preceded by case and variable screening. The aim was to have a clean dataset for further analysis. After initial data exploration, all 110 cases were retained.

3.6.1 Validity

“Validity simply involves how we measure what we want to measure and is probably the most important single measurement factor” (Watson, 2015:82). Consequently, validity is the degree to which differences found with a measuring instrument indicate true differences between those tested. Construct validity test, discriminant validity, and convergent validity was tested. Construct validity test for the six latent variables was done based on indices such as Relative Chi-Square (χ2/df); Comparative Fit Index (CFI); Root Mean Square Error of Approximation (RMSEA); PCLOSE and SRMR. The obtained indices show that there is good construct validity. To measure convergent validity, Average Variance Extracted (AVE) and results showed that all AVE estimates are greater 0.5 prove that our CFA model has good convergent validity. There is validity when the findings of the research reflect the perceptions of the people under study. Validity is probably the single most important feature of any measuring instrument design in research (Watson, 2015:66).

3.6.2 Reliability

Reliability refers to the degree to which the test scores are error-free (Watson, 2015:71). Credible analysis of the research should be accurate and consistent. Accurate data is accurate, reliable, unerring, trustworthy, and reputable. The reliability of the responses has been tested using Cronbach alpha and SPSS for the current study. It is commonly accepted that Cronbach's alpha scores above 0.69 are measures of reliability. The reliability of the responses has been tested using Cronbach alpha and SPSS for the current study. Consequently, the reliability test was confirmed using the critical Cronbach alpha value of 0.7.

3.7 Ethical consideration

In conducting the research, the researcher was required to maintain the highest ethical standards, especially when human subjects are involved. Having maintained the highest ethical standards, it remained the researcher’s duty to comply with all applicable regulations in this regard, including those of the institution at which the work is performed, the Cape Peninsula University of Technology. The researcher established ethical principles by first ensuring the company grants permission to perform the study and to survey the participants.

The consent letter was then signed and approved by the Regional Manager upon consultation with the Institution's head office.

An ethical clearance certificate was submitted to the institution concerning data collection, and the letter of consent, data collection request, approval letter, and confidentiality agreement were requested and submitted to the public sector organization by the researcher (evidence attached as appendices). The researcher physically administered the questionnaires, where participants were given the freedom to either choose to take part or not. The researcher advised the participants of the type and purpose of the research being conducted, and the participants were asked to sign the consent form. All participants were ensured of confidentiality and their privacy was safeguarded. One of the major risks associated with the research project is the confidentiality and trust breach. This risk was immediately mitigated as the researcher was not required to keep any personal information of the participants. The collected data was used for its intended research purpose. The research was conducted following the ethical and professional guidelines as specified in CPUT's ethical policy.

3.8 Conclusion

In this chapter, the study methodology and design were deliberated, as well as the specified sample size. \the research site and the data collection techniques that were used were discussed. The quantitative method was used to collect a thorough analysis of the knowledge and experiences of the participants in the research area. Data were collected through a survey. The administration of the questionnaires was limited to Western Cape Metro area train passengers. Data were analysed and discussed. Ethics, reliability, and validity were also discussed in this chapter. The chapter ended with an explanation of the upholding of the ethos of integrity and anonymity and ethical security for the participants. The next segment summarizes and presents the findings of the study.

CHAPTER 4: RESULTS AND DISCUSSION OF FINDINGS

4.1 Introduction

To achieve the objectives of the study, a survey was used at a selected passenger railway organisation in the Western Cape Region. The quantitative data were collected from the responses recorded on 110 questionnaires administered to train users in the Western Cape Region. The responses collected from the survey have been analysed using Factor analysis and a one-sample t-test. One-sample t-test was used in SPSS version 26 to perform data analyses. Data analysis was preceded by case and variable screening. Tables and graphs are presented to summarize the responses concerning the key variables investigated in the study. Demographic data are described and this relates to gender, age, and occupation, the purpose of using railway services, section, and frequency of use.

4.2 Demographic profile

Table 4.1 below summarises the demographics details of the participants and their travel characteristics.

Table 4-1: Demographics of study participants (N=100)

Variable	Number	Percentage (%)
Gender		
Male	46	42
Female	64	58
Age bracket		
<20 years	6	5
21-30 years	33	30
31-40 years	39	35
41-50 years	13	12
51-60 years	15	14
>60 years	4	4
Occupation		
Student	24	22
Full-time employed	61	55
Part-time employed	11	10
Retired	4	4
Unemployed	10	9
Purpose of using railway services		
Study	15	14
Employment	71	65
Personal	14	13
Business	4	4
Jobseeker	6	5
Section		
Southern Section	23	21
Northern Section	55	50
Central section	32	29
Frequency of use		
5-12 times per day	15	14
3-4 times per week	56	51
1-2 times per week	13	12
1-2 times per month	7	6
1-2 times per quarter	6	5
Rarely	13	12

4.2.1 Gender

Figure 4.1 illustrates the respondents' demographic according to gender. Of the n=110 participants, the majority of n=54 (58%) respondents were female while the minority of n=46 (42%) was male. The study shows that women were more responsive to completing the survey. The results may reflect the gender of the respondents rather than the gender profile of people who mostly use the train service.

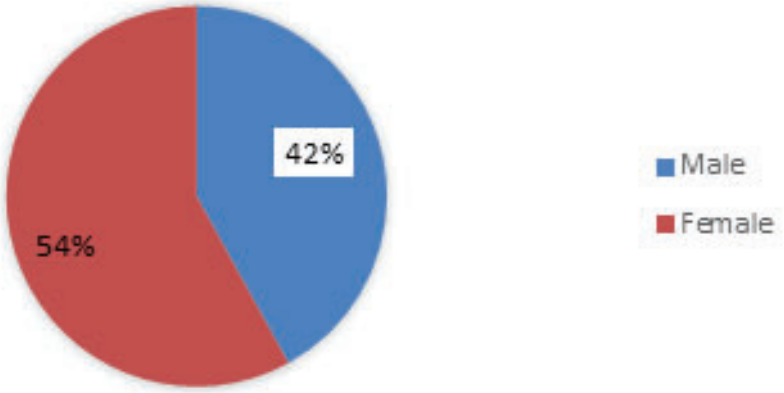

Figure 4.1: Gender of the respondents

4.2.2 Age

The ages of the participants were captured in ranges as indicated in Table 4.1. These ranges were mainly used in literature to collect demographic data. As indicated in Figure 4.2 most commuters who gave consent to participate in the survey were in the age bracket between 31-40 years.

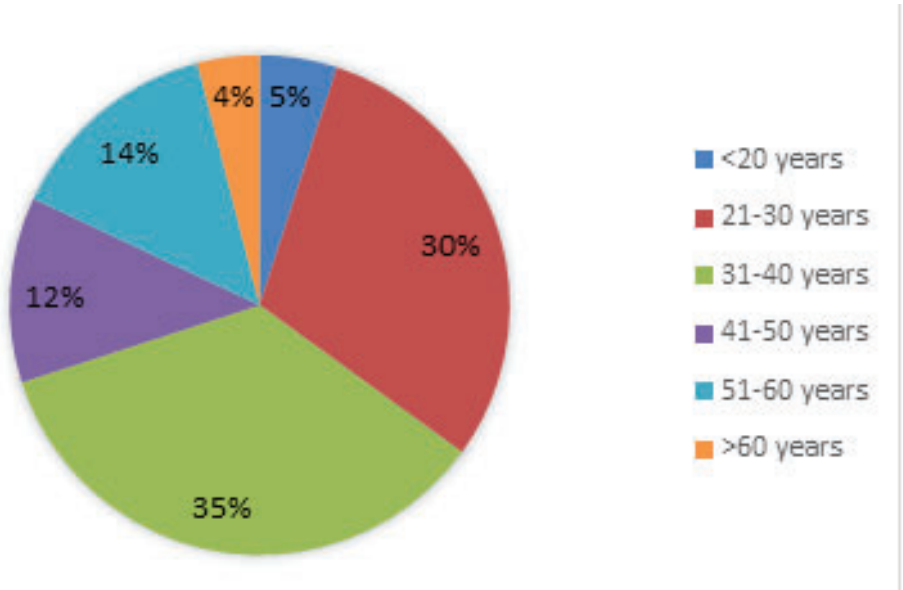

Figure 4.2: Age of respondents

The respondents' age average was not determined as it was difficult to work it out because the data were captured in ranges. The least respondents were those of age >60 years which was 4% and <20 years which was 5%

4.2.3 Occupation

The respondents were not asked to state their grades rather the employment status as seen on the results presented in the table and the results are represented in Figure 4.3. The highest number of respondents was employed (55%) with the least of respondents being retired (4%).

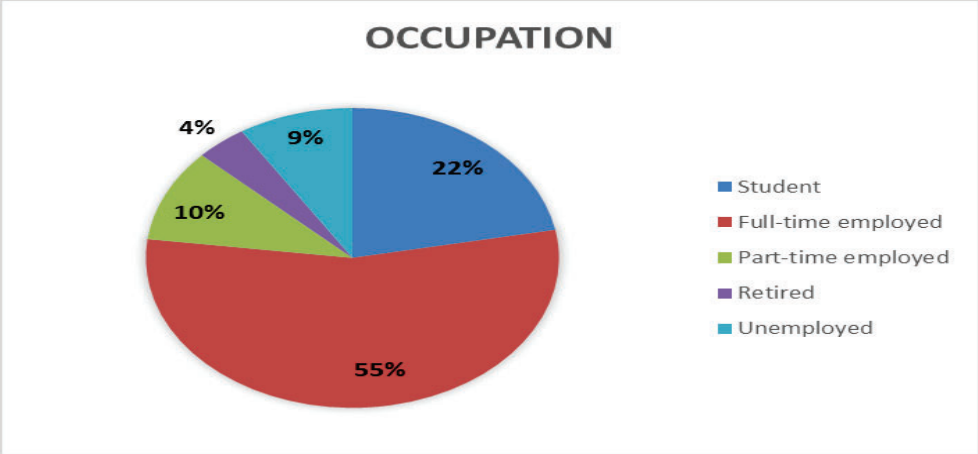

Figure 4.3: Occupation of respondents

4.2.4 Purpose of using railway service

Figure 4.4 illustrates the respondents' demographics according to the purpose of using railway services. Of the n=110 participants, the majority of n=71 (64%) respondents used the railway services to reach their places of employment. This is in line with the above finding that most respondents were employed.

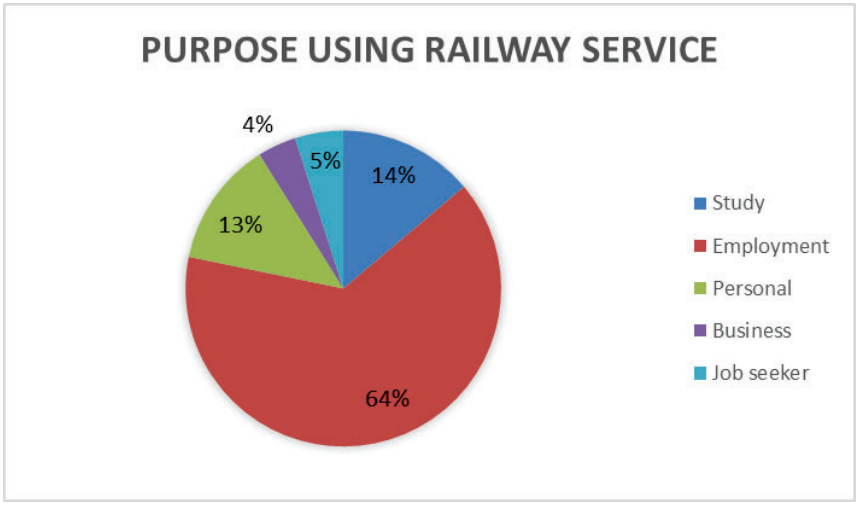

Figure 4.4 Respondent's purpose of using railway service

4.2.5 Section of travel

The Western Cape Region is divided into three sections of travel, i.e., South, North, and Central. Figure 4.5 illustrates the respondents' demographic according to their most section of travel. The section of travel may be the route from home to work or any other destination.

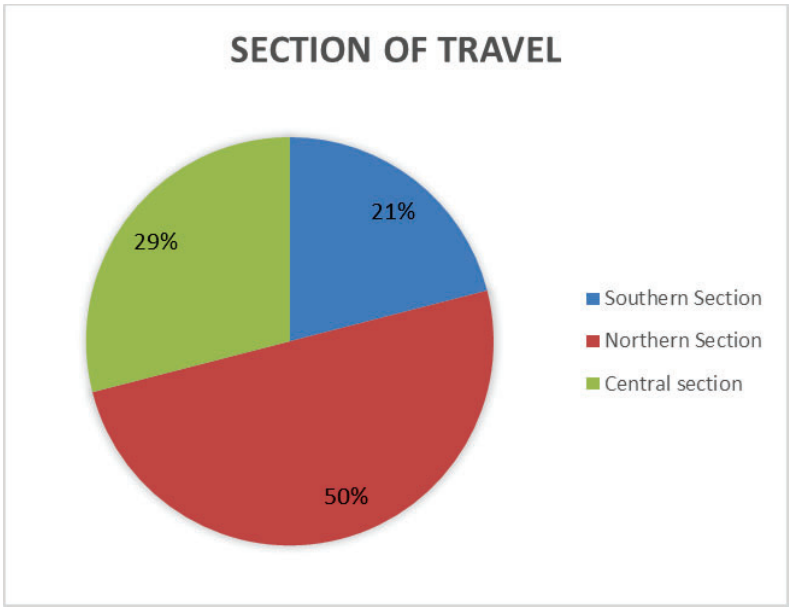

Figure 4.5: Respondent's' section of travel

Of the n=110 participants, the majority of n=55 (50%) respondents were travellers on the Northern section, whilst travellers on the Central section were n=32 (29%) and on the Southern section were n=23 (21%). It should also be noted that during the time of the survey the central section was closed, i.e., no train service was provided for two months. However, this did not discourage commuters from the central section to raise their feelings.

4.2.6 Frequency of use

Figure 4.6 indicates the frequency of use of railway service by the respondents. This was basically to understand how often the respondents use the railway services to ascertain whether the services were judged on less or more frequent use. The majority of respondents, that is, 51% of respondents use railway services 3-4 times weekly.

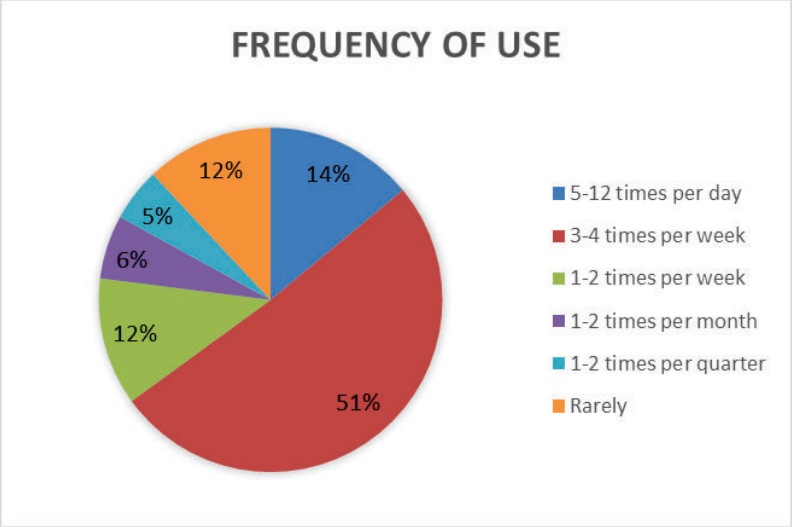

Figure 4.6: Respondent's frequency of use of the railway services

4.3 Variables in the Study

Table 4.2 indicates the variables and the number of initial indicators in the instrument. The variables were developed upon reading through the literature that discusses service quality, especially the service quality of railway transport service.

Table 4-2: Variable of the study

Item	Code	Initial No of Items
Reliability	R	7
Safety and security	S	7
Comfort	C	7
Access and service coverage	A	8
Customer services and professionalism	CS	7
Affordability	Af	7

To accurately assess the quality of service, the attributes used in SERVQUAL, the public transport industry, and the railway service sector have been grouped to form a pool of measuring objects. Consequently, the attributes in the SERVQUAL model have been updated and new attributes have been applied to the RAILSERVQUAL metric for the standard of rail passenger services.

4.4 Normality Test

The data collected were tested for normality using skewness and kurtosis and the estimates are presented in Table 4.3. Based on the strict rule of +1 and -1, a few items are not normally distributed. However, following the more relaxed upper threshold of 3.3 suggested by Sposito

et al. (1983), the skewness and kurtosis estimates show that there is fairly normal distribution in the indicators of latent variables in terms of skewness and kurtosis across all constructs. (Kothari C. R., no date) indicates that understanding the shape of the distribution curve is important for the use of statistical methods in the quantitative analysis since most methods make clear assumptions about the existence of the distribution curve.

Table 4-3: Descriptive statistics and normality estimates of construct indicators

Items	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
R1	110	1	5	1.791	0.889	0.984	0.607
R2	110	1	5	2.118	1.123	0.634	-0.683
R3	110	1	5	1.845	0.940	1.125	1.119
R4	110	1	5	2.082	1.126	0.739	-0.407
R5	110	1	5	2.109	1.168	0.734	-0.580
S1	110	1	4	1.809	0.893	0.938	0.119
S2	110	1	5	2.564	1.208	0.484	-0.691
S3	110	1	5	2.891	1.295	0.026	-1.119
S4	110	1	5	1.973	1.113	0.950	-0.012
C1	110	1	5	2.327	1.006	0.293	-0.505
C2	110	1	5	2.445	1.105	0.244	-0.817
C3	110	1	5	2.255	1.104	0.477	-0.776
C4	110	1	5	2.400	1.060	0.315	-0.751
C5	110	1	5	2.400	1.175	0.522	-0.477
C6	110	1	5	2.255	1.121	0.556	-0.766
A1	110	1	5	2.055	1.172	0.589	-0.960
A2	110	1	5	2.855	1.099	0.041	-0.689
A3	110	1	5	3.373	1.124	-0.268	-0.529
A4	110	1	5	3.045	1.176	-0.055	-0.800
A5	110	1	5	3.209	1.142	-0.158	-0.632
A6	110	1	5	3.273	1.022	-0.099	-0.320
CS1	110	1	5	2.555	1.019	0.247	-0.515
CS2	110	1	5	2.464	1.139	0.414	-0.662
CS3	110	1	5	2.300	1.080	0.487	-0.513
CS4	110	1	5	2.555	1.089	0.314	-0.530
CS5	110	1	5	2.727	1.226	0.265	-0.821
Af1	110	1	5	4.445	0.894	-1.871	3.525
Af2	110	1	5	4.182	1.094	-1.227	0.609
Af3	110	1	5	4.164	1.009	-1.099	0.569
Af4	110	1	5	3.709	1.316	-0.602	-0.863
Af5	110	1	5	4.000	1.173	-1.146	0.570

4.5 Exploratory and Confirmatory Analysis

The next step was to conduct an exploratory factor analysis (EFA) to determine which of the 43 latent indicators adequately explain variation in the six latent constructs (reliability; safety and security; comfort; access and service coverage; customer services and professionalism; and affordability) involved in this study. The maximum likelihood method was used for extraction of factors; while Promax rotation was used for the model optimisation with Kappa

set at 4. Other criteria include: Eigen values>1; suppression of small coefficients was set at <0.5; loading factor >0.5.

Most literature studies maintain that 200 or above is the reasonable absolute minimum sample size required for factor analysis. However, this does not invalidate the sample size of 110 for this study. This is because Pearson & Mundform (2010) and Pearson and De-Winter *et al*. (2009) argued that reliable results can emanate from studies with a low sample size ; below 50 with some conditions. One, the factor loadings must be high (greater 0.5 or 0.6), the number of factors is low and the number of variables is high. With this argument, it was decided that 110 sample size is sufficient especially because of the high loadings (mostly 0.6 and above).

From the EFA results, a six-factor model was obtained with the sixth factor having eigen value=1.124 which is greater than 1. The three factors explain 62.854% of the total variance having 17% non-redundant residuals with absolute values greater than 0.05. The retained items (22 out of the initial 43 items) were considered adequate based on the Kaiser-Meyer-Olkin measure of sampling adequacy higher than 0.5 (0.820) and a statistically significant Bartlett sphericity test (<0.001). The clean pattern matrix obtained from the EFA is presented in Table 4.4. All factor loadings are above the 0.5 benchmark.

Table 4-4: Pattern matrix for extracted factors and items

Item	Factor					
	1	2	3	4	5	6
R1				0.523		
R2				0.708		
R3				0.867		
R5				0.551		
S2						0.706
S3						0.765
S4						0.717
C1		0.784				
C2		0.738				
C3		0.825				
C4		0.621				
A2			0.632			
A3			0.598			
A4			0.878			
A5			0.768			
CS2	0.784					
CS3	0.798					
CS4	0.966					
CS5	0.835					
Af2					0.819	
Af3					0.738	
Af5					0.746	

4.6 Confirmatory Factor Analysis

The clean pattern matrix was used to conduct the confirmatory factor analysis (CFA) to ascertain the construct, discriminant, and convergent validity of latent constructs retained from the exploratory factor analysis stage. Figure 4.7 showed the RAILSERVQUAL Confirmatory Factor Model. Factor analysis resulted in grouping the items into six distinct dimensions; Customer service and professionalism, Comfort, Access and service coverage, Reliability, Affordability, and Safety. The factor loadings in the pattern matrix were copied into the pattern matrix builder plugin in Amos version 26 to obtain construct, discriminant, and convergent validity.

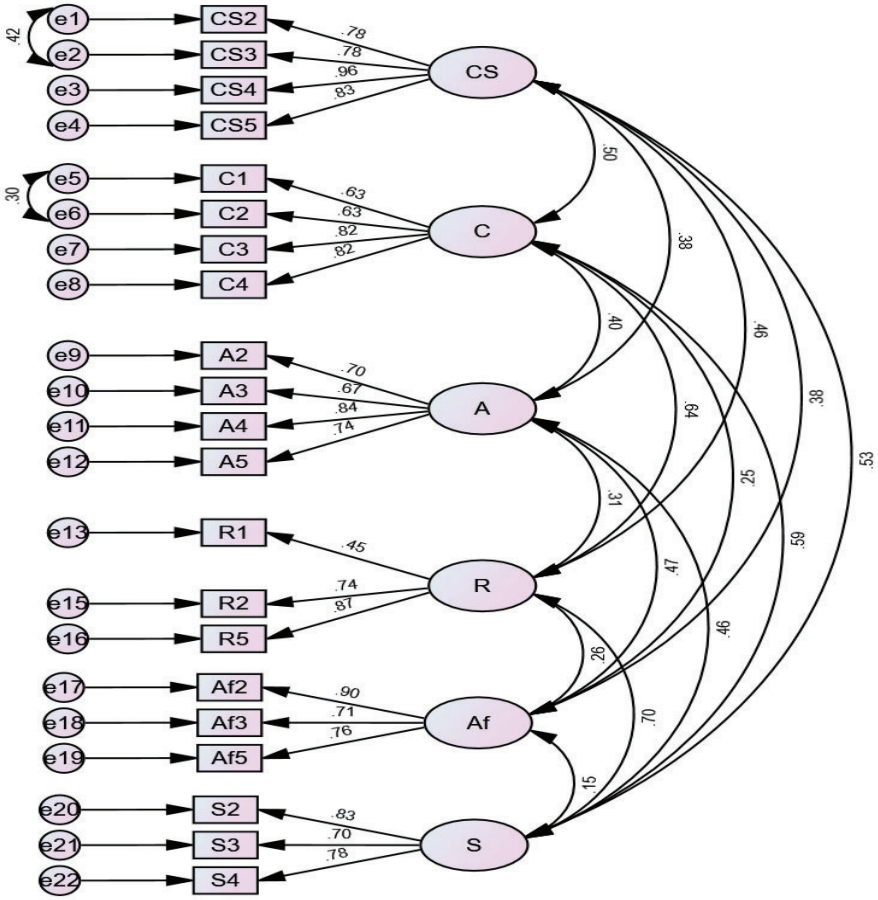

Figure 4.7: RAILSERVQUAL Confirmatory Factor Model

4.6.1 Construct Validity

Construct validity test for the six latent variables (as indicated in Tables 4.1 and 4.2) was done based on indices such as Relative Chi-Square (χ2/df); Comparative Fit Index (CFI); Root Mean Square Error of Approximation (RMSEA); PCLOSE and SRMR. The threshold of these fit indices is summarized in Table 4.5 as well as the good-of-fit indices obtained (Hooper,

Coughlan and Mullen, 2008; Moss, 2009). The obtained indices show that there is good construct validity. This implies that the six constructs in the study are valid based on the dataset.

Table 4-5: Critical and obtained model fit indices

Fit index	Threshold	Estimated	Remark
CMIN (Chi-Square)		250.017	Good fit
DF		172	
P		0.000	
CMIN/DF (Relative Chi-Square, χ2/df)	Between 1 and 3 (for n<200)	1.454	Good fit
IFI	>0.90	0.936	Good fit
TLI	>0.90	0.919	Good fit
CFI	>0.90	0.934	Good fit
RMSEA	<0.08	0.065	Good fit
SRMR	<0.08	0.070	Good fit
PCLOSE	>0.05	0.092	Good fit

4.6.2 Discriminant validity

For studies involving theory-testing, discriminant validity is a requirement. Discriminant validity is conduct to determine that a latent construct is not better explained by some other variables than by its observed variables. After arguing that the Fornell and Larcker and cross-loading criteria are weak, Henseler *et al*. (2014) introduced a new discriminant validity criterion called the heterotrait-monotrait ratio (HTMT). As a ratio, the method compares the mean of the correlations of indicators across constructs with the mean of the correlations of indicators within the same construct. Using Kline (2015)'s criterion of $HTMT_{.85}$, HTMT greater 0.85 is considered to lack discriminant validity. From the HTMT values in Table 4.6, there is evidence of discriminant validity.

Table 4-6: Critical and obtained mode fit indices

	CS	C	A	R	Af	S
CS[1]						
C[2]	0.419					
A[3]	0.437	0.421				
R[4]	0.503	0.563	0.338			
Af[5]	0.383	0.275	0.458	0.189		
S[6]	0.572	0.571	0.495	0.651	0.144	

[1] Customer Service and professionalism
[2] Comfort
[3] Access and service coverage
[4] Reliability
[5] Affordability
[6] Safety and security

4.6.3 Convergent validity

The validity of the modified SERVQUAL was also empirically tested by testing its convergent validity, i.e. the correlation between SERVQUAL scores and answers to a query that asked passengers to provide an overall quality rating of the rail service. To measure convergent validity, the Average Variance Extracted (AVE) was used based on literature (Malhotra & Dash, 2011). The essence of convergent validity is to determine that a latent variable is best explained by its observed items. The criterion is that AVE should be greater than 0.5 implying that less than 50 percent of the variance should be due to error. The results in Table 4.7 showing that all AVE estimates are greater than 0.5 prove that our CFA model has good convergent validity. Convergent validity will address the question "Does a SERVQUAL-determined service quality measure correlate to other service quality measures?"

Table 4-7: Master validity output for study constructs

	CR	AVE	MSV	MaxR(H)	CS	C	A	R	Af	S
CS[7]	0.906	0.707	0.276	0.945	**0.841**					
C[8]	0.816	0.530	0.403	0.842	0.502***	**0.728**				
A[9]	0.826	0.545	0.223	0.841	0.383**	0.398**	**0.738**			
R[10]	0.741	0.504	0.496	0.821	0.463**	0.635**	0.314*	**0.71**		
Af[11]	0.835	0.63	0.223	0.872	0.377**	0.253*	0.473***	0.258*	**0.794**	
S[12]	0.812	0.591	0.496	0.822	0.525***	0.591***	0.463***	0.704***	0.145	**0.769**

4.6.4 Composite Reliability

The reliability test was confirmed using the Cronbach alpha critical value of 0.7. The master validity and reliability test results presented in Table 4.7 above show that the composite reliability values obtained for the six constructs are above the critical value of 0.7. These values confirm the reliability of the constructs.

4.7 Results

This section presents the results of the study to the following objectives of the study:

- To identify the determinants of customer satisfaction of service quality.

[7] Customer service and professionalism
[8] Comfort
[9] Access and service coverage
[10] Reliability
[11] Affordability
[12] Safety and security

- To find out the level of customer experience of the service quality provided by the railway organisation.
- To determine the areas that need the most improvement in service quality offered by railway transportation in South Africa.

4.7.1 Objective One

To identify the determinants of passenger satisfaction of service quality

From the EFA and CFA results, all extracted items with significant loadings are considered determinants of passenger's satisfaction with regards to railway service quality. All extracted indicators (for each construct) are statistically significant at $p<0.001$. According to Khuong and Dai (2016), the KMO index ranges from 0 to 1 and the minimum value suggested for satisfactory factor analysis is 0.4, which means that the data are appropriate for further analysis. Table 4.8 below showed that all variables were of a CR greater than 0.4 (from 0.451 to 0.96)].

Table 4-8: Extracted indicators of service quality constructs (variables)

Construct	Indicator	Standardised Estimates	Standardised Estimates	P
Customer services and professionalism	CS2	Staff behaviour at stations	0.782	0.000
	CS3	Ability of staff to handle customer problems	0.779	0.000
	CS4	The interest of staff to serve and help customers	0.960	0.000
	CS5	The professional approach by the staff	0.830	0.000
Comfort	C1	Tidiness on trains	0.626	0.000
	C2	Seat conditions on trains	0.627	0.000
	C3	Stability and comfort during the ride	0.818	0.000
	C4	Availability of seats on trains	0.817	0.000
Access and service coverage	A2	Connection to substations/other transport terminals.	0.696	0.000
	A3	Parking at the stations	0.672	0.000
	A4	Access to ticket sales	0.837	0.000
	A5	Accessibility of train stations to passengers in terms of proximity to malls, residential settlement, public offices	0.736	0.000
Safety and security	S1	Visible personnel security on trains	0.649	0.000
	S2	Visible personnel security on stations	0.835	0.000
	S3	Safety measure against crime on trains	0.695	0.000
	S4	Safety signs at stations displayed to the public	0.763	0.000
Reliability	R1	Provision of on-time train service (punctuality)	0.452	0.000

Construct	Indicator	Standardised Estimates	Standardised Estimates	P
	R2	Availability of information on train schedules at stations	0.741	0.000
	R5	Availability of information on train cancellations, delays and platform changes	0.870	0.000
Affordability	Af2	Fare increase rate	0.904	0.000
	Af3	Reasonable fare based on your earnings	0.708	0.000
	Af5	Willingness to pay for service	0.757	0.000

4.7.2 Objective Two

To determine the level of customer perception of the service quality provided by the railway organisation.

The one-sample t-test was used to measure the level of customer experience on the service quality provided by the railway organisation. The results obtained are presented in Table 4.9. Table 4.9 indicates that one-sample t-test of customer's experience of service railway quality. In regards to the comfortability during the ride, for indicator C2 the mean difference of -2.445 with t= -24.239 at 95%CI= (-2.763, -2.346) of the significant at p<0.001. This reflects a 48% below the 100 percent standard as far as the conditions of the seats in a train.

Table 4-9: One-sample *t-Test* of customer's experience of service railway quality

Indicator	Mean	Std Deviation	t	df	P	Mean difference	95% CI of the Difference	
							Lower	Upper
CS2	2.464	1.139	-23.360	109	0.000	-2.536	-2.752	-2.321
CS3	2.300	1.080	-26.224	109	0.000	-2.700	-2.904	-2.496
CS4	2.555	1.089	-23.560	109	0.000	-2.445	-2.651	-2.240
CS5	2.727	1.226	-19.444	109	0.000	-2.273	-2.504	-2.041
C1	2.327	1.006	-27.876	109	0.000	-2.673	-2.863	-2.483
C2	2.445	1.105	-24.239	109	0.000	-2.555	-2.763	-2.346
C3	2.255	1.104	-26.080	109	0.000	-2.745	-2.954	-2.537
C4	2.400	1.060	-25.733	109	0.000	-2.600	-2.800	-2.400
A2	2.855	1.099	-20.473	109	0.000	-2.145	-2.353	-1.938
A3	3.373	1.124	-15.184	109	0.000	-1.627	-1.840	-1.415
A4	3.045	1.176	-17.430	109	0.000	-1.955	-2.177	-1.732
A5	3.209	1.142	-16.446	109	0.000	-1.791	-2.007	-1.575
S1	1.809	0.893	-37.462	109	0.000	-3.191	-3.360	-3.022
S2	2.564	1.208	-21.153	109	0.000	-2.436	-2.665	-2.208
S3	2.891	1.295	-17.086	109	0.000	-2.109	-2.354	-1.864
S4	1.973	1.113	-28.538	109	0.000	-3.027	-3.238	-2.817
R1	1.791	0.889	-37.850	109	0.000	-3.209	-3.377	-3.041
R2	2.118	1.123	-26.914	109	0.000	-2.882	-3.094	-2.670
R5	2.109	1.168	-25.960	109	0.000	-2.891	-3.112	-2.670
Af2	4.182	1.094	-7.847	109	0.000	-0.818	-1.025	-0.612
Af3	4.164	1.009	-8.690	109	0.000	-0.836	-1.027	-0.646
Af5	4.000	1.173	-8.941	109	0.000	-1.000	-1.222	-0.778

4.7.2.1 Reliability dimension

Reliability is characterized as the ability to perform the service offered with reliability and accuracy. Reliability means in its broadest sense: Does the railway organization fulfill its obligations about the provision of quality services? The level of customer experience on the provision of on-time train service (punctuality) and visible personnel security on trains was found to be the lowest. This implies that the railway service is unable to honour its timetable and there is a safety concern as there is no visible security in trains. If the service is not available when and where customers expect it, they will become dissatisfied and seek to stop using the train. For indicator R1 with mean difference = -3.209 with t=-37.850, df=109 at 95%CI= (-3.377, -3.041) significant p<0.001; this reflects the poor service quality by the railway organisation as it is 36% below the expected 100% performance on punctuality.

As regards reliability in the provision of on-time train service, Figure 4.8 below shows that 46 percent of passengers experienced poor quality of service in terms of punctuality while 1 percent experienced excellent passenger rail services in providing timely train service.

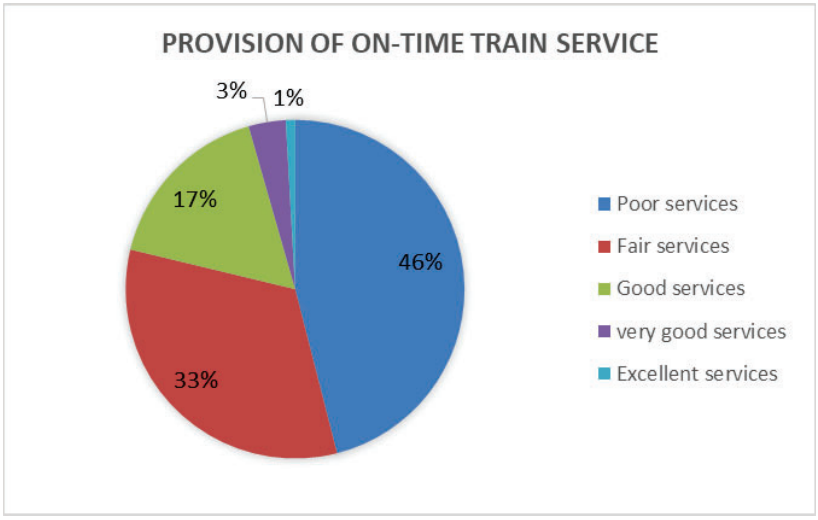

Figure 4.8: Passenger experience on provision of on-time train service (punctuality)

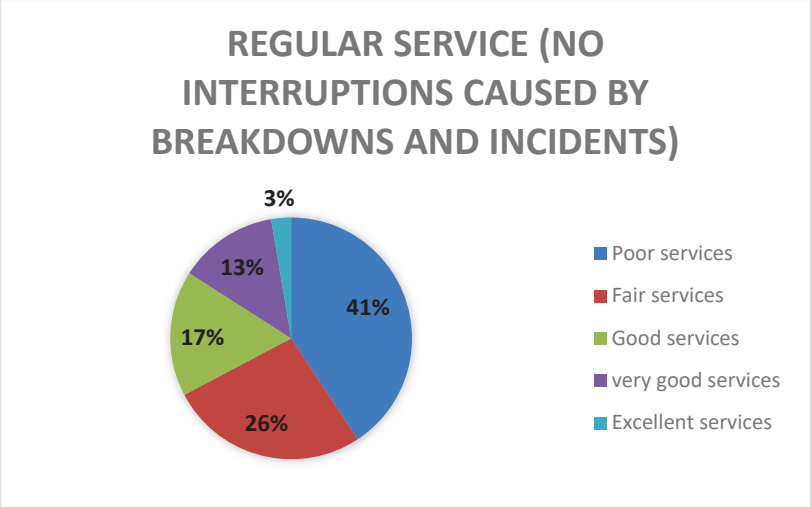

Figure 4.9: Passenger experience on regular train service with no breakdown and accidents

Figure 4.9 above indicates commuters' frustration with commuter rail as 41 percent of their passengers reported weak daily train services. The loss of output and revenue due to unexpected breakdowns can be managed by implementing successful maintenance programmes for the vital railway infrastructure network, according to Åhrén and Parida (2009).

4.7.2.2 Safety and security dimension

The quality of service experienced by commuters was indicated by the participants in Figure 4.10. It shows that they are dissatisfied with the visibility of the safety staff on the trains.

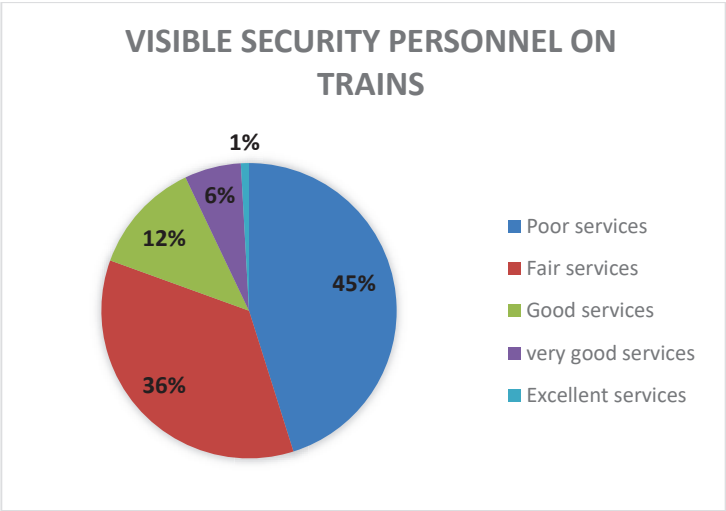

Figure 4.10: Level of customer experience on the visibility of security personnel on trains

Passengers of the commuter rail were also asked about their perceived level of safety in the area of platforms related to the availability of emergency controls and visible security personnel on the platforms. Safety on platforms is regarded as a prerequisite for considering a trip. If

potential passengers fear that a train trip is risky and dangerous, they can avoid it. Figure 4.11, in which passengers were questioned about their safety experience when waiting for their trains to move on platforms, indicates a similar response of disappointment to visible security in trains.

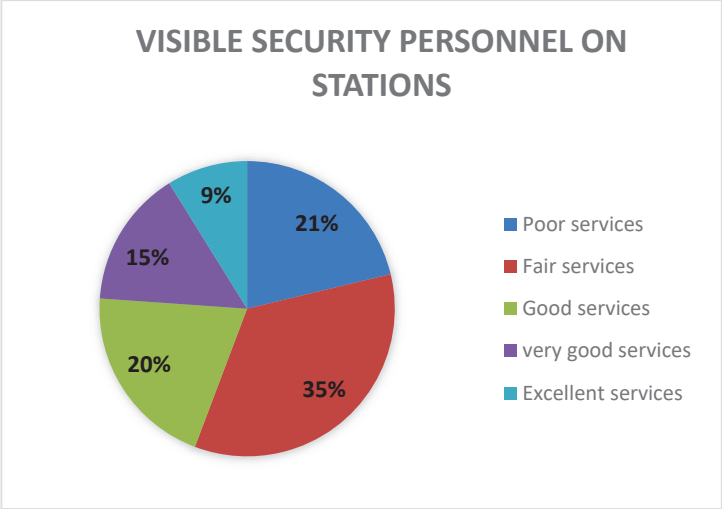

Figure 4.11: Level of customer experience on the visibility of security personnel on trains

4.7.2.3 Comfort dimension

The level of customer experience in terms of comfort was mostly perceived to have a fair level of quality at 47% and it was important in customer satisfaction, with the only exception of stability and comfort during the ride considered to be a factor to take action on. A passenger's comfort during the time s/he spends on a journey is evaluated through three sub-criteria, that is, cleanliness of inside the trains, noise level and vibration during the journey, and seating condition whilst inside the train.

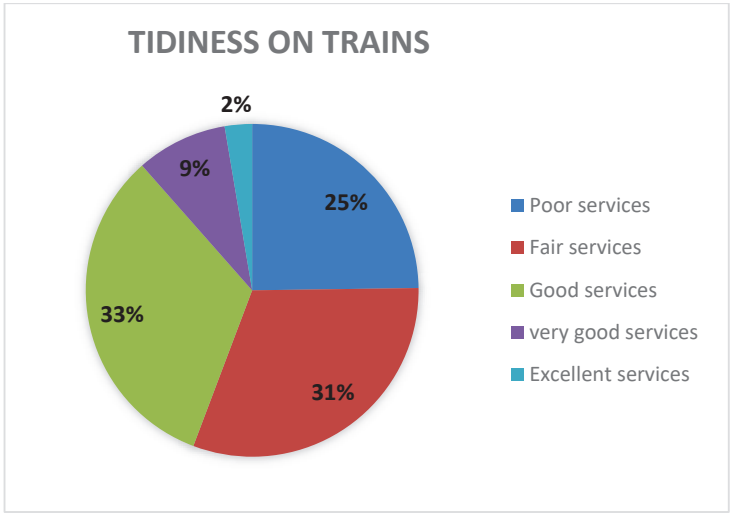

Figure 4.12: Level of customer experience on the tidiness of trains

Service frequency, on-time performance, travel speed, and vehicle tidiness are identified as the most effective attributes of satisfaction in the tendered regions (Celik *et al*., 2014). Cleanliness and hygiene on platforms are another significant finding (Ghosh *et al*., 2017).

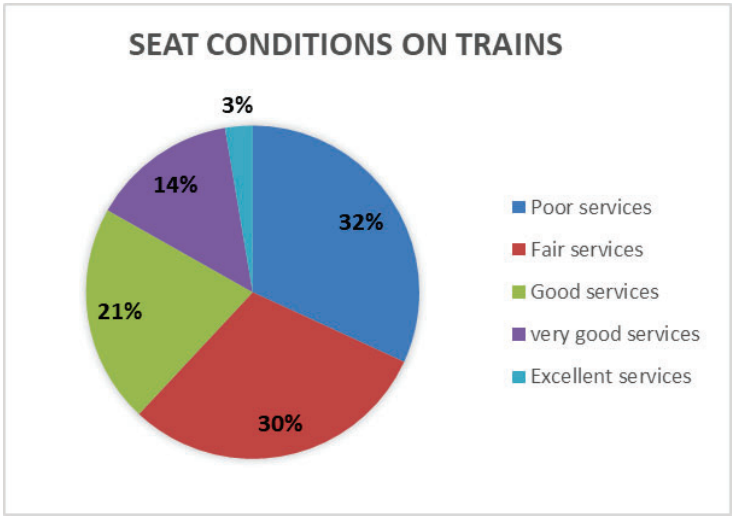

Figure 4.13: Level of customer experience on seat conditions of the trains

For the stability and comfort during the ride, indicator C3, the mean difference of -2.745 was found which implies that railway services provide a service which customers find 45% below the 100% standard. When customers were asked how they viewed the train's stability and comfort during the journey, they were not pleased. Figure 4.14 below indicates that in the indicator 28% of respondents received bad and fair service.

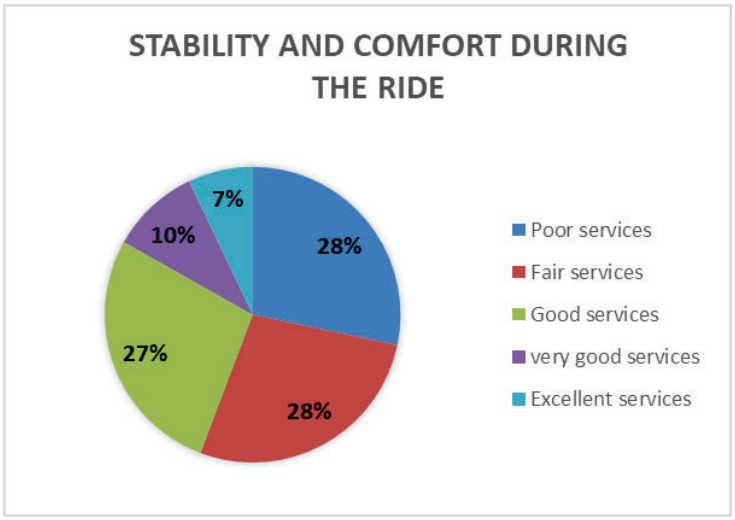

Figure 4.14: Level of customer experience on stability and comfort during the ride

4.7.2.4 Affordability, access and service coverage dimensions

Based on Table 4.9 two variables, Affordability and Access and service coverage were the only variables performing above 60%. Respondents were very happy with the affordability of the tickets at about 80% level of customer experience. Indicator AF2 showed mean difference of 0.818 with t=-7.847, df=109 at 95% CI= (-1.025, -0.612) significant p<0.001. This implies that railway service quality experience by customers is a mere 17% short of the 100% standard as far as the fare increase rate is concerned. Figure 4.15 shows that 54% of the respondents perceived the fare increase rate as being of excellent service to the commuters.

Figure 4.15: the level of customer experience on the rate on which ticket price increase

4.7.2.5 Customer services and professionalism dimension

The dimension of Customer Services and Professionalism refers to employee knowledge and courtesy, and their ability to inspire confidence and trust. Customer service is about more than just good manners on the part of employees, it is about creating friendly passenger relationships. This is an important feature in the world of public transportation as railway organization employees may view passengers as needy rather than as valued persons. Based on Table 4.9, for indicator CS2, the mean difference of -2.536 with t=-23.360, df=109 at 95%CI = (-2.752, -2.321) significant at p<0.001. This implies that the level of customer experience is about 51 percent below the 100 percent standard as far as staff behaviour at the stations is concerned. Out of the four indicators of the variable, Customer services, and professionalism, indicator CS3 was the lowest level of customer experience with a mean difference of -2700 t=-26.224, df=109 at 95%CI = (-2904, - 2496) significant at p<0.001. This means that the level of customer experience on CS3 is 46%. This implies that the ability of staff to handle customer problems is a concern. The overall level of customer experience of service quality on the variable, Customer service, and professionalism was found to be good at just 50% below the standard and expected service quality. Customer service improvements and professional provision could improve customer satisfaction. For example, second-priority actions such as increasing staff efficiency in customer attendance, improving customer service performance (e.g., offices, website, and telephone service), as well as providing up-to-date, accurate and reliable station information can be effective strategies (Machado-León *et al*., 2017:183).

4.7.3 Objective Three

To determine the areas that need most improvement in service quality offered by the railway transportation in South Africa.

This objective seeks to identify top priority areas for improving the quality of railway service in South Africa. From the results presented in Table 4.10, provision of on-time train service (36%); visibility of personnel security on trains (36%); display of safety signs at stations (39%); availability of information on train cancellations, delays, and platform changes (42%); and availability of information of train schedules at stations (42%) are the five least performing areas of railway service quality in SA. Therefore, they form the top five priority areas.

Table 4-10: Estimated improvement and performance in Service quality indicators

Code	Indicators	Current Performance Level (%)	Expected Improvement Level (%)
R1	Provision of on-time train service (punctuality)	36	64
S1	Visible personnel security on trains	36	64
S4	Safety signs at stations displayed to the public	39	61
R5	Availability of information on train cancellations, delays, and platform changes	42	58
R2	Availability of information on train schedules at stations	42	58
C3	Stability and comfort during the ride	45	55
CS3	The ability of staff to handle customer problems	46	54
C1	Tidiness on trains	47	53
C4	Availability of seats on trains	48	52
C2	Seat conditions on trains	49	51
CS2	Staff behaviour at stations	49	51
CS4	The interest of staff to serve and help customers	51	49
S2	Visible personnel security on stations	51	49
CS5	The professional approach by the staff	55	45
A2	Connection to substations/other transport terminals.	57	43
S3	Safety measure against crime on trains	58	42
A4	Access to ticket sales	61	39
A5	Accessibility of train stations to passengers in terms of proximity to malls, residential settlement, public offices	64	36
A3	Parking at the stations	67	33
Af5	Willingness to pay for service	80	20
Af3	Reasonable fare based on your earnings	83	17
Af2	Fare increase rate	84	16

4.8 Discussion of Findings

This chapter deals with the discussions of the findings of the study by appealing to the extant literature.

4.8.1 Determinants of Railway Service Quality

As it is discussed in the literature the quality of the services is becoming more demanding for the customers and it is one of the key factors that can contribute to making the railways more efficient. The quality of service can be measured in terms of customer perception, customer experience, customer expectation, customer satisfaction, and attitude to the customer. Therefore, to determine the determinants of service quality, 6 key determinants of Passenger Satisfaction on Service Quality were taken into account. Geetika and Nandan (2010) used factor analysis to identify the most important factors of customer satisfaction with quality

service mainly on platforms. Their findings revealed that five factors are considered important in determining railway platform satisfaction, i.e. refreshments, safety and security, basic facilities, information system, and service quality behavioural aspects. The six variables of RAILSERVQUAL were found to be the determinants of passenger satisfaction on service quality, i.e., Reliability, Safety and security, Comfort, Access and service coverage, Customer services and professionalism, and Affordability. The study conducted by Hundal and Kumar (2015), in Indian Railways, found that the basic amenities, safety & protection, punctuality, and employee behaviour towards passengers are the most important factors deciding passenger satisfaction. They also considered reliability and assurance to be the dimensions affecting the good services. Based on factor analysis, a model of passenger satisfaction on railway service quality is found in Figure 4.16.

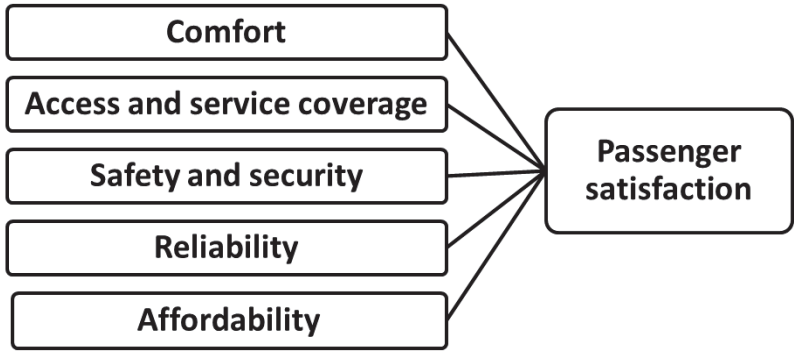

Figure 4.16: Research model for determinants of passenger satisfaction on Railway service quality

4.8.2 The Overall Service Quality

The level of customer experience on the provision of on-time train service (punctuality) and visible personnel security on trains was found to be the lowest. This implies that the railway service is unable to keep to its timetable and there is a safety concern as there is no visible security in trains. In terms of reliability, all indicators exhibited poor customer experience on the rail services except the provision of on-time train service, suggesting that the railways did not resolve the reliability issues of the commuters effectively. Rail passengers in particular complain that the trains are not punctual and seem to break down too often. So, enhancing the quality of a customer journey is about time well saved and time well spent (van Hagen & van Oort, 2019).

The lack of punctuality harms the passengers because if the trains are late, they will not arrive at their destination on time. Therefore, it can be deduced that they are frequently late for work, which then affects the relationship between them and their employers because they seem to

be lacking commitment and are deemed unreliable. Also, they arrive late at home, which affects family time. In addressing issues of reliability Parasuraman, Zeithaml and Berry (1991) advised managers to set reliability standards and teach their subordinates the why and how of reliability in training sessions. They further suggest forming reliability teams to evaluate specific services for ways of reducing failures, measuring failure rates, and rewarding failure-free services (Parasuraman *et al*., 1991). Two variables, Affordability and Access and service coverage were the only variables to be found performing above 60%. Respondents were very happy with the affordability of the tickets at about 80% level of customer experience. However, the overall level of customer experience on the service quality provided by the railway was found to be significantly below customers' expectations.

4.8.3 Top Priority Areas of Railway Service Quality

It can be deduced from the results that three variables which require attention from the railway managers are reliability, safety, and comfort. From a reliability perspective, the worst-performing areas were the provision of on-time trains. Railway service appears to be struggling with punctuality. In a study conducted by Heyns and Luke (2018) in Metrorail in Gauteng, they found key service deficiencies for Metrorail in terms of punctuality and adherence to train schedules, security given on both trains and stations, breakdown of trains, insufficient running times, and train cleanliness.

Railway passengers have highlighted their safety issues on trains from a safety perspective, as there is no obvious protection during a journey. The other security concern with the commuters was the availability of safety signs at stations. The most significant characteristic is the sense of protection against crime and antisocial behaviour, an aspect that is closely correlated with reducing public riding. Gupta and Datta (2016) concluded that greater passenger satisfaction can be achieved through an effective and noticeable protection network that must be maintained at all travel hours. According to Barabino *et al*. (2012), the ability to deliver the promised service professionally, as well as inspiring feelings of security and confidence among its users, could therefore be deemed of utmost importance in promoting a more positive and appealing public transport image.

Seating conditions on trains and comfort during the journey are determined as qualities that must be enhanced. Comfort during the journey is related to noise and vibration. The primary subjects in minimizing noise and vibration are the preventive maintenance of the trains and railway lines. Celik *et al*. (2014) note that the regular and continuous inspection of railway lines is one of the preventive maintenance activities that should be applied and further concluded that noise and vibration reduction would provide the passengers with a relaxing ride.

The other lowest-performing indicators which are of concern to the commuters were availability of information on train cancellations, delays and platform changes, and availability of information of train schedules at stations. Although the indicators represent the variable, reliability, they allude more to communication which should be targeted at railway users. This is in agreement with Maruvada and Bellamkonda (2012) who note that proper communication between officials and passengers themselves could streamline the flow of passengers and make better patronage easier. Figure 4.17 also demonstrated the benefits gained by enhancing communication between a traveller and a transportation organisation.

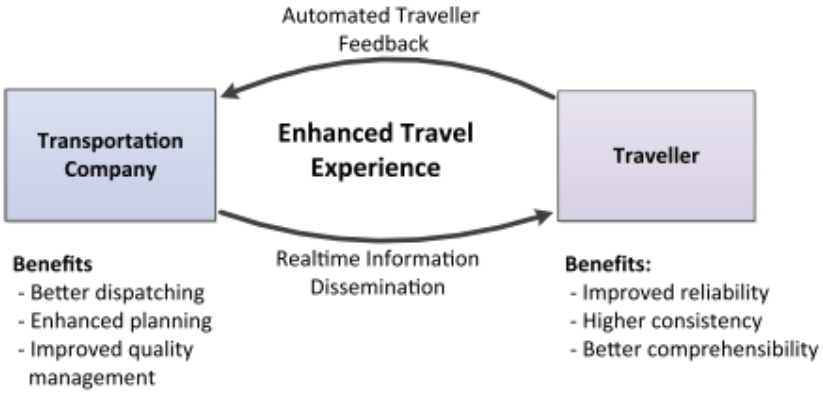

Figure 4.17: Benefits derived from improved contact/communication

(Source: Stelzer *et al*., 2016)

Stelzer *et al*. (2016) suggest that informing commuters about train movements or schedule adjustments would minimize confusion, improve continuity, and make them more understandable. This gives passengers the sense of being well-informed and service efficiency increases as a result.

The study also noted the top 5 areas in which the railway organisation is performing best, that is, fare increase rate (84%), reasonable fare based on your earnings (83%), willingness to pay for service (80%), parking at stations (67%) and accessibility of train stations to passengers in terms of proximity to malls, residential settlement, and public offices (64%). Due to the comparatively better-perceived level of quality such as fare increase rate, willingness to pay for the service and reasonable fare based on customer earnings, the affordability of the service can be considered a "keep up the good work" factor. Accessibility of train stations to passengers in terms of proximity to malls, residential settlement, and public offices including parking at the stations was also perceived to have a good level of quality in regards to the variable, “Access and service coverage”.

4.9 Conclusion

Chapter presented the main results and discussion of the findings based on the analyses of data collected via the questionnaire and the theoretical constructs found in the RAILSERVQUAL framework. It also highlighted the methods that were used to collect the survey data, namely, the questionnaire and direct observation. Factor analysis resulted in grouping of the items into six distinct dimensions; Customer service and professionalism, Comfort, Access and service coverage, Reliability, Affordability, and Safety. The reliability and validity of the constructs measure very highly and hence the findings are reliable and the instrument measured accurately. Based on these key findings, the next chapter will provide an overall conclusion and useful recommendations for the railway organisation. Moreover, a direction for future research will be pointed out.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

In the previous chapter data analysis, interpretation, and findings were discussed. This study aimed to measure the quality of service delivered by the railway industry, using the modified SERVQUAL approach (RAILSERVQUAL), in South Africa for passenger rail to monitor and improve its services and increase competitiveness among the transport industry. Hence, the primary objective of this study was to determine the level of customer experience on the service quality provided by the railway organisation. This chapter concludes and suggests certain recommendations based on the research findings. This chapter starts by illustrating the scale of the previous chapter by aligning the important aspect of each chapter. Following this, the chapter then expands by describing what was encountered as limitations and addressing the research questions. The later section concludes and puts forward recommendations as well as possible further areas of study.

5.2 Key findings

The key findings were determined through the achievement of the research questions highlighted below:

5.2.1 Addressing research questions

This section addressed the findings of the main questions of the research to clarify the study.

The research questions are revisited as the following:

- What are the determinants of passenger satisfaction of service quality?
- What is the level of customer experience of the service quality provided by the commuter railway organisation?
- What are the areas that need the most improvement in service quality offered by the commuter railway transportation system in South Africa?

The following sections conclude the study findings in line with the research questions.

5.2.2 The determinants of passenger satisfaction of service quality

All extracted indicators (for each construct) were statistically significant at $p<0.001$. According to Khuong and Dai (2016), the KMO index ranges from 0 to 1 and the minimum value suggested for satisfactory factor analysis is 0.4, which means that the data are appropriate for

further analysis. The six variables of RAILSERVQUAL were found to be the determinants of passenger satisfaction on service quality, i.e., Reliability, Safety and security, Comfort, Access and service coverage, Customer services and professionalism, and Affordability.

5.2.2.1 The level of customer experience on the service quality

The level of customer experience on the provision of on-time train service (punctuality) and visible personnel security on trains was found to be the lowest. This implies that the railway service is unable to keep to its timetable and there is a safety concern as there is no visible security in trains. Two variables, Affordability and Access and service coverage were the only variables to be found performing above 60%. Respondents were very happy with the affordability of the tickets at about 80% level of customer experience. However, the overall level of customer experience on the service quality provided by the railway was found to be significantly below customers' expectations.

5.2.2.2 The areas in service quality improvement

For the railway organisation to improve the overall customer expectation they should focus on the worst-performing areas, that is, provision of on-time train service; visibility of personnel security on trains; display of safety signs at stations; availability of information on train cancellations, delays, and platform changes; and availability of information of train schedules at stations. It was noted that the railway organisation had to put strategies in place to address three variables which were found to be below customer expectations, namely, reliability, safety, and comfort. The study also highlighted areas in which the railway organisation is the best performing. These areas are aligned with the 'keep up the good work' factor; affordability and Access and service coverage.

5.2.3 Overall key findings

Overall, the empirical results from this study indicate that passengers perceived that the rail transport network, the Western Cape's main public transport sector, is not providing high-quality services to meet their expectations. Through systematically evaluating and defining the determinants of service quality through using a customer survey and assessing the degree of customer experiences of using railway facilities, the empirical investigation study was able to achieve its research goals. Priyadharshini and Selladurai (2016), advised that rail and other organizations should continue to receive at least three to six months of regular feedback from passengers on their trains. In that case, the railway will have to put strategies in place to improve the quality of the service. The network services and security have to be strengthened in both trains and railway stations. Once the basic facilities are in order, customers will be satisfied (van Hagen & van Oort, 2019).

5.3 Study limitations

Since the dataset generated and used for this study is self-reported, there are some inherent limitations such as recall bias, among others. This study's limitations are largely related to the short period in which the research was conducted. Findings may differ if the study is conducted over a longer duration.

A further limitation lies in the respondents' composition. Non-users are not included and their view of rail transport is also not known. The impression of non-users is very important, as one of the goals of enhancing the quality of service is to attract new passengers.

5.4 Recommendation for practice and future study

From a strategic viewpoint, these results provide specific guidance for future initiatives aimed at improving railway organisations' service rates. It is evident from the study that to better match their service offerings with customer preferences, Metrorail needs to concentrate its quality enhancement efforts on the basic questions of reliability and health. The following recommendations might assist the railway organisation when managing the service quality:

The management of public transport service providers should emphasize marketing and operational strategy that can improve passengers' perceived value, perceived usefulness, and the image of the public transport service (Sumaedi et al., 2016).

To ensure continuous improvement, electronic survey pads hosting these quality indicators should be installed around outlets accessible to customers to collect similar datasets for analysis. This will enable railway companies to constantly determine the top service quality priorities each month or quarter.

The above recommendations can lead to research projects which can be informative for railway management but also to add to the body of literature in terms of among others, operational and marketing concerning railway management practices to improve customer satisfaction.

5.5 Conclusion

The researcher has summarized all of the preceding chapters in this chapter (chapter six), addressed the main findings, and provided some recommendations. The results of this research offer some operational consequences in assessing the satisfaction of passengers by the managers of the public transport service providers. The results indicate that suppliers of

public transport services should control the subjective experience of their passengers concerning the reliability, comfort, and protection of the train services. Therefore, commuter rail service provider management should emphasize an operational strategy that may improve passenger satisfaction in terms of reliability, comfort, and safety. Commuter rail managers may also categorize their passengers in each portion of the network, based on their satisfaction. This is because passenger needs in the North section cannot be the same as passengers in the Southern section. Therefore, it is appropriate for the commuter rail to recognize these differences instead of focusing on a certain aspect when that area's passengers do not find it relevant. The study's shortcomings were illustrated, and suggestions were made for future studies.

REFERENCES

Adriaan Kruger (2019) *Why Ramaphosa got stuck on a train*, *Money Web*. Available at: https://www.moneyweb.co.za/news/south-africa/why-ramaphosa-got-stuck-on-a-train/ (Accessed: 6 February 2020).

Alzaydi, Z. M. *et al.* (2018) 'A Review of Service Quality and Service Delivery: Towards A Customer Co-Production and Customer-Integration Approach', *Business Process Management Journal*.

Awasthi, A. *et al.* (2011) 'A hybrid approach based on SERVQUAL and fuzzy TOPSIS for evaluating transportation service quality', *Computers and Industrial Engineering*. Elsevier Ltd, 61(3), pp. 637–646. doi: 10.1016/j.cie.2011.04.019.

Aydin, N., Celik, E. and Gumus, A. T. (2015) 'A hierarchical customer satisfaction framework for evaluating rail transit systems of Istanbul', *Transportation Research Part A: Policy and Practice*. Elsevier Ltd, 77, pp. 61–81. doi: 10.1016/j.tra.2015.03.029.

Banu, I. P. (2018) 'Determinants of Passenger Satisfaction on Service Quality in Southern Railways with Reference to Salem Division', *International Journal of EngineeringTechnology Science and Research*, 5(1), p. 389.

Barabino, B., Deiana, E. and Tilocca, P. (2012) 'Measuring service quality in urban bus transport: A modified SERVQUAL approach', *International Journal of Quality and Service Sciences*, 4(3), pp. 238–252. doi: 10.1108/17566691211269567.

Beck, A. *et al.* (2013) 'Railway Efficiency – An Overview and a Look at Opportunities for Improvement', *The International Transport Forum's Discussion Paper Series*. International Transport Forum, Paris. Available at: http://dx.doi.org/10.1787/5k46bj46ptkb-en%0AThis Version is available at: http://hdl.handle.net/10419/97105%0AStandard-Nutzungsbedingungen:%0ADie Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und ko.

Bhawna and Gobind (2015) 'Research Methodology and Communication', *IOSR Journal of Research & Method in Education*, 5(3), pp. 48–51. doi: 10.9790/7388-05344851.

Caruana, A., Money, A. H. and Berthon, P. R. (2001) 'Service quality and satisfaction – the moderating role of value', *Measuring Business Excellence*, 5(1), p. 25. doi: 10.1108/mbe.2001.26705aaf.015.

Cavana, R. Y., Corbett, L. M. and lo, Y. L. G. (2007) 'Developing zones of tolerance for managing passenger rail service quality', *International Journal of Quality & Reliability Management*, 24(1), pp. 7–31. doi: 10.1108/02656710710720303.

Celik, E., Aydin, N. and Gumus, A. T. (2014) 'A multiattribute customer satisfaction evaluation approach for rail transit network: A real case study for Istanbul, Turkey', *Transport Policy*. Elsevier, 36, pp. 283–293. doi: 10.1016/j.tranpol.2014.09.005.

De-Winter, J. C. F., Dodou, D. and Wieringa, P. A. (2009) 'Exploratory Factor Analysis With Small Sample Sizes', *Multivariate Behavioral Research*, 44, pp. 147–181. doi: 10.1080/00273170902794206.

Eboli, L., Forciniti, C. and Mazzulla, G. (2018) 'Spatial variation of the perceived transit service quality at rail stations', *Transportation Research Part A: Policy and Practice*. Elsevier, 114(February), pp. 67–83. doi: 10.1016/j.tra.2018.01.032.

Eboli, L. and Mazzulla, G. (2012) 'Structural Equation Modelling for Analysing Passengers'

Perceptions about Railway Services', *Procedia - Social and Behavioral Sciences*, 54, pp. 96–106. doi: 10.1016/j.sbspro.2012.09.729.

Eboli, L. and Mazzulla, G. (2015) 'Relationships between rail passengers' satisfaction and service quality: a framework for identifying key service factors', *Public Transport*. Springer Berlin Heidelberg, 7(2), pp. 185–201. doi: 10.1007/s12469-014-0096-x.

Esmaeili, A. A., Manesh, M. A. and Golshan, E. (2013) 'Service Quality , Customer Satisfaction and Customer Loyaltyin RAJA Rail Transportation Company', 5(3), pp. 347–352.

Etikan, I. (2016) 'Comparison of Convenience Sampling and Purposive Sampling', *American Journal of Theoretical and Applied Statistics*, 5(1), p. 1. doi: 10.11648/j.ajtas.20160501.11.

Geetika and Nandan, S. (2010) 'Determinants of Customer Satisfaction on Service Quality: A Study of Railway Platforms in India', *Journal of Public Transportation*, 13(1), pp. 97–113. doi: 10.5038/2375-0901.13.1.6.

George, S. A. and Rangaraj, N. (2008) 'A performance benchmarking study of Indian Railway zones', *Benchmarking*, 15(5), pp. 599–617. doi: 10.1108/14635770810903178.

Ghosh, P., Ojha, M. K. and Geetika (2017) 'Determining passenger satisfaction out of platform-based amenities: A study of Kanpur Central Railway Station', *Transport Policy*. Elsevier Ltd, 60(August), pp. 108–118. doi: 10.1016/j.tranpol.2017.09.007.

Ghotbabadi, A. R., Feiz, S. and Baharun, R. (2015) 'Service Quality Measurements: A Review', *International Journal of Academic Research in Business and Social Sciences*, 5(2), pp. 267–286. doi: 10.6007/ijarbss/v5-i2/1484.

Greener, S. (2008) *Business Research Methods.[e-book] Dr*, *Sue Greener and Ventus Publishing ApS. Available through:< http://www. bookbon. com>[Accessed 9 May 2011]*. Available at: http://gent.uab.cat/diego_prior/sites/gent.uab.cat.diego_prior/files/02_e_01_introduction-to-research-methods.pdf.

Guirao, B., García-Pastor, A. and López-Lambas, M. E. (2016) 'The importance of service quality attributes in public transportation: Narrowing the gap between scientific research and practitioners' needs', *Transport Policy*. Elsevier, 49, pp. 68–77. doi: 10.1016/j.tranpol.2016.04.003.

Gupta, S. and Datta, R. (2010) 'A comparative study of two different techniques for evaluating service quality', *Asian Journal on Quality*, 11(3), pp. 223–235. doi: 10.1108/15982681011093989.

Gupta, S. and Datta, R. (2016) *A methodology for component level improvement of passenger facilities at the Howrah railway station in India*, *TQM Journal*. doi: 10.1108/TQM-03-2013-0037.

van Hagen, M. and van Oort, N. (2019) 'Improving Railway Passengers Experience: Two Perspectives', *Journal of Traffic and Transportation Engineering*, 7(3). doi: 10.17265/2328-2142/2019.03.001.

Haron, S., Nasir, M. S. B. and Mohamad, S. S. (2016) 'Rail transport service performance indicators in Klang Valley', *AIP Conference Proceedings*, 1774(October 2016). doi: 10.1063/1.4965078.

Hartono, S. S. (2019) 'The effect of expected and perceived service quality on customer satisfaction: Optical retail in Indonesia.', *International Journal of Business and Administrative Studies*, 5(2), pp. 186–198.

Henseler, J., Ringle, C. M. and Sarstedt, M. (2014) 'A new criterion for assessing discriminant validity in variance-based structural equation modeling', *Journal of the Academy of Marketing Science*, 43(1), pp. 115–135. doi: 10.1007/s11747-014-0403-8.

Heyns, G. J. and Luke, R. (2018) 'Rail Commuter Service Quality in South Africa : Results From a Longitudinal Study', (July).

Hooper, D., Coughlan, J. and Mullen, M. (2008) 'Structural Equation Modelling: Guidelines for Determining Model Fit', *The Electronic Journal of Business Research Methods*, 6(1), pp. 53–60.

Horsu, E. N. and Yeboah, S. T. (2015) 'Influence of Service Quality on Customer Satisfaction: A Study of Minicab Taxi Services in Cape Coast, Ghana', *International Journal of Economics, Commerce and Management*, III(5), pp. 1451–1464. Available at: http://ijecm.co.uk/wp-content/uploads/2015/05/3595.pdf.

Hult, G. T. M. *et al.* (2017) 'Do managers know what their customers think and why?', *Journal of the Academy of Marketing Science*, 45(1), pp. 37–54.

Hundal, B. S. and Kumar, V. (2015) 'Assessing the service quality of Northern Railway by using SERVQUAL model', *Pacific Business Review International*, 8(2), pp. 82–88. Available at: www.pbr.co.in.

Isikli, E. *et al.* (2017) 'Identifying key factors of rail transit service quality: An empirical analysis for Istanbul', *Journal of Public Transportation*, 20(1), pp. 63–90. doi: 10.5038/2375-0901.20.1.4.

ISO (2015) 'ISO 9000:2015, Quality Management Systems – Fundamentals and Vocabulary'.

Khathutshelo, E. M. and Mudzanani, E. T. (2019) 'Analysing Commuters' Perceptions of Service Quality on A PUTCO Bus Route in the City Of Tshwane.', *African Journal of Business and Economic Research*, 14(2), pp. 149–165. doi: 10.31920/1750-4562/2019/14n2a8.

Khorshidi, H. A., Nikfalazar, S. and Gunawan, I. (2016) 'Statistical process control application on service quality using SERVQUAL and QFD with a case study in trains' services', *The TQM Journal*, 28(2), pp. 195–215. Available at: https://doi-org.libproxy.cput.ac.za/10.1108/TQM-02-2014-0026.

Khuong, M. N. and Dai, N. Q. (2016) 'The Factors Affecting Customer Satisfaction and Customer Loyalty — A Study of Local Taxi Companies in Ho Chi Minh City, Vietnam', *International Journal of Innovation, Management and Technology*, 7(5), pp. 228–233. doi: 10.18178/ijimt.2016.7.5.678.

Kline, R. B. (2015) *Principles and practice of structural equation modeling*. Guilford publications.

Kothari, C. (2004) *Research Methodology Methods and Techniques*. Second Rev. India: New Age International (P) Ltd.

Krishnamani, R. (2015) 'Service quality in Banking sector in India - A Theoretical Framework', *Shanlax International Journal of Management*, 3(2), pp. 70–76.

Kuo, C.-W. and Tang, M.-L. (2011) 'Survey and empirical evaluation of nonhomogeneous arrival process models with taxi data', *Journal of Advanced Transportation*, 47(June 2010), pp. 512–525. doi: 10.1002/atr.

Lwesya, F. and Jaffu, R. (2017) 'Customer service quality management in public transport: The case of rail transport in Tanzania', *International Review*, (3–4), pp. 102–117. doi:

10.5937/intrev1704102l.

Machado-León, J. L. *et al.* (2017) 'Railway transit services in Algiers: priority improvement actions based on users perceptions', *Transport Policy*. Elsevier, 53(September 2016), pp. 175–185. doi: 10.1016/j.tranpol.2016.10.004.

Makovsek, D., Benezech, V. and Perkins, S. (2015) *Efficiency in Railway Operations and Infrastructure Management*. 12. Paris.

Malhotra, N. K. and Dash, S. (2011) *Marketing Research an Applied Orientation*. London: Pearson Publishing.

Maluleke, K. (2013) 'Instilling safety culture in the passenger rail transport industry within the South African context', *Journal of Transport and Supply Chain Management*, 7(1), pp. 6–11. doi: 10.4102/jtscm.v7i1.84.

Marczyk, G., DeMatteo, D. and Festinger, D. (2005) *Essentials of Research Design & Methodology*.

Maruvada, D. P. and Bellamkonda, R. S. (2010) 'Analyzing the Passenger Service Quality of the Indian Railways using Railqual: Examining the applicability of Fuzzy Logic', *International journal of innovation, management and technology*, 1(5), p. 478.

Maruvada, D. P. and Bellamkonda, R. S. (2012) 'The Effects of Individual Dimensions of Railway Service Quality: Findings from Indian Railway Passenger Services through Developing RAILQUAL', *International Journal of Innovation, Management and Technology*, 3(1), pp. 42–45.

Miranda, S., Tavares, P. and Queiró, R. (2018) 'Perceived service quality and customer satisfaction: A fuzzy set QCA approach in the railway sector', *Journal of Business Research*. Elsevier, 89(July 2017), pp. 371–377. doi: 10.1016/j.jbusres.2017.12.040.

Monsuur, F. *et al.* (2017) 'Impact of train and station types on perceived quality of rail service', *Transportation Research Record*, 2648(1), pp. 51–59. doi: 10.3141/2648-06.

Morrison, C. L. J. (2004) 'Measuring service quality', *International Journal of Market Research*, 46(3), pp. 34–39.

Moss, S. (2009) *Fit indices for structural equation modeling.*

Mouton, J. (2001) *How to succed in your Master's & Doctoral Studies*. First Edit. Pretoria: Van Schaik Publishers.

Pal, R. (2012) 'A study on customer satisfaction in airlines industry', 119(10), pp. 1–33. Available at: https://rajatpal43.files.wordpress.com/2013/03/customer-satisfaction.docx.

Parasuraman, A., Zeithaml, V. A. and Berry, L. L. (1985) 'A Conceptual Model Service Its Quality and Implications for Future Research', *Research Paper*, 49(4), pp. 41–50. doi: 10.1016/S0148-2963(99)00084-3.

Parasuraman, A., Zeithaml, V. and Berry, L. (1991) 'Understanding Customer Expectations of Service Understanding Customer Expectations of Service Parasuraman , A .; Berry , Leonard L .; Zeithaml , Valarie A .', *Sloan Management Review*, 32(3), p. 39.

Passenger Rail Agency of South Africa (2019a) *Annual report 2018/19*. Available at: www.prasa.com › Annual Reports › Prasa Annual Report 2018-19.

Passenger Rail Agency of South Africa (2019b) *Annual report 2018/19*.

Pearson, R. H. and Mundform, D. J. (2010) 'Recommended Sample Size for Conducting Exploratory Factor Analysis on Dichotomous Data', *Journal of Modern Applied Statistical Methods*, 9(2), pp. 359–368. doi: 10.22237/jmasm/1288584240.

Prasad, M. D. and Shekhar, B. R. (2010) 'Impact of Service Quality Management (SQM) Practices on Indian Railways - A Study of South Central Railways', *International Journal of Business and Management*, 5(9), pp. 139–146. doi: 10.5539/ijbm.v5n9p139.

Prentkovskis, O. *et al.* (2018) 'A new methodology for improving service quality measurement: Delphi-FUCOM-SERVQUAL model', *Symmetry*, 10(12). doi: 10.3390/sym10120757.

Priyadharshini, J. and Selladurai, M. (2016) 'Service Quality and Passengers Satisfaction of Southern Railways by ServQual Model', *International Journal of Trend in Research and Development*, 3(6), pp. 3–6. Available at: www.ijtrd.com.

Putra, K. E. and Sitanggang, J. M. (2016) 'The Effect of Public Transport Services on Quality of Life in Medan City', *Procedia - Social and Behavioral Sciences*. Elsevier B.V., 234, pp. 383–389. doi: 10.1016/j.sbspro.2016.10.255.

Rahimi, R. and Kozak, M. (2017) 'Impact of customer relationship management on customer satisfaction: The case of a budget hotel chain', *Journal of Travel & Tourism Marketing*, 34(1), pp. 40–51.

Ranjan, R., Chatterjee, P. and Chakraborty, S. (2016) 'Performance evaluation of Indian Railway zones using DEMATEL and VIKOR methods', *Benchmarking*, 23(1), pp. 78–95. doi: 10.1108/BIJ-09-2014-0088.

Rozaq, F. and Istiantara, D. T. (2018) 'The Customer Service Quality of Railway Station in Yogyakarta', *IOP Conference Series: Materials Science and Engineering*, 407(1). doi: 10.1088/1757-899X/407/1/012037.

Saunders, M., Lewis, P. and Adrian, T. (2016) *Research Methods for Business Students*.

Schulze, S. (2003) 'Views on the combination of quantitative and qualitative research approaches', *Zitteliana*, 19(8), pp. 159–170.

Shainesh, G. and Mathur, M. (2000) 'Service Quality Measurement: The Case of Railway Freight Services', *Vikalpa*, 25(3), pp. 15–22. doi: 10.1177/0256090920000303.

Sharma, M. G. *et al.* (2016) 'Benchmarking of rail transport service performance through DEA for Indian railways', *International Journal of Logistics Management*, 27(3), pp. 629–649. doi: 10.1108/IJLM-08-2014-0122.

Siami, S. and Gorji, M. (2012) 'The measurement of service quality by using SERVQUAL and quality gap model', *Indian Journal of Science and Technology*, 5(1), pp. 1956–1960.

Sposito, V. A., Hand, M. L. and Skarpness, B. (1983) 'On the efficiency of using the sample kurtosis in selecting optimal lpestimators', *Communications in Statistics-simulation and Computation*, 12(3), pp. 265–272.

Statistics SA (2020) *Land transport (Preliminary)*. Pretoria. Available at: http://www.statssa.gov.za/publications/P7162/P7162November2019.pdf.

Stelzer, A. *et al.* (2016) 'Improving service quality in public transportation systems using automated customer feedback', *Transportation Research Part E: Logistics and Transportation Review*. Elsevier Ltd, 89, pp. 259–271. doi: 10.1016/j.tre.2015.05.010.

Sumaedi, S. *et al.* (2016) 'Factors influencing public transport passengers' satisfaction: a new

model', *Management of Environmental Quality: An International Journal*, 27(5), pp. 585–597. doi: 10.1108/MEQ-05-2015-0084.

Taghavi, M. *et al.* (2020) 'Two-stage game theoretical framework for iaas market share dynamics', *Future Generation Computer Systems*, 10(2), pp. 173–189.

Teffo, M., Earl, A. and Zuidgeest, M. H. P. (2019) 'Understanding public transport needs in Cape Town's informal settlements: A Best-Worst-Scaling approach', *Journal of the South African Institution of Civil Engineering*, 61(2), pp. 39–50. doi: 10.17159/2309-8775/2019/v61n2a4.

Thompson, L. and Bente, H. (2014) 'What is Rail Efficiency and How Can it Be Changed?', *International Transport Forum*, 23(December), pp. 1–43.

Tronvoll, B. *et al.* (2011) 'Paradigms in service research', *Journal of Service Management*, 22(5), pp. 560–585. doi: 10.1108/09564231111174951.

Ugo, P. D. (2014) 'The bus rapid transit system: A service quality dimension of commuter uptake in Cape Town, South Africa', *Journal of Transport and Supply Chain Management*, 8(1), pp. 1–10. doi: 10.4102/jtscm.v8i1.145.

Vanniarajan, T. and Stephen, A. (2008) 'Railqual and Passengers Satisfaction: An Empirical Study in Southern Railways', *Asia Pacific Business Review*, 4(1), pp. 64–75. Available at: https://doi.org/10.1177/097324700800400107.

Vilakazi, A. M. and Govender, K. K. (2014) 'Exploring public bus service quality in South Africa: A structural equation modelling approach', *Journal of Transport and Supply Chain Management*, 8(1), pp. 1–10. doi: 10.4102/jtscm.v8i1.127.

Wang, Y., Zhang, Z. and Sun, H. (2018) 'Assessing Customer Satisfaction of Urban Rail Transit Network in Tianjin Based on Intuitionistic Fuzzy Group Decision Model', *Discrete Dynamics in Nature and Society*, 2018(1986). doi: 10.1155/2018/4205136.

Watson, R. (2015) *Quantitative research*, *Nursing standard (Royal College of Nursing (Great Britain) : 1987)*. doi: 10.7748/ns.29.31.44.e8681.

Wisniewski, M. (2001) 'Using SERVQUAL to assess customer satisfaction with public sector services', *Managing Service Quality: An International Journal*, 11(6), pp. 380–388. doi: 10.1108/EUM0000000006279.

Yuda Bakti, I. G. M. and Sumaedi, S. (2015) 'Quality paper P-TRANSQUAL: A service quality model of public land transport services', *International Journal of Quality and Reliability Management*, 32(6), pp. 534–558. doi: 10.1108/IJQRM-06-2013-0094.

Zeybek, H. (2018) 'Service Quality and its Importance for Rail Freight Customers', *International Journal of Transportation Engineering*, 7(2), p. 2019.

APPENDIX A: REQUEST FOR DATA COLLECTION

Cape Peninsula University of Technology

GRADUATE CENTRE FOR MANAGEMENT
Faculty of Business | Commerce Building
Ground Floor | Cape Town Campus

To whom it may concern

Re: Introductory letter for the collection of research data

Zuko Lukrozo is registered for the **MTech: Business Information Systems** degree at Cape Peninsula University of Technology (CPUT) with student number **213094991**. The thesis is titled *"Factors affecting operational performance within a railway organisation in South Africa)"* with the aim to analyse the critical factors that affect operational performance within a railway organisation in South Africa. The main supervisor for this research is Dr. Bingwen Yan.

In order to meet the requirements of the University's Higher Degrees Committee (HDC) the student must get consent to collect data from organizations which they have identified as potential sources of data. In this case the student will interview sixteen (16) of your staff at convenient times to gather relevant data. These would be scheduled with you to avoid disruption your operations.

If you agree to this, you are requested to complete the attached form (an electronic version will be made available to you if you so desire) and print it on your organization's letterhead.

For further clarification on this matter please contact either the supervisor(s) identified above, or the Departmental Research Committee Secretary at 021 460 3833.

Regards

Dr. Michael Twum-Darko (UCT)

Postgraduate Research
Graduate Centre for Management
Faculty of Business and management Sciences
*Date: **2 April 2019***

APPENDIX B : LETTER OF CONSENT FROM THE INSTITUTION

prasa
PASSENGER RAIL AGENCY OF SOUTH AFRICA

PRASA HOUSE
1040 Burnett Street
Hatfield
Pretoria

Private Bag X101
Braamfontein, 2017
T: +27 12 748 7000

www.prasa.com

Date: 03 April 2019

I **Richard Walker**, in my capacity as Regional Manager at **Prasa/Metrorail (Western Cape Region)** give consent in principle to allow **Zuko Lukrozo**, a student at the Cape Peninsula University of Technology, to collect data in this company as part of his Master of Technology research. The student has explained to me the nature of his research and the nature of the data to be collected.

This consent in no way commits any individual staff member to participate in the research, and it is expected that the student will get explicit consent from any participants. I reserve the right to withdraw this permission at some future time.

In addition, the company's name may or may not be used as indicated below. (Tick as appropriate).

	Thesis	Conference paper	Journal article	Research poster
Yes				
No				

Richard Walker
Regional Manager (Prasa/Metrorail Western Cape Region)

20.05.2019
Date

prasa
PASSENGER RAIL AGENCY OF SOUTH AFRICA

PRASA HOUSE
1040 Burnett Street
Hatfield
Pretoria

Private Bag X101
Braamfontein, 2017
T: +27 12 748 7000

www.prasa.com

PRIVATE AND CONFIDENTIAL

15 May 2019

Mr.Zuko Lukrozo
Assistant Manager
Infrastructure
20009240

CONSENT TO CARRY OUT RESEARCH ON FACTORS AFFECTING OPERATIONAL PERFORMANCE WITHIN A RAILWAY ORGANISATION IN SA

Your request to conduct survey for data collection and access incident data, supporting your post graduate MTech: Business Administration the above mentioned Research Topic Cape Peninsula University of Technology" is approved.

Kindly note the following conditions to this approval:

- A new application for approval should be applied for should there be any changes to the Research topic.
- There cannot be any disruptions on business operations during the research collection.
- All Metrorail/ PRASA data/information collected must be threated confidentially.
- The findings/ recommendations of the Research must be presented to the Metrorail Western Cape Regional Executive.
- The presentation of such research or writing of publications around the research must be approved by Metrorail Western Cape.
- A copy of your theses must be made available to Metrorail Western Cape.

You may proceed with the research once you have agreed to the conditions attached.

This letter can be presented as approval during the conduct of the survey.

Kind regards

Mark Horne
Acting Senior Manager
Human Resources

APPENDIX C: ETHICS FORM

Cape Peninsula University of Technology

P.O. Box 1906 • Bellville 7535 South Africa •Tel: +27 21 4603291 • Email: fbmsethics@cput.ac.za
Symphony Road Bellville 7535

Office of the Chairperson Research Ethics Committee	Faculty: BUSINESS AND MANAGEMENT SCIENCES

The Faculty's Research Ethics Committee (FREC) on **12 September 2019**, ethics **Approval** was granted to **Zuko Lukrozo (213094991)** for research activities of **M Tech: Business Administration** at Cape Peninsula University of Technology.

Title of dissertation/thesis/project:	AN APPLICATION OF RAILOUAL FOR MEASURING SERVICE QUALITY AT A SELECTED RAIL ORGANISATION IN SOUTH AFRICA Lead Supervisor (s): Dr B Yan & Dr S O Olutuase

Comments:

Decision: Approved

	12 September 2019
Signed: Chairperson: Research Ethics Committee	Date

Clearance Certificate No | 2019FOBREC700

APPENDIX D: STUDY QUESTIONNAIRE

Graduate Centre for Management
Faculty of Business and Management Sciences
Cape Peninsula University of Technology

INFORMED CONSENT FORM

I am Zuko Lukrozo, a Master's student in the Graduate Centre for Management, Cape Peninsula University of Technology. I am carrying out a study on ***An Application of RAILSERVQUAL model for improving service quality at a selected rail organisation in South Africa*** and would like you to participate in the study.

Study Purpose
The purpose of the study is to examine the service quality of the passenger rail in South Africa in the Western Cape Region using a RAILSERVQUAL model in order to improve the quality of passenger services for the organization.

Study Procedure
This study will involve asking you to complete an anonymous questionnaire. The questionnaire will obtain information from you on socio-demographics and your personal experience of PRASA services. The results of the study will be used for the sole for the purpose of this study.

Potential Harm, Risks or Discomfort
It is not likely that there will be any harm or discomfort associated with this research.

Right to Refusal or Withdrawal
Your participation in this study is voluntary. If you decide to participate, you can stop at any time, even after signing the consent form or in the course of the study. There will be no consequences if you decline to participate.

Confidentiality
The results of the study will be kept confidential and used only for research purposes. Your identity shall be concealed as your name will not appear anywhere on the coded information forms. Whatever it is in our findings that could identify you will not be published except with your consent.

Statement of Consent

I (Initials) …… have understood the questions asked and explained to me and I am willing to participate.

I agree ☐ I decline ☐

Signature of Participant ……..... Date…….

Signature of Witness …… Date…….

Researcher's Contact Details:

Mr Zuko Lukrozo

Phone: 076 436 3323

Email: zlukrozo@gmail.com

QUESTIONNAIRE

Section A: Description of participants
Please tick (x) as appropriate.

Gender	Male		Female		**Section of train travel**		Southern Section		Northern Section		Central section	
Age bracket	<20 years		21-30 years		31-40 years		41-50 years		51-60 years		>60 years	
Occupation	Student		Full-time employed		Part-time employed		Retired		Unemployed			
Frequency of travel by train	5-12times per day		3-4 times per week		1-2 times per week		1-2 times per month		1-2 times per quarter		Rarely	
Purpose of the journey by train	Study		Employment		Personal		Business		Tour		Jobseeker	

Section B: Participant's Experience of rail services provided
1= Poor services; 2=Fair services; 3=Good services; 4=very good services; 5=Excellent services. *Please tick (x) in the box*

Dimension	Indicators	Scale				
		1	2	3	4	5
Reliability	Provision of on-time train service (punctuality)					
	Availability of information on train schedules at stations					
	Trains running as per schedule/timetable					
	Availability of information on train cancellations, delays and platform changes					
	Regular service (no interruptions caused by breakdowns and incidents)					
Safety and security	Visible personnel security on trains					
	Visible personnel security on stations					
	Safety signs at stations displayed to the public					
	Emergency controls on train					
Comfort	Tidiness on trains					
	Tidiness on waiting areas					
	Seat conditions on trains					
	Seat conditions on waiting areas					
	Stability and comfort during the ride					
	Availability of seats on trains					
Access and service coverage	Access for people with disability					
	Connection to substations/other transport terminals.					
	Access to ticket sales					
	Accessibility of train stations to passengers in terms of proximity to malls, residential settlement, public offices					

Dimension	Indicators	Scale				
		1	2	3	4	5
	Platform and train relation (ease of entrance or exit to or from the train)					
	Ease of access to platforms					
Customer services and professionalism	Staff appearance at stations					
	Staff behaviour at stations					
	The ability of staff to handle customer problems					
	Professionalism approach by the staff					
	Willingness to help customers					
Affordability	Ticket price compared to other modes of transport					
	Fare increase rate					
	Reasonable fare based on your earnings					
	Willingness to pay for service					
	Frequencies of fare increase					