



GSJ: Volume 11, Issue 2, February 2023, Online: ISSN 2320-9186
www.globalscientificjournal.com

**MOBILE TELECOMMUNICATIONS QUALITY OF SERVICE AND CUSTOMER
SATISFACTION IN KIGALI, RWANDA**

BY

MUHIRE Francis

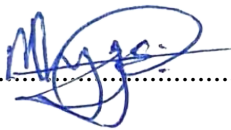
REG NO: MSCIT/19/09/6039

**A DISSERTATION SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES IN
THE PATIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF A
MASTER'S DEGREE OF SCIENCE IN INFORMATION TECHNOLOGY OF THE
UNIVERSITY OF KIGALI, RWANDA**

APRIL, 2021

DECLARATION

I MUHIRE Francis, hereby declare that this dissertation is a result of my own effort and has never been submitted for any award to any university.

Signed..........

Date18th/11/2021....

DEDICATION

I dedicate this work to my parents, Mr. Kalangwa Cyril & Mrs Kalangwa Mary Joyce. I also dedicate it to my entire family (The Kalangwa family) who are located in different countries in East Africa, I love them so much.

ACKNOWLEDGMENT

To my family and other relatives who have contributed to the successful completion of my studies from the first day I came in Rwanda, I do remember and pray for all of you every single day of my life. Special thanks go to my cousins, Mr. GASHUMBA Edward & family and Mr. MOGAS Nicholas who gave me a good studying atmosphere and encouraged me every day during my study time. My workmates and the management of Kinazi Cassava Plant Ltd (KCP), more thanks to you as well for being flexible with my work schedule in support of my master studies at University of Kigali.

I also thank my Supervisor, **Dr. Sanja Michael Mutong'wa** for your invaluable guidance that has seen me through this accomplishment.

To all my colleagues in University of Kigali from years 2018, 2019, 2020 & 2021 Intakes of Master of Science in Information Technology whom we shared and supported each other during my study time, a big THANK YOU comrades.

TABLE OF CONTENTS

Contents

LIST OF ABBREVIATIONS	8
ABSTRACT	9
INTRODUCTION	10
1.1 Introduction	10
1.2 Background	10
1.2.1 Historical background	10
1.2.2 Theoretical background	12
1.2.3 Conceptual background	14
1.2.4 Contextual background	14
1.3 Problem Statement	15
1.4 Purpose of the Study	17
1.5 Objectives of the study	17
1.6 Research Questions	17
1.7 Hypothesis	17
1.8 Conceptual Frame Work	18
1.9 Scope of the Study	20
1.10 Significance of the Study	20
1.11 Justification of the Study	21
1.12 Operational Definition of Key Terms and concepts	21
LITERATURE REVIEW	23
2.1 Introduction	23
2.2 Overview of Mobile Telecommunications Quality of Service and Customer Satisfaction	23
2.3 Theoretical review	24
2.3.1 The SERVQUAL Model	24
2.3.2 Expectation Disconfirmation Theory (EDT)	25
2.4 Network Performance and Customer Satisfaction	27
2.4.1 Service Retainability Performance and Customer Satisfaction	28
2.4.2 Service Integrity Performance and Customer Satisfaction	29
2.4.3 Service Accessibility Performance and Customer Satisfaction	30
2.5 Non-Network Performance aspects of QoS and Customer Satisfaction	31
2.5.1 Service Support Performance and Customer Satisfaction	32
2.5.2 Service Operability Performance and Customer Satisfaction	32
2.5.3 Service Security Performance and Customer Satisfaction	33
2.6 Summary of the Literature Review	33
METHODOLOGY	34
3.1 Introduction	34

3.2 Research Design.....	34
3.3 Study Population.....	34
3.5 Sampling Techniques and Procedures.....	35
3.6 Data Collection Method.....	36
3.7 Data Collection Instruments.....	36
3.7.1 Self-administered questionnaires.....	37
3.8 Validity and Reliability of Instruments.....	37
3.8.1. Validity.....	37
3.8.2 Reliability.....	38
3.9 Procedure of Data Collection.....	39
3.10 Data Analysis.....	39
3.11 Measurements of variables.....	40
PRESENTATION, ANALYSIS AND INTERPRETION OF FINDINGS.....	41
4.1 Introduction.....	41
4.2 Response Rate.....	41
4.3 Background Characteristics of the sample.....	42
4.3.1 Distribution of respondents by gender.....	42
4.3.2 Respondents period of Telecommunications Subscription.....	43
4.3.3 Type of Subscription.....	43
4.4 Descriptive results on Network performance aspects of quality of service.....	44
4.5 Correlation Results for Network Performance and Customer Satisfaction.....	47
4.6 Regression Results for Network Performance and Customer Satisfaction.....	48
4.7 Descriptive results on non-Network performance aspects of Quality of Service.....	49
4.8 Correlation results on non-Network performance aspects of Quality of Service.....	55
4.9 Regression Results for Non Network Performance aspects of Quality of Service and Customer Satisfaction.....	56
4.10 Descriptive Results for Customer satisfaction.....	57
SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.....	63
5.1 Introduction.....	63
5.2 Summary of Key findings.....	63
5.2.1 Network Performance aspect of quality of service and Customer Satisfaction.....	63
5.2.2 Non Network Performance aspects of Quality of Service and Customer Satisfaction.....	64
5.3 Discussion of findings.....	64
5.3.1 Network Performance and Customer Satisfaction.....	64
5.3.2 Non Network performance aspects of Quality of Service and Customer Satisfaction.....	65
5.4 Conclusions of the study.....	66
5.4.1 Network Performance and Customer satisfaction.....	66
5.4.2 Non Network Performance aspects of QoS and Customer satisfaction.....	66
5.5 Recommendations.....	66
5.5.1 Network Performance and Customer satisfaction.....	66

5.7 Contributions of the study	68
5.8 Areas recommended for future research	68
REFERENCES	70
APPENDIX I: QUESTIONNAIRE FOR TELECOMMUNICATIONS SERVICES PROVIDER’S CLIENTS	76
SECTION A: BIO DATA	76
SECTION B: NETWORK PERFORMANCE ASPECTS OF QUALITY OF SERVICE	77
SECTION C: NON- NETWORK PERFORMANCE ASPECTS OF QUALITY OF SERVICE	78
SECTION D: CUSTOMER SATISFACTION	79

LIST OF ABBREVIATIONS

IJET- International Journal of Engineering & Technology

ITU- International Telecommunications Union

MID- Mean Interruption Duration

MTBI- Mean Time Between Interruptions

NP- Network Performance

QoS- Quality of Service

SMS- Short Message Service

RURA- Rwanda Utilities Regulatory Agency

TSP- Telecommunications Services Provider

AfrISPA - African Internet Service Providers Association

EDT- Expectancy Disconfirmation Theory

GSM- Global System for Mobile Communications

ICC- International Chamber of Commerce

ICT- Information and Communications Technology

IEEE- Institute of Electrical and Electronic Engineers

RITA – Rwanda Information Technology Authority

ABSTRACT

This study examined mobile telecommunications quality of service (QoS) and customer satisfaction (CS) in Kigali-Rwanda. The study had two objectives: One, was to establish the relationship between network performance (NP) aspects of QoS and CS in Kigali and the second was to assess the relationship between non-NP aspects of QoS and CS in Kigali. The researcher was perturbed by continuous information from AfrISPA and other sources indicating that mobile telecommunications QoS was very poor in Kigali and Rwanda at large. This prompted the study.

A cross sectional research design was adopted and quantitative approach was used. The study population of mobile telecommunications subscribers in Kigali was estimated and exceeds 100% of the total population of the city (1.132m *ref. datareportal*), this is because many people have more than one mobile connection. Different writers and web pages were used for the study. Self-administered questionnaires were used to collect data and a response rate of 75% was obtained.

Correlation results showed a significant weak positive relationship between NP and CS and a significant weak positive relationship between non-NP aspects of QoS and CS. The findings provided an insight into customers' satisfaction within the mobile telecommunications domain much as the study was limited to Kigali and to mobile voice telephony and SMS.

Recommendations to TSPs included a need to emphasize both NP and Non-NP QoS aspects for greater improvements in CS. Also, TSP training programs should be tailored to equip staff with necessary skills and knowledge to better serve the customers. TSPs should also increase the number of customer helpline staff and lines. Much as RURA carries out network performance tests; it was recommended that in addition nationwide surveys should be carried out to ascertain the non-network performance aspects of QoS of mobile telecommunications.

CHAPTER ONE

INTRODUCTION

1.1 Introduction

The research aimed at establishing the relationship between quality of service (QoS) of mobile telecommunications and customer satisfaction in Kigali. In this chapter, a background to the study, the problem statement, purpose of the study, objectives of the research, research questions, research hypotheses, scope, significance of the study, conceptual framework and finally the terms and concepts as used in the study will be defined.

1.2 Background

1.2.1 Historical background

The timeline for telecommunications policy development in Rwanda can be divided into two major periods: the periods before and after 1994. The first period is characterized by a centralized and government-based telecommunications sector, where the Ministry of Telecommunication plays the role of both service provider and regulator until 1993

In 1979, according to the African Internet Service Providers Association (AfrISPA),¹⁰ the installation of an automated telex center and the inauguration of the Ecole Nationale Mixte des Postes et Telecommunications in Kigali took place. The Government has recently established the Rwanda Development Board with five economic clusters, namely ICT, Tourism, Trade & Manufacturing, Services, and Agriculture. The ICT pillar is known as RDB/ICT and takes over the mandate and functions of the previous entity known as the Rwanda Information Technology Authority—RITA. The RDB/ICT is entrusted with the implementation of the NICI plan, monitoring and evaluating the implementation of ICT programs across Ministries, Departments and Agencies, increasing awareness and providing advisory and support services to ICT

programs. The telecommunications network has expanded over the years under government initiatives and private sector promotion. The telecommunication industry has shifted quickly since 2005 from the government control to private sector with the privatization of RWANDATEL and the arrival of three GSM operators namely MTN Rwanda, Rwandatel and TIGO. The author further asserts that governments realized that monopoly networks and services were limiting the development of new markets and services. With the introduction of competition and profit-oriented players to provide telecommunications, governments had to ensure quality telecommunications services through independent regulators.

According to the World Bank and International Telecommunications Union [ITU] (2013) by the year 2010, forty-two of the forty-four countries in Sub Saharan Africa (excluding Somalia and Mayotte whose data wasn't reported) had an independent regulator of communications. From the same source, four of the countries in Sub Saharan Africa have monopolies as the Telecommunications Services Providers while the remaining forty have competition. All the countries in East Africa have independent regulatory bodies and have full competition in the Telecommunication industry and the regulators have mechanisms aimed at ensuring good quality services from the service providers (ITU, 2013).

Rwanda Utilities Regulatory Agency (RURA) was established under the 2001 law governing telecommunications as an autonomous institution to regulate the provision of public utilities goods and services, including telecommunications. The 2001 law was amended in 2013 and RURA's mandate was extended to include "telecommunications, information technology, broadcasting and converging electronic technologies including the Internet and any other information and communication technology." This study explored the relationship between quality of services and customer satisfaction in Mobile Telecommunications in Kigali, Rwanda

1.2.2 Theoretical background

The Expectancy Disconfirmation Theory (EDT) was adopted for this study. Afullo (2004) theorizes that quality as perceived from a customer stem from a comparison of what they feel or expect the product should offer with their perceptions of the actual performance of the product. The author notes that in practice the customer’s view of quality may significantly differ from that of the service provider whose view of quality will be based on their perspective of the product offering. This is shown in figure 1 below.

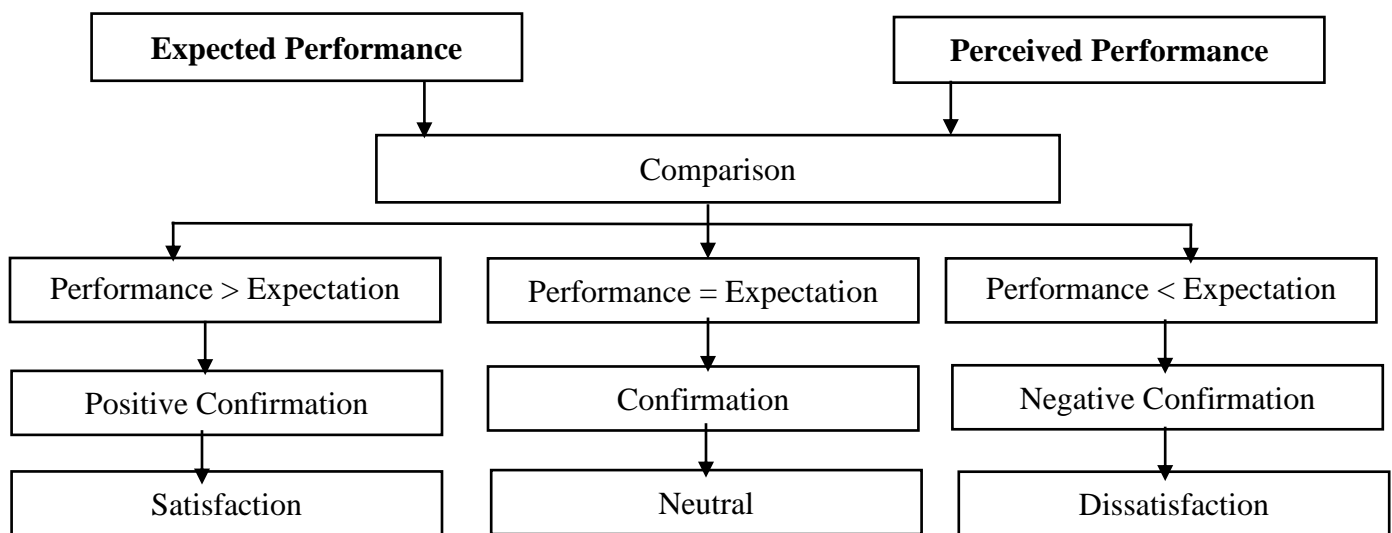


Figure 1: Disconfirmation Model of customer satisfaction

Source: Afullo (2004). Quality of Service in Telecommunications - The Customer's Perspective

The disconfirmation model of customer satisfaction above shows that the customer compares the perceived performance with the expected performance of a service. When a services’ performance exceeds the expectations of the customer, then there is positive confirmation and the customer is satisfied. If on the other hand the services’ performance is below the customer’s expectations then there is negative confirmation and the customer wouldn’t be satisfied. Should the service just meet the customer’s expectation, confirmation happens and the customer remains neutral. The EDT theory, together with the SERVQUAL model shall be expounded on in chapter two under the theoretical review section.

ITU (2008) and (ITU 1994) illustrate the relationship between QoS and Network Performance. QoS comprises both network performance (NP) and non-network related performance. The list of QoS criteria for a particular service would be dependent upon the service and their relevance could vary among the segments of the customer population (ITU 2008).

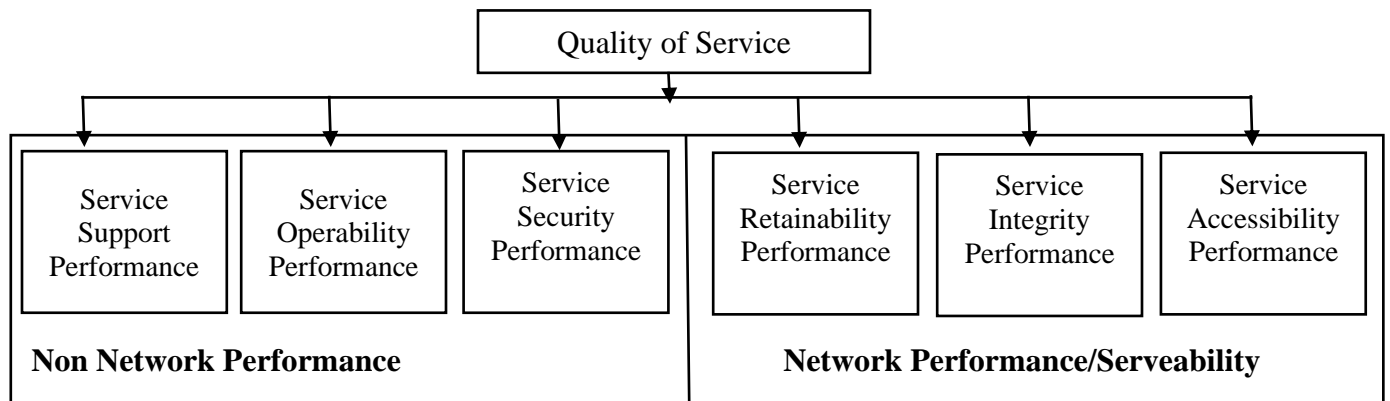


Figure 2: Quality of Service Dimensions

Source: ITU (1994) ITU-T Recommendation E.800: Quality of telecommunication services

From the provider’s viewpoint, network performance is a concept by which network characteristics can be defined, measured and controlled to achieve a satisfactory level of service quality (ITU, 2008). This study covered both NP and non-NP aspects of QoS.

1.2.3 Conceptual background

ITU (2008) defines QoS as the totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service. This implies that the user is best placed and is the judge of good or bad QoS. QoS comprises both network performance like network congestion and non-network related performance aspects like handling of complaints.

Oliver (1980) and Leisen (2001) as quoted by Loke et al (2011) defined customer satisfaction as a personal feeling of either pleasure or disappointment resulting from the evaluation of services provided by an organization to an individual in relation to expectations. Yi (1990) asserts that customers buy services with pre-purchase expectations about anticipated performance, once the bought service has been used, outcomes are compared against expectations. If the outcome matches expectations, the result is confirmation. When there are differences between expectations and outcomes, disconfirmation occurs. Positive disconfirmation occurs when product or service performance exceeds expectations. Therefore, satisfaction is caused by positive disconfirmation or confirmation of customer expectations, and dissatisfaction is the negative disconfirmation of customer expectations (Yi, 1990).

1.2.4 Contextual background

The telecommunications sector in Rwanda has been transformed by liberalization and introduction of competition. Rwanda Utilities Regulatory Agency (RURA) was established under the 2001 law governing telecommunications as an autonomous institution to regulate the provision of public utilities goods and services, including telecommunications. RURA, through Act (2001) empowers the Agency to establish an intelligent network monitoring system to monitor traffic, revenue and quality of service of operators. In addition, Sections 3(i) and 3(m) of the -5- Rwanda's population of 13.22 million (as of 2021) is mostly serviced by three mobile

phone operators namely MTN, Airtel, and TIGO. Fixed telephony services are provided by MTN and Rwandatel (formerly a state-owned entity now operating as Liquid Telecom LTD). There are numerous internet service providers including: MTN, Liquid telecom, TIGO, New Artel, ISPA, Altech Stream, 4G Networks, BSC, 4G Rwanda, Airtel and others.

There were 3.31 million internet users in Rwanda in January 2020. The number of internet users in Rwanda increased by 267 thousand (+8.8%) between 2019 and 2020. Internet penetration in Rwanda stood at 26% in January 2020 (Digital 2020 Rwanda).

1.3 Problem Statement

Recognizing that the development of the local telecommunications services sector is dependent on being globally competitive, governments world over have continued to advocate the introduction of full market competition in the local telecommunications services sector. Governments realized that monopoly networks and services were limiting the development of new markets and services (ICC, 2004).

Rwanda was slow to liberalize the mobile sector, allowing MTN a monopoly until 2006 when the fixed-line incumbent, Rwandatel (since acquired by Liquid Telecom) became the second mobile operator. There was effective competition among three operators after Tigo launched services in 2009. However, the acquisition of Tigo by Airtel saw a significant consolidation in the market, and the cancellation of Rwandatel's license in 2011 resulted in the market becoming a duopoly (Analyst: Henry Lancaster, 2013).

The telecom operators as well as government agencies and regulators (RURA) as they react to the crisis to ensure that citizens can continue to make optimum use of telecom services.

Despite the less competition in these telecommunication companies in Rwanda, the telecommunication market faces a problem of pressure to provide high quality services because of the increase in demand for data and broadband. This rapid increase in demand is due to the growing penetration of mobile devices and increasing demand for multimedia content and applications.

At the end of the fourth quarter of 2020, the active mobile subscriptions market shares for MTN Rwanda Ltd increased by 0.8 percentage points up to 61.8 percent, whereas that for Airtel Rwanda Ltd dropped by the same margin reaching 38.2 percent compared to the previous quarter.

Table 1. Market share trends for mobile (SIM cards) subscriptions per operator

Name of Operator	Sept 2020	Dec 2020
MTN Rwanda Ltd	61.0%	61.8%
Airtel Rwanda Ltd	39.0%	38.2%

statistics report for telecom, media and broadcasting sector as of the fourth quarter of the year 2020

1.4 Purpose of the Study

The purpose of the study was to investigate the relationship between quality of service of mobile telecommunication and customer satisfaction in Kigali, Rwanda.

1.5 Objectives of the study

- a) To establish the relationship between network performance and customer satisfaction in Kigali, Rwanda.
- b) To assess the relationship between non network performance aspects of QoS and customer satisfaction in Kigali, Rwanda.

1.6 Research Questions

- a) What is the relationship between network performance and customer satisfaction in Kigali, Rwanda?
- b) What is the relationship between non network performance aspects of QoS and customer satisfaction in Kigali, Rwanda?

1.7 Hypothesis

- a) There is a relationship between network performance and customer satisfaction in Kigali, Rwanda.
- b) There is a relationship between non network performance aspects of QoS and customer satisfaction in Kigali, Rwanda.

1.8 Conceptual Frame Work

<u>INDEPENDENT VARIABLE</u>	<u>DEPENDENT VARIABLE</u>
Quality of Service	Customer Satisfaction
Network Performance	Loyalty to company
<ul style="list-style-type: none"> • Service Retainability Performance • Service Integrity Performance • Service Accessibility Performance 	Propensity to switch
Non-Network Performance	Willingness to pay more
<ul style="list-style-type: none"> • Service Support performance • Service Operability performance • Service Security performance 	External response to problems
	Internal Response to problems

Figure 3: Illustration of the conceptual framework

Source: ITU (1994); ITU-T Recommendation E.800: Quality of telecommunication services, Zeithaml, Berry and Parasuraman (1996). The Behavioral Consequences of Service Quality, *Journal of Marketing*, 1996, 60, April: 31-46 and modified by the researcher

Figure 3 above shows the conceptual framework that was used in the study. Ganesh, Arnold and Reynolds (2000) and Caruana (2002) observed that if a customer perceives service quality to be high, he/she will have high levels of satisfaction. This shows that customer satisfaction depends on QoS as shown in the figure. The figure also shows that quality of service has dimensions of network performance and non-network performance aspects. Network Performance has indicators of accessibility, retainability and integrity of the service while non-network performance has dimensions of operability, support and security. The dimensions of customer satisfaction were adapted from Zeithaml, Berry and Parasuraman (1996). The authors state that behavioral intentions are dependent variables with high validity because they are more

closely related to actual behaviors and rich diagnostic value. The authors further assert that research Offers evidence that customer satisfaction or service-quality perceptions results in favorable customer behavior for the service provider.

According to ITU (1994), a user's degree of satisfaction with the service provided depends on quality of service; that is on the user's perception of the Support, Operability, Serve-ability and Security of the service. The serve-ability performance however, is the most generally affected and was fully focused on in this study. It is subdivided into three terms; Service accessibility performance, Service retainability performance and Service integrity performance.

Service Integrity performance measures include: Interruption (Break of service), time between interruptions, interruption duration, mean time between interruptions (MTBI) and mean interruption duration (MID).

Service Retainability measures include: Connection retainability, premature release probability or cut-off call probability, release failure probability and probability of successful service completion

Service support performance measures include: mean service provisioning time, billing error probability, incorrect charging or accounting and billing integrity while Service accessibility measures include: service access probability, mean service access delay, network accessibility, connection accessibility and mean access delay, misrouting probability and no tone probability.

Service operability measures consist of: service user mistake probability, dialing mistake probability, service user abandonment probability and call abandonment probability and Service Security performance considers the protection provided against unauthorized monitoring, fraudulent use, malicious impairment, misuse, human mistake and natural disasters (ITU, 1994).

1.9 Scope of the Study

The study was carried out in Kigali, Rwanda. The research specifically addressed mobile telecommunications which has the majority of users of telecommunication services in Rwanda. As of 30 June 2020, the number of active mobile-cellular telephone subscriptions was around 9.9 million SIM cards. Therefore, the mobile-cellular subscriptions were 77.9 registered for every 100 people while for fixed telephone subscriptions were 0.1% (RURA 2019). The services that were considered include Voice telephony, Short Message Service (SMS), mobile internet, and Value-Added Services (VAS) like mobile money.

1.10 Significance of the Study

The findings of the study may be of use to the regulator of communications RURA, telecommunications companies in Rwanda, consumer protection associations and other researchers with interests in quality of service and its relationship with customer satisfaction.

The findings may also guide telecommunication companies in improving customer satisfaction through improving QoS.

RURA as an independent regulator may find the conclusions and recommendations of this study worth considering for the review of policies, and regulations for the good of the mobile telecommunications sector. This study will also act as a reference for scholars who will pursue further research as regards the aspects of QoS and customer satisfaction particularly in mobile telecommunications.

1.11 Justification of the Study

There has been an increase in competition in the telecommunications sector especially when two new operators KTRN Telecom and Mango Telecom joined the Rwanda Market in 2017 and 2019 respectively (Jaramogi & Muwanga, 2009). This caused many promotions and different tariff plans that could have had an adverse effect on the quality of services offered by the telecommunications service providers. On the other hand, the operators would be expected to improve the quality of services offered so as to have a competitive advantage over their competitors in the sector. This research will help see the relationship between QoS and customer satisfaction of mobile telecommunications in Rwanda.

1.12 Operational Definition of Key Terms and concepts

The Key terms in this study are defined as:

- **Accessibility:** The ability of a service to be obtained, within specified tolerances and other given conditions, when requested by the user (Ali, Shehzad and Akram, 2010)
- **Connection retainability:** that is the probability that a connection, once obtained, will continue to be provided for communication under given conditions for a given time duration.
- **Customer satisfaction:** Oliver (1980) and Leisen (2001) as quoted by Loke et al (2011) defined customer satisfaction as a personal feeling of either pleasure or disappointment resulting from the evaluation of services provided by an organization to an individual in relation to expectations.
- **Network Performance:** It's the technical performance of elements of the network or of the whole network (Afullo, 2004) yet ITU (2008) defines it as the ability of a network or network portion to provide the functions related to communications between users.

- **Quality of Service:** Is the totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service (ITU, 2008)
- **Retainability:** The ability of a service, once obtained, to continue to be provided under given conditions for a requested duration (Ali, Shehzad and Akram, 2010).
- **Serve-ability:** "The ability of a service to be obtained within specified tolerances and other given conditions when requested by the user and continue to be provided without excessive impairment for a requested duration. NOTE: Serve-ability performance may be subdivided into the service accessibility performance, service retainability performance and the service integrity performance (ITU, 1994)."
- **Service Integrity:** The degree to which a service is provided without excessive impairments, once obtained (ITU, 1994).
- **Service support:** The ability of an organization to provide a service and assist in its utilization.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents and discusses the related literature on quality of service and customer satisfaction and seeks to position the work within scholarly context. Books, electronic journals, articles from newspapers, articles from publications, information from Rwanda Information Technology Authority under the Rwanda Development Board (RDB), RURA and recommendations of the International Telecommunications Union (ITU) and other resources from the internet have been used in literature sourcing. This literature review aims to assess research completed in areas related to this study and avoid repetitions and also to ably define QoS, customer satisfaction and the mechanisms governing their interaction. QoS and customer satisfaction in mobile telecommunications and the mechanisms through which QoS impacts customer satisfaction are the central concepts for this study. The main theories in which the study is grounded are reviewed to bring out the constructs which are of importance to the research.

2.2 Overview of Mobile Telecommunications Quality of Service and Customer Satisfaction

Ganesh, Arnold and Reynolds (2000), reported that if a business performs a service that surpasses customer expectations, the customer will be satisfied and is likely to be a repeat customer for the service provider. The assertion implies that poor service is a major cause of dissatisfaction among customers. Perceived expectations, perceived quality, perceived value, perceived usefulness, and perceived ease of use were critical factors for customer satisfaction Chou and Chang (2006). Afullo (2004) is in agreement with the above view stating that the role of customers' perception is a major consideration in the specification of quality and that

satisfaction is associated with the entire customer product-ownership experience. The author further asserts that companies in the telecommunications industry must have to operate closer to the market and customer needs and that customer needs are likely to be the main driver in the telecommunications industry. Thus, QoS plays a major role in determining customer satisfaction.

2.3 Theoretical review

This section reviews the theories that were identified as the guiding principle in the study and how they were used.

2.3.1 The SERVQUAL Model

The SERVQUAL (Service Quality) theory and the Expectation Disconfirmation Theory (EDT) were reviewed. Parasuraman, Zeithaml, & Berry (1988) presented SERVQUAL as a multi-item scale developed to assess customer perceptions of service quality in service and retail businesses.

The scale decomposes the notion of service quality into five constructs as follows:

Tangibles - physical facilities, equipment and staff appearance; Reliability - ability to perform service dependably and accurately as promised; Responsiveness - willingness to help and respond to customer needs; Assurance – Knowledge and courtesy of employees and their ability to inspire trust and confidence; Empathy - the extent to which caring individualized service is given.

The five constructs when compared to the dimensions of quality of services as per ITU recommendations model do not exactly fit but there are some agreements. Responsiveness and Empathy from SERVQUAL is a good match to Service support while reliability from SERVQUAL matches service retainability and service integrity. The rest of the SERVQUAL

constructs are not comparable to the telecommunications QoS dimensions adapted for this study and thus the theory was not the best for this study. Negi (2009) used the five QoS dimensions of the SERVQUAL model and added two other dimensions that are network aspect, and convenience to conceptualize service quality in a study of perceived QoS in Addis Ababa, Ethiopia. The author noted that most quality features in the SERVQUAL scale are related with customer handling but the author's study incorporated, and investigated further, the added two dimensions of network aspect and convenience. This study has network performance as a major dimension of QoS. SERVQUAL represents service quality as the discrepancy between a customer's expectations for a service offering and the customer's perceptions of the service received, requiring respondents to answer questions about their expectations and perceptions (Parasuraman, 1988). This is in agreement with the Expectation Disconfirmation Theory below which was adopted for this study.

2.3.2 Expectation Disconfirmation Theory (EDT)

According to Parker and Mathews (2001) as quoted by Loke et. al (2011), the most popular descendant of the discrepancy theories is the Expectation Disconfirmation Theory (EDT) which states that the result of customers' perceptions of the difference between their perceptions of performance and their expectations of performance determines their satisfaction. Expectancy Disconfirmation Theory (EDT) can measure the customer's satisfaction from the difference between customer's expectation and experience in perceived products or services. The model consists of expectations, perceived performance, disconfirmation and satisfaction components (Elkhani and Bakri, 2010). The authors assert that Expectations define the customer's anticipations about performance of products and services and that EDT has the ability to define multiple manners of customers in purchase process. First, the customers can have initial expectation based on previous experience of using a service. Expectation of such customers who repurchase from the same service provider is closer to reality. Second, the new customers without

a first-hand experience about performance and quality of services that they tend to purchase from a specific service provider for the first time. The initial expectation of such customers consists of feedbacks that they receive from other customers, advertisement, and mass media Haistead and Hartman (1994) as quoted in Elkhani and Bakri (2010).

Perceived performance investigates the customer's experience after using services that may be better or worse than the customer's expectation (Spreng, MacKenzie, and Olshavsky, 1996). Both kinds of these customers will use purchased products or offered services for a while and can appreciate actual quality of presented services by the service provider (Elkhani and Bakri, 2010). Disconfirmation is defined as the difference between the customer's initial expectations and observed actual performance (Bhattacharjee and Premkumar, 2004) as quoted in Elkhani and Bakri (2010). Elkhani and Bakri (2010), further state that disconfirmation is divided into three types; positive disconfirmation, negative disconfirmation and simple disconfirmation. When actual performance of a service cannot meet the customer's expectation, negative disconfirmation occurs and leads to a customer's dissatisfaction. Positive disconfirmation leads to the customer's satisfaction, if perceived performance of a specific product or service is able to exceed a customer's expectations, then satisfaction. Finally, when there isn't any difference between customer's expectation and actual performance of specific product or service, it means perceived performance equals to expectation, thus simple confirmation occurs (Elkhani and Bakri, 2010).

2.4 Network Performance and Customer Satisfaction

Afullo (2004) asserts that Network Performance (NP) contributes towards QoS and defines network performance as the technical performance of elements of the network or of the whole network. In agreement with the same views is ITU (2008), and asserts that QoS comprises both network performance like network congestion and non-network related performance like handling of complaints (ITU, 2008). Huendling and Weske (2006) state that there is a whole set of different properties about different aspects related to a service that are often categorized as functional and non-functional properties. Generally speaking, functional properties describe what the service does and non-functional properties are used to describe how the service does it. Functional properties of a service in the context of this research are equivalent to the Network Performance component of QoS while non-functional properties of a service are the equivalent to the non-network performance component of QoS. Thus, the author's assertion is in agreement with (ITU, 2008). Network performance has the most effect on the perception of the user of a service which affects a user's degree of satisfaction. Network performance is subdivided into three terms: service accessibility performance; service retainability performance and service integrity performance (ITU, 2008). Afullo (2004) reports that the Singapore's regulator launched a Cellular Network Performance Measurement System (CNPMS) in July 2000 through which it surveys the service quality of Singapore's three mobile service providers. The parameters covered include call success rate, service coverage at street level in terms of signal strength, Voice quality and call drop out which means it does cover some network performance parameters which could be fitted in the three broad network terms from the ITU model used in this study.

2.4.1 Service Retainability Performance and Customer Satisfaction

According to ITU (2008), Service retainability is the ability of a service, once obtained, to continue to be provided under given conditions for a requested duration. It generally depends on the transmission tolerances, the propagation performance and reliability performance of the related systems. Afullo (2004) has a measure of service retainability which was termed service reliability though this was applied to internet and email services only. On the other hand, for this performance concept (ITU 2008) recommends the following measures to be used: service retainability; this is the probability that a service, once obtained, will continue to be provided under given conditions for a given time duration. Connection retainability; this is the probability that a connection, once obtained, will continue to be provided for communication under given conditions for a given time duration. Retainability of an established connection; this is the probability that a switched connection, once established, will operate within specified transmission tolerances without interruption for a given time interval. Premature release probability as known as cut-off call probability; this is the probability that an established connection will be released for a reason other than intentionally by any of the parties involved in the call. Release failure probability; the probability that the required release of a connection will not take place. Ali, Shezard and Akram (2010) had the same definition for service retainability but had different measures from those proposed by ITU (2008) that is call drop rate and handover success rate. These are network performance QoS aspects but can only be measured from the network equipment and not from the customer but a customer can be asked about dropped calls. This study aimed at establishing the relationship between service retainability performance and customer satisfaction by using relevant measures presented above.

2.4.2 Service Integrity Performance and Customer Satisfaction

Service Integrity Performance is the degree to which a service is provided without excessive impairments, once obtained (ITU, 2008). The author recommends the following measures for the integrity performance concept: Interruption also defined as break of service; Temporary inability of a service to be provided persisting for more than a given time duration, characterized by a change beyond given limits in at least one parameter essential for the service. It may be caused by disabled states of the items used for the service or by external reasons such as high service demand or an interruption of a service which is generally an interruption of the transmission, which may be characterized by an abnormal value of power level, noise level, signal distortion, error rate, etc. Afullo (2004) reported a measure of QoS used in the UK termed as Customer Reported Faults which describes the reliability of a TSP's network this measure is very similar to break of service above. Afullo (2004) also presented another measure of QoS that is Repeated Customer Reported Faults which is also close to ITU (2008)'s recommended Time between interruptions and Interruption duration; the time duration of an interruption. ITU (2008) recommends Mean time between Interruptions (MTBI); the expectation of the time between interruptions. Mean interruption duration (MID); the expectation of the interruption duration as other measures for service integrity. Only those measures that can be appreciated by the customer were considered in this study when investigating service integrity and customer satisfaction.

2.4.3 Service Accessibility Performance and Customer Satisfaction

According to ITU (2008), service accessibility is the ability of a service to be obtained, within specified tolerances and other given conditions, when requested by the user. Ali, Shehzad and Akram (2010) have the same definition and presented indicators for accessibility performance as paging success rate, SDCCH access success rate, SDCCH drop rate, call setup success rate and call setup TCH congestion rate all of which can be obtained from the network equipment but not from the customer. In contrast ITU (2008) recommends the following measures for service accessibility: Service access probability; the probability that a service can be obtained within specified tolerances and other given operating conditions when requested by the user. In the UK, Service Provision (SP) is a measure used to describe the ability of companies to keep their promises to provide services (Afullo, 2004). This is however a non-network performance aspect of QoS yet service access probability is a network performance QoS aspect. ITU (2008) also recommends Mean service access delay as a measure of QoS; The expectation of the time duration between an initial bid by the user for the acquisition of a service and the instant of time the user has access to the service, the service being obtained within specified tolerances and other given operating conditions. Network accessibility; the probability that the user of a service after a request receives the proceed to select signal within specified conditions is another measure recommended by ITU (2008) but has not been found in other literature. Other ITU (2008) recommended measures for service accessibility include: Connection accessibility; The probability that a connection can be established within specified tolerances and other given conditions following receipt by the exchange of a valid code. Mean access delay; The expectation of the time duration between the first call attempt made by a user of a telecommunication network to reach another user or a service and the instant of time the user

reaches the wanted other user or service, within specified tolerances and under given operational conditions. Accessibility of a connection to be established; the probability that a switched connection can be established, within specified transmission tolerances, to the correct destination, within a given time interval, when requested by the user. For user originated calls, it could express the probability of a successful call establishment on the first attempt. For operator handled calls, it could represent the probability of having a satisfactory connection established within a given time duration. In general, the tolerances should correspond to a level of transmission performance which makes the connection unsatisfactory for service such that, for example, a substantial percentage of users would abandon the connection. Unacceptable transmission probability measures the probability of a connection being established with an unacceptable speech path transmission quality. These measures cannot be obtained from the customer yet the customer is based placed to determine service quality (Afullo, 2004).

2.5 Non-Network Performance aspects of QoS and Customer Satisfaction

Huendling & Weske (2006) assert that separating QoS properties into functional and non-functional is feasible and useful, because functional equivalence can be defined on two services with the same functional properties. Thus, a service can easily be replaced by a functional equivalent service with more suitable non-functional properties, e.g., lower cost, faster execution, and higher security. The implication to this research is that it's possible for two Telecommunications services providers to have similar Network Performance but differing QoS as long as their non-Network performance service aspects are different. It's also indeed possible for a provider to have excellent Network Performance whereas the QoS is poor if the non-Network performance components associated with the service are poor. This section shall review literature on the non-Network Performance components of QoS.

2.5.1 Service Support Performance and Customer Satisfaction

This study sought to establish the relationship between Service Support Performance and customer satisfaction. Afullo (2004) presented technical support as one of the measures of QoS in agreement with ITU (2008) who defines service support performance as the ability of an organization to provide a service and assist in its utilization. ITU (2008) gives an example of service support performance as the ability to provide assistance in commissioning a basic service, or a supplementary service such as the call waiting service or directory enquiries service and recommends the following measures of the performance concept: Mean service provisioning time; the expectation of the duration between the instant of time a potential user requests that an organization provides the necessary means for a service, and the instant of time when these means are furnished. Billing error probability; the probability of an error when billing a user of a service. Incorrect charging or accounting probability; the probability of a call attempt receiving incorrect charging or accounting treatment. Undercharging probability; the probability that a call attempt will be undercharged for any reason. Overcharging probability; the probability that a call attempt will be overcharged for any reason. Billing integrity (probability); the probability that the billing information presented to a user correctly reflects the type, destination and duration of the call attempt. This measure of service support is also used in the UK's measure of TSP's QoS but it's only referred to as billing and is said to describe the customer's perception of the accuracy of billing information (Afullo, 2004).

2.5.2 Service Operability Performance and Customer Satisfaction

ITU (2008) defines Service Operability Performance as the ability of a service to be successfully and easily operated by a user and recommends the following measures for the concept: Service user mistake probability; Probability of a mistake made by a user in his

attempt to utilize a service. Dialing mistake probability; the probability that the user of a telecommunication network makes dialing mistakes during his call attempts. Service user abandonment probability; the probability that a user abandons the attempt to use a service. Abandonments may be caused by excessive user mistake rates, by excessive service access delays, etc. Call abandonment probability; the probability that a user abandons the call attempt through a telecommunication network. These were considered when investigating the relationship between service operability and customer satisfaction in this study.

2.5.3 Service Security Performance and Customer Satisfaction

ITU (2008) defines Service Security Performance as the protection provided against unauthorized monitoring, fraudulent use, malicious impairment, misuse, human mistake and natural disaster but doesn't recommend the measures for this performance concept until further studies are done. The study measured security performance using the definition.

2.6 Summary of the Literature Review

The literature review focused on quality of service and customer satisfaction in mobile telecommunication. It was realized that most authors and the ITU agree that QoS has dimensions of network performance and non-network performance aspects. It was also realized that many authors are of the view that QoS contributes to customer satisfaction. The literature review has also helped to identify the measures that can be used in the study for the different quality of service concepts especially since previous studies were done basing on the SERVQUAL Model's conceptualization of QoS which isn't the same for this study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter will deal with the methodology that was used in conducting the study on quality of services and customer satisfaction in mobile telecommunications in Rwanda. It presents the study design, study population, sample size, sampling techniques, data collection methods, data collection instruments, Validity and Reliability of the instruments, data collection procedure, data analysis and measurement of the research variables.

3.2 Research Design

A cross-sectional research design was adopted to establish the state of quality of services and their relationship with customer satisfaction in Kigali. The above design was adopted because according to Babbie (2007) it involves observation of a sample of a population or phenomenon that is made at one point in time and this holds true for this study. Quantitative approach was used to quantify the number of respondents with a given opinion on all research questions.

3.3 Study Population

Kigali's population is estimated at (1.169889m) - One million, One hundred Sixty-nine thousand Eight hundred Eighty-nine people (World Population Review, 2021). The total number of active mobile-cellular telephone subscriptions in Rwanda increased from 9,667,021 at the end of May-2020 to 9,860,169 at the end of June-2020, representing an increase of 2.0%. As a result, the mobile-cellular telephone subscriptions per 100 inhabitants increased by 1.6 percentage points from 76.3% to 77.9%. (RURA, 2020). The City of Kigali made a big progress in terms of mobile phone ownership because the percentage of households with at least one mobile phone in Kigali

City was 79.6 per cent in 2010/2011 from 33.2 per cent in 2005/2006, which was a growth rate of 46.4 per cent in only five years.

3.4 Determination of sample size

A sample is a subset of a particular population (Mugenda and Mugenda, 1999). Sekaran (2003) elaborates on the above definition when he defines a sample as a subset of a population from which researchers should be able to draw conclusions that would be generalizable to the population of interest. Sekaran (2003) further recommends sample sizes from 30 to 500 being appropriate for research. The sample size for the study was 384 mobile telecommunications subscribers adapted from Krejcie and Morgan (1970). The study involved sampling with some objective decisions determining who and how many respondents will take part in the study. Sampling allowed the findings to be generalized to the population yet it saved time and kept the costs low.

3.5 Sampling Techniques and Procedures

These are the techniques used when selecting an appropriate sample to represent the total population (Babbie, 2007). A sampling technique is a plan for obtaining a sample from a given population (Kothari, 2009). The study took into consideration the heterogeneous nature of the strata that formed the population. The population was stratified along the lines of different Telecommunications Service Providers (TSP) and data was collected from all the districts of Kigali which are Nyarugenge, Kicukiro and Gasabo. Each TSP was to be represented basing on the market share; MTN Rwanda, Airtel/Tigo Rwanda, KT Rwanda Network (Wholesaler Network Service Provider, Liquid Telecom (Internet Service Provider) and others (RURA, 2019). Quota sampling was used along the lines of TSPs and their market share to ensure that all TSPs are represented. In quota sampling people are selected according to some fixed quota. In proportional

quota sampling, the major characteristics of the population are represented by sampling a proportional amount of each (Babbie, 2007). Proportional quota sampling was thus used in the study and the quotas were generated according to each TSP’s market share as shown in table 2 below.

Table 2: Mobile telephone network coverage per type of technology and per operator as of March 2015

Operator	2G	2.5G	3G	3.5G
GEOGRAPHIC COVERAGE				
MTN Rwanda Ltd	99.11%	99.11%	69.57%	69.57%
Tigo Rwanda Ltd	89.62%	89.62%	16.00%	16.00%
Airtel Rwanda Ltd	92.02%	92.02%	17.00%	17.00%
POPULATION COVERAGE				
MTN Rwanda Ltd	99.91%	99.91%	89.03%	89.03%
Tigo Rwanda Ltd	99.98%	99.98%	52.43%	52.43%
Airtel Rwanda Ltd	93.45%	93.45%	23.15	23.15

Source: **RURA operators’ returns**

3.6 Data Collection Method

According to Sekaran (2003) data collection methods are an integral part of a research design. There are several data collection methods and if properly used the methods greatly enhance the value of research but for this study, a questionnaire survey is the method that was used in the study. Afullo (2004) asserts that this method in particular has many advantages including being cost-effective and it collects data directly from the source of perceived service quality.

3.7 Data Collection Instruments

Data collection instruments are the tools used to collect the necessary information for the study. (Mugenda and Mugenda, 2003). Since the study is quantitative, self-administered questionnaires were used to collect data.

3.7.1 Self-administered questionnaires

This method was used because it is easy to administer, time saving and cost effective (Mugenda and Mugenda, 1999). It also generates unbiased responses since respondents are sometimes reluctant to report controversial or deviant attitudes on interviews but are willing to respond to an anonymous structured questionnaire (Babbie, 2007).

The questionnaire was set on a five-point Likert scale. This involved the respondents indicating how closely their feelings matched the question or statement on a rating scale. The number at one end of the scale represented least agreement, or "Strongly Disagree," and the number at the other end of the scale represented most agreement, or "Strongly Agree." The Likert scale was chosen because it is unambiguous and allows for calculating the average index score for those agreeing or disagreeing with each individual statement and thus indicating the greater or lesser degree of prejudice reflected in a particular response.

3.8 Validity and Reliability of Instruments

Reliability measures the degree to which a research instrument yields consistent results after repeated trials while validity measures the degree to which the results obtained from the field are relevant to the study (Amin, 2005).

3.8.1. Validity

This was determined by setting questions that correctly represented the variables under study and gave four experts the questionnaires to judge if the set questions were valid for finding out the relationship between quality of services and customer satisfaction in Kigali. Content validity is indicated if the items in the data collection tool sample the complete range of the attribute under study, Schultz and Whitney (2005). It was determined by computing the Content Validity Index (CVI) as shown in the table below. The average CVI obtained from the

four experts were 0.81 well above the 0.7 minimum recommended by Amin (2005). The computation is shown in table 3 below.

Table 3: Content Validity Computation

Expert	Validity Score
1	73
2	70
3	92
4	89
Average	81

Source: Primary data

3.8.2 Reliability

In this study, the data collection instrument was pre-tested to assess its reliability. The instrument was piloted on a small group of ten (10) individuals. A reliability coefficient was computed to indicate the data’s reliability. Cronbach’s coefficient Alpha was adopted by the study to determine how items correlate among themselves. Cronbach’s Internal consistency method is the most popular when using Likert scale Instruments (Amin, 2005). Reliability was measured numerically using the Cronbach alpha coefficient, where any value from 0.5 to 1 was regarded as reliable for internal consistence (Mugenda and Mugenda, 2003). The questionnaire was amended to remove mistakes and a final copy was presented to the study supervisors for approval before data was collected. Table 4 below shows the obtained Cronbach alpha values and since all were above 0.5 thus all were reliable.

Table 4: Computed Cronbach Alpha values

Dimension	Number of Items	Cronbach’s Alpha value
Network Performance	7	0.755
Non-Network Performance	14	0.729
Customer Satisfaction	11	0.778

3.9 Procedure of Data Collection

A letter of introduction was obtained from University of Kigali, and presented to the participants that were contacted to take part in the study. A pilot study of data collection instruments was conducted in the area of study to get their validity and reliability. The questionnaires were then administered to respondents.

3.10 Data Analysis

The study employed quantitative methods of data analysis since it was purely quantitative. The data collected was edited, coded and later analyzed using SPSS computer package. Quantitative data was presented in form of descriptive statistics using mean and standard deviations for each of the variables used in the study, correlation and regression techniques. Pearson’s coefficient (r) was used because the scale that accompanied the questionnaire was ordinal. Significance (p) was tested at 95% confidence levels based on two tailed correlations to determine the confidence in the findings. A positive correlation would indicate a direct positive relationship between the variables while a negative correlation would indicate a negative relationship between the two variables. The regression analysis used the adjusted R^2 values and significance values to determine the magnitude of the influence of the independent variables on the dependent variable (Amin, 2005). The correlation coefficient(r) was used to determine the strength of the relationship between as shown in table 5 below.

Table 5: Pearson Correlation Interpretation

Pearson’s correlation coefficient(r)	Interpretation
0	No correlation
Less than 0.35	Low or weak correlation
0.36 – 0.67	Moderate or modest correlation
0.68 – 0.99	Strong or High correlation
1	Perfect Correlation

Source: Taylor (1990).

3.11 Measurements of variables

The questionnaire was designed to ask responses about mobile telecommunications quality of service and customer satisfaction. These were channeled into measurable elements to enable the development of an index of the concept. The variables for this study were measured using the interval scale. Thus, it was possible to perform arithmetical operations on the data collected from the respondents, measuring the magnitude of the differences in the preferences among respondents by computing means and standard deviations. This was possible because the responses to the items in the study were tapped on a 5-point Likert scale to measure both the independent and dependent variables. It was therefore possible to measure the distance between 2 points on the scale (Sekaran, 2003). This is shown in table 6 below.

Table 6: Table showing the five points Likert Scale used

Statement	Points
Strongly Agree	5
Agree	4
Undecided/Neutral	3
Disagree	2
Strongly disagree	1

Source: Primary data

CHAPTER FOUR

PRESENTATION, ANALYSIS AND INTERPRETION OF FINDINGS

4.1 Introduction

This chapter presents analyses and interprets the result of the study findings. The data was collected using questionnaires whose validity and reliability had been ensured. The analysis is made of descriptive statistics and analysis of variance (ANVOA). The response rate is presented followed by the background information about respondents. Presentation and analysis of findings in relation to specific objectives of the study is then done.

4.2 Response Rate

In this study the sample size was 300 but out of 300 Questionnaires distributed, 291 were returned giving an overall response rate of 97% which is an acceptable response rate since it is above the 50% rate that Mugenda and Mugenda (2003) recommends. This indicates that much of the targeted population was realized and information generated can be generalized and used for decision making. The details are indicated in table7 below.

Table7. Response Rate

Telecommunication Service Provider	Sample Size	Number of Respondents	Response Rate
MTN	165	160	97
Airtel/Tigo	125	121	97
Others	10	10	100
Overall	300	291	97

4.3 Background Characteristics of the sample.

In this section the background characteristics of the respondents are presented. The section presents gender distribution of the study respondents, their Telecommunications Services Provider, period of subscription, type of subscription and the division of Kigali where they worked or stayed. This information was considered useful in that it would reveal the relevance and knowledge base of the respondents to give informed responses.

4.3.1 Distribution of respondents by gender

The study composed of 291 respondents of which 157 were male and 134 were female. The study findings indicated that most respondents were men at 54% while 46% were females as illustrated in figure 4 below. This could mean that men were more willing to take part in the study. The study data was from nearly the same number of women and men so there was no gender bias in the findings.

Distribution of Respondents' Gender

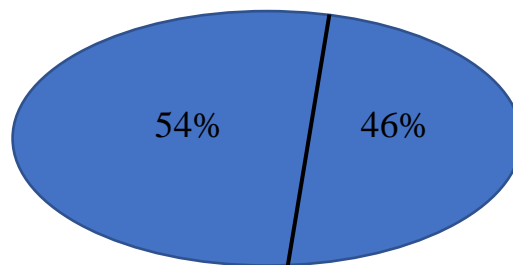


Figure 4: Demographic description of the sample by gender

4.3.2 Respondents period of Telecommunications Subscription

The number of years that a respondent had spent with a particular Telecommunications Services Provider is shown in table 8 below.

Table 8: Period of subscription to a particular network

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 1 year	16	5.5	5.5	5.5
1-3 years	75	25.8	25.8	31.3
3-5 years	91	31.3	31.3	62.5
Over 6 years	109	37.5	37.5	100.0
Total	291	100.0	100.0	

Source: Primary data

As seen in Figure 5 above, 109 respondents had subscribed to their networks for over 6 years and they made up 37.5%. Those who had been with a particular TSP between 3-5 years were 91 (31.3%) while those between 1-3 years were 75 (25.8%). Those who had been with a telecommunications service provider for less than a year were 16 (5.5%). These figures make the study findings reliable since most of the respondents had substantial experience with their TSPs.

4.3.3 Type of Subscription

Type of subscription shows the payment plans of the respondents as presented in table 9 below.

Table 9: Type of subscription

	Frequency	Percent	Valid Percent	Cumulative Percent
Prepaid (load airtime)	271	93.1	93.1	93.1
Post-paid (Receive monthly bill)	20	6.9	6.9	100.0
Total	291	100.0	100.0	

Source: Primary Data

The study findings indicated that 271 (93%) of the respondents were using a prepaid payment plan. The rest (20) used the postpaid plan and were 7%. This is not surprising as most people in Rwanda do not have permanent and reliable addresses where bills would be delivered. Prepaid payment plans are most convenient for TSPs and their clients. The study respondents were drawn from both subscription categories in proportions representative of the population.

4.4 Descriptive results on Network performance aspects of quality of service

The first objective of the study was to establish the relationship between network performance and customer satisfaction in Rwanda. According to the conceptual frame work presented in chapter one, network performance aspects of quality of service are measured using three indicators that were gathered by asking the respondents seven questions. The questions and associated responses are shown in table 6 below. It contains the questions posed to respondents about network performance aspects of QoS and the answers obtained giving their frequencies, percentages, mean, and standard deviation scores. Further, the mean values above three (>3.00) reveal agreement while the scores below three (<3.00) reveal disagreement in responses, similarly, the standard deviation scores less than one (<1) reveal communalities well as scores above one (>1) reveal divergences.

Findings from table 11 below reveal that more than half the respondents agreed that their phone calls were maintained to completion. This comprised of the 46.7% that agreed and the 13.1% that strongly agreed with the statement on the issue. 23.4% disagreed and 10% strongly disagreed with the statement. This combined gave 33.4% of telecommunications subscribers that reported that they drop calls.

On the other hand, 55% and 23% of respondents agreed and strongly agreed that a disconnection is promptly made when they end a phone call. This shows that 78% of respondents did not have any problems with prompt disconnection when they ended a phone call. 4.8% of respondents were neutral while 13.7% and 3.4% or respondents disagreed and strongly disagreed with the statement.

This showed that generally the TSPs performance on service retainability is good.

Table 10: Descriptive results for Network Performance aspects of Quality of Service

Questions on Network Performance aspects of Quality of Service	Responses (Percentage Response)					Mean	Standard Deviation
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
Service Retainability Performance							
Once you place a phone call, it's always maintained up to when you complete.	29 (10.0)	68 (23.4)	20 (6.9)	136 (46.7)	38 (13.1)	3.3	1.24
Once you end a phone call, a disconnection is promptly made.	10 (3.4)	40 (13.7)	14 (4.8)	160 (55.0)	67 (23.0)	3.8	1.05
Service Integrity Performance							
Once you place a phone call, it's clear for the whole duration of the call.	21 (7.2)	91 (31.3)	34 (11.7)	113 (38.8)	32 (11.0)	3.15	1.19
When you attempt to send an SMS, it is promptly sent.	11 (3.8)	64 (22.0)	24 (8.2)	49 (51.2)	43 (14.8)	3.62	2.05
Service Accessibility Performance							
When you make a call, you often get through on the first attempt.	35 (12.0)	102 (35.1)	28 (9.6)	103 (35.4)	23 (7.9)	2.92	1.23
You always have network bars on your phone.	24 (8.2)	79 (27.1)	21 (7.2)	120 (41.2)	47 (16.2)	3.3	1.26
Value added services like mobile money; SMS are available whenever you need them.	29 (10.0)	99 (34.0)	32 (11.0)	94 (32.3)	37 (12.7)	3.04	1.26

Source: Primary Data

From the same table 11 above, 38.8% and 11% of respondents agreed and strongly agreed to have clear phone calls for the whole duration of a call while 31.3% and 7.2% disagreed and strongly disagreed respectively. 11.7% were neutral. An average of 3.15 showed that almost half the respondents did not find their TSPs service integrity performance so good when it came to phone call clarity. There is thus a lot of room for improvement by the TSPs when it comes to clarity of phone calls.

51.2% and 14.8% of respondents agreed and strongly agreed respectively that their SMS are promptly sent whenever they attempt while 22% and 3.8% disagreed and strongly disagreed respectively. 8.2% were neutral. The mean was 3.62 showing that more people agreed to having their SMS promptly sent though a standard deviation of 2.05 means the views on this issue were very divergent. Much as the majority found the performance on this aspect acceptable, the TSPs still need to improve the aspect as the unsatisfied percentage (26%) is substantially big. All indicators of service integrity had an average above 3 that showed that majority did not find that dimension wanting. Since the values were below 4

Respondents were asked if they often got through on the first attempt of making a call, 35.4% and 7.9% agreed and strongly agreed with the statement while 9.6 were neutral. 35.1% and 12% or the respondents disagreed and strongly disagreed with the statement. A mean of 2.92 was obtained showing that the majority did not agree.

41.2% and 16.2% of respondents agreed and strongly agreed to always having network signal bars on their phone while 7.2% were neutral. 27.1% and 8.2% of respondents disagreed and strongly disagreed respectively. A mean of 3.3 showed that most respondents agreed while a standard deviation of 1.26 showed divergent views.

Findings also indicated that 32.3% and 12.7% agreed and strongly agreed respectively that value added services like mobile money and SMS were available whenever needed. Further, 34% and 10% of respondents disagreed and strongly disagreed while 11% were undecided.

Table 11 below shows the responses obtained from respondents when asked about their satisfaction with the quality of their network. This question was meant to establish what the respondents feel about the network performance of their telecommunications service provider.

Table 11: Respondents satisfaction with their networks’ performance

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	187	63.8	63.8	63.8
No	104	36.2	36.2	100.0
Total	291	100.0	100.0	

Source: Primary Data

Table 12 above shows that 64% of the respondents were satisfied with the network performance of their TSP while 36% of the same respondents were not.

4.5 Correlation Results for Network Performance and Customer Satisfaction

The researcher sought to establish whether a relationship existed between network performance and customer satisfaction. This was done with the support of the Pearson correlation product moment technique. Table 13 below shows the results that emerged. It comprises of two variables; network performance and customer satisfaction, Level of significance (sig., at 95%) and N stands for number of respondents who returned the questionnaires and the Pearson correlation (R=.193**), sig (=001) N (=291). The R value of .193** reveals that a weak positive relationship was found between network performance and customer satisfaction in Kigali.

Table 12: Correlation results for Network performance aspects of quality of service and customer satisfaction.

	Network performance aspects of quality of service	Customer Satisfaction
Pearson Correlation	1	.193**
Sig. (2-tailed)		.001
N	291	291

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Primary Data

Table 12 above shows a weak positive correlation 0.193 between network performance aspects of quality of service and customer satisfaction. The correlation is significant at 95% level of confidence since the probability value is 0.001. This implies that there was a significant weak positive relationship between network performance aspects of Quality of Service and customer satisfaction as described in table 3. Network performance aspects of QoS thus do affect customer satisfaction. The better the network performs; the more TSP clients are satisfied. There are however other factors that affect customer satisfaction and these could include price and availability of TSP outlets and their products and services like scratch cards for loading airtime that were not investigated in the study.

4.6 Regression Results for Network Performance and Customer Satisfaction

A regression analysis; the model summary in particular was used to establish the variation or effect network performance had on customer satisfaction. The results that emerged are shown in table 13 below:

Table 13: Regression results for Network performance aspects of quality of service and customer satisfaction

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.193 ^a	.037	.034	.39864

a. Predictors: (Constant), Network performance aspects of quality of service

Source: Primary Data

The model summary as shown in table 11 above comprises of values; R, R squared, adjusted R square and the standard error of the estimate; where R=.193, R²=.037, adjusted R²= .034 and standard error =.39864 using the predictor; Network Performance aspects of QoS. The adjusted R-square value of .034 indicates that Network performance was found to have a 3.4% effect on customer satisfaction and the remaining 96.6% was attributed to other factors. The adjusted R-square value is the coefficient of determination and the value that was obtained meant that network performance could account for 3.4% of the variations in customer satisfaction.

4.7 Descriptive results on non-Network performance aspects of Quality of Service

According to the conceptual frame work non network performance aspects of quality of service are measured using three indicators that were gathered by asking the respondents fourteen questions. The questions and associated responses are shown in table 15 below. It contains the questions posed to respondents about non network performance aspects of QoS and the answers obtained giving their frequencies, percentages, mean, and standard deviation scores. Further, the mean values above three (>3.00) reveal agreement while the scores below three (<3.00) reveal disagreement in responses, similarly, the standard deviation scores less than one (<1) reveal communalities well as scores above one (>1) reveal divergences.

Table 14: Descriptive results on non-Network performance aspects of quality of service

Questions on Non-Network Performance aspects of Quality of Service	Responses (Percentage Response)					Mean	Standard Deviation
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
Service Support Performance							
Service provider charges you the right amount for the services.	30 (10.3)	93 (32.0)	37 (12.7)	108 (37.1)	23 (7.9)	3	1.19
Your Airtime is not deducted under unclear circumstances.	57 (19.6)	95 (32.7)	16 (5.5)	86 (29.6)	37 (12.7)	2.83	1.38
Service provider assists you in using the services offered.	16 (5.5)	43 (14.8)	35 (12.0)	165 (56.7)	32 (11.1)	3.53	1.05

Questions on Non-Network Performance aspects of Quality of Service	Responses (Percentage Response)					Mean	Standard Deviation
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
When you have complaints, they are satisfactorily addressed.	26 (8.9)	80 (27.6)	49 (16.8)	111 (38.1)	25 (8.6)	3.2	2.1
When you load Airtime credit on your phone, it is immediately reflected on your account.	07 (2.4)	21 (7.3)	13 (4.5)	160 (55.0)	90 (30.9)	4.05	0.92
You are always able to check your account balance.	10 (3.4)	44 (15.1)	22 (7.6)	145 (49.8)	70 (24.2)	3.76	1.09
The customer help Line is promptly answered when you call.	84 (28.9)	112 (38.5)	23 (7.9)	46 (15.5)	26 (8.9)	2.36	1.29
The customer helpline staffs satisfactorily resolve your complaints.	32 (11.0)	86 (29.7)	49 (16.8)	104 (35.7)	20 (6.9)	2.98	1.17
Service Operability Performance							
Services from your provider are easy to use.	12 (4.2)	47 (16.2)	24 (8.2)	173 (59.5)	35 (12.0)	3.59	1.03
Mistakes are not made when using the services provided.	19 (6.5)	83 (28.4)	49 (16.8)	120 (41.2)	20 (6.9)	3.13	1.2
When many mistakes are made during service use, you abandon the service.	29 (10.0)	83 (28.5)	57 (19.6)	92 (31.6)	30 (10.3)	3.04	1.19
Service Security Performance							
There isn't an authorized monitoring of your phone services usage.	23 (7.9)	54 (18.6)	106 (36.5)	85 (29.2)	23 (7.9)	3.24	2.62
You are not likely to suffer loss from fraudsters through your phone.	26 (8.9)	93 (32)	78 (26.8)	72 (24.7)	22 (7.6)	2.9	1.1
You are not charged for unsolicited messages (SMSs)	51 (17.4)	75 (26.8)	39 (13.4)	98 (33.7)	28 (9.6)	2.93	1.29

Source: Primary Data

Table 14 above shows that 33% and 10.3% of respondents disagreed and strongly disagreed respectively that TSP charge the right amount for services rendered. 12.7% of the same respondents were undecided to this effect. 37.1% and 7.8% of the respondents agreed and strongly agreed respectively to same effect. A mean of 3 means generally respondents were neutral to the statement. This shows that many clients are not happy with the billing performance of TSPs which could mean that there is a knowledge gap with many not knowing how much they should be charged and under what circumstances different charges apply.

A statement asserting that airtime was not deducted under unclear circumstances had results that showed that 32.6% and 19.7% of the respondents disagreed and strongly disagreed respectively. 5.5% of the same respondents were undecided. About 30% and 13% of the respondents agreed and strongly agreed respectively. The mean was less than 3 meaning that generally respondents asserted that their airtime was deducted under unclear circumstances. This should send a message to TSPs to improve their billing systems and to sensitize their clients so that they appreciate how they are charged for the services provided because the findings could only mean that TSP clients don't understand how they are billed or the billing has so many errors.

Table 14 above also shows that 14.8% and 5.4% of the respondents disagreed and strongly disagreed respectively that service providers assist in using the services offered. 12% of the same respondents were undecided to this effect. 56.6% and 11% of the respondents agreed and strongly agreed respectively. A mean of 3.54 showed that generally service providers do assist in use of the services they offer and a standard deviation of 1.05 means the respondent's views didn't diverge so much. This shows that this service support aspect of non-network performance aspect of QoS is well executed by TSPs.

27.4% and 8.9% of the respondents disagreed and strongly disagreed respectively that complaints were satisfactorily addressed by their respective TSPs. 16.8% of the same respondents were undecided to this effect. 38.2% and 8.6% of the respondents agreed and strongly agreed respectively to same effect. The views on the issue were very divergent, given a standard deviation of 2.1. Much as the majority (54%) did not fault the TSPs when it came to addressing complaints raised, those not happy with the aspect (32%) make up a substantially big number that should not be ignored and TSPs need to improve their response to complaints raised. They could do this by ensuring that their staff is very knowledgeable and skilled to satisfactorily address client needs.

7.3% and 2.3% of the respondents disagreed and strongly disagreed respectively to airtime being immediately reflected on their accounts whenever they topped up. 5% of the same respondents were undecided to this effect yet 55% and 30.8% of the respondents agreed and strongly agreed respectively. A mean of 4.1 showed that generally airtime was reflected as soon as respondents topped up and a standard deviation of 0.93 showed that views on the issue were not divergent.

15.1% and 3.4% of the respondents disagreed and strongly disagreed respectively to always being able to check their account balance while 7.6% of the same respondents were undecided 49.8% and 24.1% of the respondents agreed and strongly agreed respectively. A mean of 3.76 obtained would imply that generally respondents were always able to check their account balance.

36.5% and 28.9% of the respondents disagreed and strongly disagreed to having the customer help line promptly answered when they called while 7.6% of the same respondents were undecided. 15.5% and 8.8% of the respondents agreed and strongly agreed. A mean of 2.37 obtained indicates that generally the customer help line was not promptly answered when

respondents called. These findings clearly show that TSPs need to increase the number of lines and staff that attend to customer help lines as that aspect of service support performed so poorly. Increasing the number of helpline staff would reduce the waiting time endured when a TSP client calls and this would improve customer satisfaction.

28.9% and 38.5% of the respondents disagreed and strongly disagreed respectively to having their complaints satisfactorily resolved by customer helpline staff while 16.8% of the same respondents were undecided. On the other hand, 35.7% and 6.8% of the respondents agreed and strongly agreed respectively. A mean of 2.98 showed that generally respondents felt that their complaints were not satisfactorily resolved by customer helpline staff. It is clear that TSP customer helpline staff and other staff need to be better equipped with knowledge and skills, say through continuous training, to increase the resolution of customer complaints. It could also mean that TSPs need to review their customer complaint resolution processes so as to make them more efficient and effective.

Table 15 above also shows that 16.1% and 4.1% of the respondents disagreed and strongly disagreed respectively to a statement asserting that services from their TSPs were easy to use. 8.2% of the same respondents were undecided while 59.4 % and 12% of the respondents agreed and strongly agreed respectively. A mean of 4% obtained implies that generally speaking, services are easy to use and a standard deviation of 1.03 shows little divergence in views.

28.5% and 5.5% of the respondents disagreed and strongly disagreed respectively to making mistakes while using services of TSPs. 17% of the same respondents were undecided. About 41% and 07% of the respondents agreed and strongly agreed respectively. This showed that TSP services are generally easy to use.

From table 14 above, it's also seen that 28.5% and 10% of the respondents disagreed and strongly disagreed respectively to a statement stating that they would abandon the service if many mistakes were made. 19.6% of the same respondents were undecided while 31.6% and 10.3% of the respondents agreed and strongly agreed respectively.

17.6% and 6.9% of respondents disagreed and strongly disagreed respectively to absence of an authorized monitoring of their phone services usage yet 36.4 % were undecided. 29.1 % and 7.9% of the respondents agreed and strongly agreed respectively. A standard deviation of 2.62 showed that views on the statement were very divergent. This big divergence in views shows that TSP clients had not been sensitized about the issue and don't have much trust in the TSPs regarding their privacy.

32% and 8.9% of the respondents disagreed and strongly disagreed respectively to a likelihood of suffering loss from fraudsters through their phones. 26.8% were undecided yet 24.7% and 7.4% of the respondents agreed and strongly agreed respectively.

Table 14 also shows that when respondents were asked whether they are not charged for unsolicited SMSs 26.8% and 17.5% of the respondents disagreed and strongly disagreed respectively and 13.4% were undecided. Of those remaining 33.7% and 9.6% of the respondents agreed and strongly agreed respectively. An average of 2.72 indicates that most respondents had been charged for unsolicited SMSs and a standard deviation of close to 1.3 showed that the views were divergent.

Table 15 below shows the responses obtained from respondents when asked about their satisfaction with the quality of customer service they received through the call center (help line) or contact with their mobile service provider staff. This question was meant to establish what the respondents felt about the non-network performance aspects of quality of service of their telecommunications service providers.

Table 15: Respondents satisfaction with non-network performance aspects of Quality of service

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	156	53.4	53.4	53.4
No	135	46.6	46.6	100.0
Total	291	100.0	100.0	

Source: Primary Data

Table 15 above shows that 53.4% of the respondents were satisfied with the network performance of their telecommunications service providers while 46.6% of the same respondents were not. It's noted that more respondents were satisfied with the network performance of their TSPs than with their non-network performance aspects of QoS.

4.8 Correlation results on non-Network performance aspects of Quality of Service

The researcher sought to establish whether a relationship exists between non network performance aspects of quality of service and customer satisfaction. This was done with the support of the Pearson correlation product moment technique. Table 17 below shows the results that emerged. It comprises of two variables; non network performance aspects of QoS and customer satisfaction, Level of significance (sig., at 95%) and N which stands for number of respondents who returned the questionnaires and the Pearson correlation ($R=.245^{**}$), sig (=000) N (=291). The R value of $.245^{**}$ reveals that a significant weak positive relationship exists between network performance and customer satisfaction in Kigali.

Table 16: Correlations between Non-network performance aspects of quality of service and Customer satisfaction

		Customer satisfaction	Non-network Performance aspects of quality of service
Customer satisfaction	Pearson Correlation	1	$.245^{**}$
	Sig. (2-tailed)		.000
	N	291	291

******. Correlation is significant at the 0.05 level (2-tailed).

Source: Primary Data

Table 16 above shows a weak positive correlation (0.245) between non-network performance aspects of quality of service and customer satisfaction. The correlation is significant since the probability value is 0.000 this implies that there was a significant weak positive relationship between non network performance aspects of QoS and customer satisfaction as derived from table 3 above. These results show that increases in non-network performance aspects of QoS would result in increases in customer satisfaction but not substantially.

4.9 Regression Results for Non Network Performance aspects of Quality of Service and Customer Satisfaction

A regression analysis; the model summary in particular was used to establish the effect of non-network performance aspect of QoS on customer satisfaction. The results that emerged are shown in table 17 below:

Table 17: Regression results for Non Network performance aspects of quality of service and customer satisfaction

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.245 ^a	.060	.057	.39386

a. Predictors: (Constant), Non Network performance aspects of quality of service

Source: Primary Data

The model summary table above comprises of values; R, R squared, adjusted R square and the standard error of the estimate; where R=.245, R²=.060, adjusted R²= .057 and standard error=.39386 using the predictor; Non Network Performance aspects of QoS. The adjusted R-square value of .057 indicates that non network performance aspects of QoS were found to account for 5.7% of the variations in customer satisfaction and the remaining 92.3% was attributed to other factors.

4.10 Descriptive Results for Customer satisfaction

According to the conceptual frame work presented in chapter one, customer satisfaction was measured using three indicators that were gathered by asking the respondents eleven questions. The questions and associated responses are shown in table 18 below. It contains the questions posed to respondents about satisfaction and the answers obtained giving their frequencies, percentages, mean, and standard deviation scores. Mean values above three (>3.00) reveal agreement while the scores below three (<3.00) reveal disagreement in responses, similarly, the standard deviation scores less than one (<1) reveal communalities well as scores above one (>1) reveal divergences.

Table 18: Descriptive Results for Customer satisfaction

Questions on Customer Satisfaction	Responses (Percentage Response)					Mean	Standard Deviation
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
Loyalty to Company							
You would recommend your Mobile Service provider to someone who seeks your advice	12 (4.0)	43 (14.8)	38 (13.1)	155 (53.2)	43 (14.5)	3.6	1.11

Questions on Customer Satisfaction	Responses (Percentage Response)					Mean	Standard Deviation
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
Your current mobile telecommunications services provider is your first choice to buy telecommunications services	14 (4.8)	69 (23.7)	51 (17.5)	121 (41.6)	36 (12.4)	3.33	1.11
Propensity to Switch							
You intend to spend less on your current telecommunications service provider in future	24 (8.2)	47 (16.1)	60 (20.6)	123 (42.2)	37 (12.7)	3.35	1.14
You intend to take some of your business to a competitor that offers better prices	17 (5.8)	46 (15.8)	51 (17.4)	134 (46.0)	43 (14.8)	3.48	1.1
You intend to take some of your business to a competitor that offers better quality	14 (4.8)	49 (16.7)	41 (14.1)	130 (44.7)	57 (19.6)	3.57	1.13
Willingness to pay more							
You would continue with your current service provider if their price increases somewhat	52 (17.9)	93 (32.0)	56 (19.2)	73 (25.1)	17 (5.8)	2.68	1.29
You pay a higher price than competitors charge for the benefits you currently receive from your service provider	54 (18.6)	92 (31.6)	56 (19.2)	79 (27.1)	10 (3.4)	2.72	1.62
External Response to problems							
You are likely to switch to another Telecommunications service provider.	21 (7.2)	78 (26.8)	59 (20.3)	88 (30.2)	48 (15.5)	3.2	1.2
You would share your frustration with others if you experienced a problem with your current provider's service	15 (5.2)	25 (8.6)	30 (10.3)	159 (54.6)	62 (21.3)	3.78	1.04

Questions on Customer Satisfaction	Responses (Percentage Response)					Mean	Standard Deviation
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree		
You would complain to external agencies like RURA if you experienced a problem with your current provider's service	19 (6.5)	57 (19.6)	64 (22.0)	100 (32.4)	51 (17.5)	3.37	1.17
Internal Response to problems							
You would complain to your service provider if you experienced a problem with their service	06 (2.1)	13 (4.4)	16 (5.5)	141(48 .5)	115(39. 5)	4.19	0.88

Source: Primary Data

Table 18 above shows that 13.8% and 4.1% of the respondents disagreed and strongly disagreed respectively to agreeing to recommend their mobile services providers to someone who sought their advice while 11.1% were undecided. 53.3% and 14.8% agreed and strongly agreed respectively. A mean of 3.6 shows that generally there was agreement though not strong.

The table also shows that 23.7% and 4.8% of the respondents disagreed and strongly disagreed respectively to a statement asserting their current mobile telecommunication service provider as their first choice to buy telecommunications services. 14.5% were undecided while 42.6% and 12.4% agreed and strongly agreed respectively. A mean of 3.3 meant that slightly more than half the respondents considered their then TSP their first choice for telecommunications services.

It's also shown that 16.2% and 8.2% of the respondents disagreed and strongly disagreed respectively to having intentions of spending less on their current telecommunication service in future while 20.6% undecided. Further, 41.3% and 11.7% agreed and strongly agreed

respectively. A mean of 3.35 indicated that generally respondent's intent to spend less on services from their TSPs yet a standard deviation of 1.1 showed some divergence in respondents' views.

Table 18 shows that 13.8% and 5.8% of the respondents disagreed and strongly disagreed respectively to be having intentions of taking some of their business to competitors of their TSPs that offered better services. On the other hand, 17.5% of the respondents were undecided while 46% and 14.8% of the respondents agreed and strongly agreed respectively. A mean of 3.48 obtained points to a fact that generally respondents intend to obtain services from TSPs whom they believe offer better services.

Results in the table show that when respondents were asked if they would take some of their business to their providers' competitor that offered better quality, 14.8% and 4.6% of them disagreed and strongly disagreed respectively while 14% were undecided. About 45% and 20% of the respondents agreed and strongly agreed respectively. A mean of 3.57 showed that respondents were more willing to change TSPs because of better quality prospects than because of price given that this mean is higher than that obtained above (3.48) when asked about doing the same for better prices.

32% and 17.9% of the respondents disagreed and strongly disagreed respectively to continuing with their TSPs if their TSPs prices increased somewhat while 19.2% were undecided. Further, 25.1% and 5.8% of the respondents agreed and strongly agreed respectively. A mean of 2.69 that was obtained shows that generally respondents would change TSPs following a price increment.

30.6 % and 18.6% of the respondents disagreed and strongly disagreed respectively to willingness to pay a higher price than competitors charge for the benefits they then received from their TSPs. 19.2% were undecided while 24.1% and 3.4% agreed and strongly agreed respectively. A mean of 2.72 shows that respondents were not willing to pay more and a standard deviation of 1.62 shows that views on this were very divergent. This shows that TSPs don't have much room to increase prices without disappointing their clients.

Table 18 above shows that 26.8% and 7.2% of the respondents disagreed and strongly disagreed respectively to the likelihood of switching to another TSP while 20% were undecided. 30.2% and 15.5% of the respondents agreed and strongly agreed respectively. The average was above 3 at 3.2 showing that generally respondents were likely to change to another TSP though not so many. The views were divergent given that the standard deviation was 1.2

8.6% and 5.2% of the respondents disagreed and strongly disagreed respectively to a statement that asserted that they would share their frustration with others if they experienced a problem with their then TSP. 10.1% of the same respondents were undecided while 52.6% and 21.3% agreed and strongly agreed. A mean of 3.78 showed that most of the respondents would share frustration with others. TSPs should thus note that their unsatisfied clients in Kigali are very likely to discourage other potential clients from joining that particular TSP.

When asked if they would complain to external agencies like RURA or RITA if they experienced a problem with their TSPs, 15.6% and 6.5% of the respondents disagreed and strongly disagreed respectively while 22% were undecided. 32.4% and 17.5% agreed and strongly agreed respectively. A mean of 3.37 shows that majority would actually complain to external agencies, while a standard deviation of 1.17 shows that views of the respondents were divergent. This shows that TSP clients expect RURA to be having mechanisms that can resolve their complaints.

Finally, table 18 above shows 4.5% and 2.1% of the respondents disagreed and strongly disagreed respectively to a statement that asserted that they would complain to their TSPs if they experienced a problem with their service while 4.5% were undecided. 48.5% and 4.19% of them agreed and strongly agreed respectively. A mean of 4.19 means that most of the respondents would complain to their TSPs if they experienced a problem while a standard deviation of 0.88 shows that the views on this issue were not divergent.

Respondents were also asked whether they were satisfied with their telecommunications services provider and the responses obtained are shown in table 17 below.

Table 19: Respondents satisfaction with their Telecommunications services Provider.

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	175	60.2	60.2	60.2
No	116	39.8	39.8	100.0
Total	291	100.0	100.0	

Source: Primary Data

Table 19 above shows that 60% of the customers were satisfied with their respective telecommunication service providers while 40% of the same respondents were not satisfied with the respective telecommunication service delivery. This partly explains the dissatisfaction of 40% of the respondents with respective telecommunications service delivery.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a discussion of findings obtained from the data presented in chapter four. It also comprises of the summary, conclusion and recommendation of the study based on the objectives of the study.

5.2 Summary of Key findings

The data that was collected provided information on respondents' TSP, period of subscription, type of subscription and districts of Kigali where they lived or worked. This background information showed that all TSPs were well represented as set out in the proportional quota sampling strategy that was used; it also showed that the majority of respondents had subscribed for a substantial period. 69 % had subscribed for over 3 years while 26% had subscribed for over a year giving a combined total of 95% meaning the respondents gave well informed views. The summary of the results pertaining to the study objectives are presented below.

5.2.1 Network Performance aspect of quality of service and Customer Satisfaction

The study established the relationship between network performance and customer satisfaction in Kigali which was one of the objectives. Network performance indicators that were measured included service retainability, Service integrity and service accessibility. Network performance was found to have a weak positive relationship with customer satisfaction as the Pearson correlation (R) value obtained was 0.193. In the regression results, network performance was found to account for 3.4 % of variations in customer satisfaction.

5.2.2 Non Network Performance aspects of Quality of Service and Customer Satisfaction

The second study objective was to examine the relationship between non network performance aspects of quality of service and customer satisfaction in Kigali. Non network performance indicators of QoS that were measured included service support, service operability and service security. Non network performance aspects of QoS were found to have a very weak positive relationship with customer satisfaction as the Pearson correlation (R) value obtained was 0.245. In the regression results, network performance was found to account for 5.7% of variations in customer satisfaction.

5.3 Discussion of findings

The discussions attempt to answer the study research questions and to explain the dependent variable basing on the findings. The discussion is organized according to the themes derived from objectives of the study. In the course of the discussion attempts were made to cross reference the implications of the findings with the existing literature.

5.3.1 Network Performance and Customer Satisfaction

Quality of service and customer satisfaction are independent but closely related, implying that an increase in one is likely to lead to an increase in another (Sureshchandar, Rajendran and Anantharaman, 2002). The first objective of the study was to establish the relationship between network performance and customer satisfaction in Kigali. Correlation results of Network performance and customer satisfaction showed that there was a weak positive relationship between network performance and customer satisfaction. A positive relationship was expected as had been predicted from the literature reviewed. Shahzad and Afsheen (2012) had done a study to determine the factors that influence customer satisfaction in Pakistan and had established that network coverage was among them which is an indicator of the service accessibility dimension of network performance. Findings of this study showed that up to 35%

of respondents did not always have network coverage in Kigali, which also explains the low levels of customer satisfaction that resulted. Responses obtained about network performance generally showed that TSP clients felt there was much to be desired about almost all indicators of network performance. This is in contrast to the results of network performance published by RURA in 2019.

5.3.2 Non Network performance aspects of Quality of Service and Customer Satisfaction

Quality evaluations are not made solely on the outcome of a service, but also involve evaluations of the process of service delivery (Parasuraman, Zeithaml, & Berry, 1988). The study thus also investigated non network performance aspects of QoS and customer satisfaction and indeed the study found that there was a significant relationship between non network performance aspects of QoS and customer satisfaction albeit weak.

Data collected about non network performance aspects of quality of service showed that many respondents (85%) were pleased with the aspect of immediate reflection of loaded credit on their phones which was a service support dimension indicator. This issue had the most positive response. On the other hand, the indicator that most respondents (68%) were not pleased was the promptness with which the customer helpline was answered. Also, a substantial number (40.6%) of respondents were not pleased with the resolution of complaints by the TSP customer helpline similarly, in a study done by Afullo (2004), a good proportion of customers were generally unhappy with complaint handling in both the UK and Botswana and this could mean that TSPs the world over need to streamline the way complaints are handled to achieve customer expectations which would increase customer satisfaction. There is no doubt concerning the importance of service quality and customer satisfaction as the ultimate goals of service providers and similarly, the need for customer satisfaction lies in its ability to result in economic success. Customer satisfaction is considered a prerequisite for customer retention and loyalty which helps in realizing economic goals like profitability, market share, and return on investment (Sureshchandar, Rajendran and Anantharaman, 2002).

5.4 Conclusions of the study

The study findings have led to the following conclusions.

5.4.1 Network Performance and Customer satisfaction

There is a significant positive relationship between Network Performance and customer satisfaction much as it is a weak relationship. When a TSP invests in improvements in network performance, the TSP's clients' satisfaction directly increases which could give them a competitive edge.

5.4.2 Non Network Performance aspects of QoS and Customer satisfaction

There is a significant positive relationship between Non-Network Performance aspects of QoS and customer satisfaction much as it is a weak relationship. Investing in improvements in non-network performance aspects of QoS of a TSP directly increases customer satisfaction which could give a competitive edge.

5.5 Recommendations

The findings do provide an insight into customers' satisfaction within mobile telecommunications domain much as the study was limited to Kigali. Results of this study should encourage strategy development by TSPs for superior service quality management in both network performance and non-network performance aspects of QoS.

5.5.1 Network Performance and Customer satisfaction

TSPs should continue to invest in network infrastructure so as to ensure that network performance is not compromised especially as their subscribers increase.

If TSPs must choose between Network performance and non-network performance aspects of QoS, they should perhaps put emphasis on Non Network performance as the study findings

indicated that it had a stronger influence on customer satisfaction compared to network performance aspects of QoS.

5.5.1 Non network Performance and Customer satisfaction

TSP Training programs should be tailored to equip staff with necessary skills and knowledge to better serve the customers and to remain competitive in the market. This would improve the non-network performance aspects of QoS and lead to increased customer satisfaction. A satisfied customer is a loyal customer and would bring more customers to the TSP.

TSPs should also increase the number of customer helpline staff and lines to improve on that aspect of service support which was the worst performing indicator.

Much as the TSPs regulator, RURA carries out network performance tests, it should in addition carry out nationwide surveys to ascertain the non-network performance aspects of QoS in the industry so as to enforce provision of quality services by TSPs. The findings obtained would support emphasis on the non-network performance aspects of QoS improvements.

5.6 Limitations of the study

The study findings may not be generalized to populations that are not urban. Also, the study findings may not be relevant in markets where there is a monopoly TSP. They are also limited to mobile telecommunication services excluding mobile internet as the study mainly focused on voice telephony and Short Message Service (SMS). The study findings are also limited to Mobile telecommunications and did not cover the fixed wireless telecommunications and fixed wired telecommunications.

5.7 Contributions of the study

The study showed that there was indeed a positive relationship between mobile telecommunications QoS and customer satisfaction in Kigali. It also showed that non network performance aspects of QoS influenced customer satisfaction more than network performance as more variations in customer satisfaction were due to the former. This is important to TSPs who are interested in means of creating competitive advantages and customer loyalty.

In addition, the study used a quality-of-service model that was developed and recommended by the International Telecommunications Union (ITU) to conceptualize quality of service. All previous studies that were reviewed had used the SERVQUAL model or its modifications. This sets this study apart and could be used by other scholars with interest in the ITU Quality of service model.

5.8 Areas recommended for future research

Given that the study was done in Kigali, Rwanda's capital and a predominantly urban area, future studies could be done in a rural area of Rwanda. Also, price was not among the factors studied yet it is likely to have an effect on customer satisfaction. Other factors like absence of number portability which would allow a subscriber to change a TSP but maintain the same phone number could also be investigated as some subscribers might be stuck with a TSP because they wouldn't want to change their phone number. In other words, a study could be done to determine the switching cost in mobile telecommunications in Rwanda. The same study could also be done to cover the whole geographical area of Rwanda. Also, a specific study could be done to cover mobile internet quality of service and customer satisfaction as social networks like Facebook and Twitter in addition to over-the-top services like WhatsApp, Instagram, Snap Chat, Tok-tok and others have become immensely popular in recent times and are mainly made possible by mobile internet.

Given that the study findings showed QoS to account for almost 40% of variations in customer satisfaction in Kigali, a study could be done to establish all the factors that affect TSP customer satisfaction in Kigali.

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APPENDIX I: QUESTIONNAIRE FOR TELECOMMUNICATIONS SERVICES PROVIDER'S CLIENTS

Dear respondent,

I am Muhire Francis, a student at University of Kigali pursuing a master's degree in Information Technology. I am conducting a study on -Mobile telecommunications quality of service and customer satisfaction in Kigali. Given your status as someone who works, studies or stays in Kigali, you have been chosen purposely for the study. Your response is therefore very instrumental to the success of my research. I would like you to be part of this study by responding to the questions herein. The data given is strictly for academic purposes and it will be treated with utmost confidentiality. *Instruction:* Please tick where appropriate

SECTION A: BIO DATA

1. **Gender** Male Female

2. **Your responses for the rest of this questionnaire should be from your experience from ONE Mobile Telecommunications Services Provider. Please indicate the**

provider below.

MTN ___

Airtel ___

Other ___ Please specify.....

3. How long have you been a subscriber of that Network?

Less than 1 year 1—3 years

3—5 years over 6 years

4. Type of subscription

a) Prepaid (Load airtime)

b) Post-paid customer (Receive monthly bill)

5. District of Kigali where you work or stay

Gasabo

Kicukiro

Nyarugenge

SECTION B: NETWORK PERFORMANCE ASPECTS OF QUALITY OF SERVICE

6. Are you satisfied with the quality of your network?

Yes No

In the table below please respond according to your first reaction to each statement by ticking in the box.

Strongly Disagree =1. Disagree = 2. Undecided/Neutral = 3 Agree = 4 and Strongly Agree = 5

	Service Retainability Performance	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
B.1	Once you place a phone call, it's always maintained up to when you complete.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
B.2	Once you end a phone call, a disconnection is promptly made.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
	Service Integrity Performance					
B.3	Once you place a phone call, it's clear for the whole duration of the call.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
B.4	When you attempt to send an SMS, it is promptly sent.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
	Service Accessibility Performance					
B.5	When you make a call, you often get through on	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree

	the first attempt.					
B.6	You always have network bars on your phone.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
B.7	Value added services like mobile money; SMS are available whenever you need them.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree

SECTION C: NON- NETWORK PERFORMANCE ASPECTS OF QUALITY OF SERVICE

1. Are you satisfied with the quality of customer service you receive through the call centre (help line) or contact with your mobile service provider staff?

Yes No

	Service Support Performance					
C.1	Service provider charges you the right amount for the services.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
C.2	Your Airtime is not Deducted under unclear circumstances.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
C.3	Service provider assists You in using the services offered.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
C.4	When you have complaints, They are satisfactorily addressed.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
C.5	When you load Airtime credit on your phone, it is immediately reflected on your account.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
C.6	You are always able to check your account balance.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
C.7	The customer help line is promptly answered when you call.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
C.8	The customer helpline staff satisfactorily resolves your complaints.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
	Service Operability Performance					
C.9	Services from your provider are easy to use.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
C.10	Mistakes are not made when using the services provided.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
C.11	When many mistakes are made during service use, you abandon the service.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
	Service Security Performance					
C.12	There isn't an authorized monitoring of your phone services usage.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree

C.13	You are not likely to suffer loss from fraudsters through your phone.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
C.14	You are not charged for unsolicited messages (SMSs)	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree

SECTION D: CUSTOMER SATISFACTION

Are you satisfied with your telecommunications service’s provider?

Yes No

	Loyalty to Company					
D.1	You would recommend your Mobile Service provider to someone who seeks your advice	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
D.2	Your current mobile telecommunications services provider is your first choice to buy telecommunications services	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
	Propensity to Switch					
D.3	You intend to spend less on your current telecommunications service provider in future	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
D.4	You intend to take some of your business to a competitor that offers better prices	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
D.5	You intend to take some of your business to a competitor that offers better quality	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
	Willingness to pay more					
D.6	You would continue with your current service provider if their price increases somewhat	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
D.7	You would pay a higher price than competitors charge for the benefits you currently receive from your service provider	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
	External Response to problems					
D.8	You are likely to switch to another Telecommunications service provider.	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
D.9	You would share your frustration with others if you experienced a problem with your current provider’s service	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree
D.10	You would complain to external agencies like RURA if you experienced a problem with your current provider’s Service	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree

	Internal Response to problems					
D.11	You would complain to your service provider if you experienced a problem with their service	Strongly Disagree	Disagree	Undecided /Neutral	Agree	Strongly Agree

Thank you very much for your time!!