

https://dspace.org/

The Impact of Big Data in Customer Retention in Telecommunications within South Africa

Pereira, Clint

2023
University of the Witwatersrand, Johannesburg
https://hdl.handle.net/10539/39908

Pereira, Clint. (2023). The Impact of Big Data in Customer Retention in Telecommunications within South Africa [Master's dissertatio, University of the Witwatersrand, Johannesburg]. WireDSpace. https://hdl.handle.net/10539/39908

Downloaded from a DSpace repository. https://dspace.org/

The Impact of Big Data in Customer Retention in Telecommunications within South Africa

Clint Pereira

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business

Johannesburg, 2023

C2 General

ABSTRACT

The telecommunications industry in South Africa has experienced a rapid adoption of Big Data techniques, which have the potential to enhance operational efficiency and decision-making. This study investigated the impact of Big Data on customer retention in the South African telecommunication sector by developing a conceptual framework focusing on service quality standards, advanced analytics, customer knowledge, and customer relationships.

The research methodology used a survey-based approach with a sample size of 123 individuals who are familiar with Big Data approaches. The survey employed a 7-point Likert scale to measure the impact of service quality, customer knowledge, advanced analytical techniques, and customer relationships on customer satisfaction and retention. Additionally, secondary research was conducted using data statistics to support the survey findings.

The study found that personalized options and advanced analytics through Big Data approaches significantly impact customer retention and satisfaction. Service quality elements, such as dependability, tangibility, and assurance, positively correlated with customer satisfaction. However, improved customer service and relationships were not significantly correlated with customer retention. The research identified challenges in data management, security, and leadership skills, recommending organizations to address these issues through proper consent management, data security measures, and providing relevant training for executives.

In summary, the study emphasizes the positive influence of Big Data techniques on customer retention and satisfaction in the South African telecommunication industry, providing valuable insights and implications for decision-makers.

DECLARATION

I, **Clint Cheslyn Pereira**, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Name: Clint Pereira Signature: 

Signed at Eikenhof

On the 19th day of June 2023

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to several individuals who have contributed to the successful completion of this thesis.

Firstly, I would like to thank my wife, Colette, for her unwavering love, support, and understanding throughout my academic journey. She has been a constant source of encouragement and has selflessly taken on additional responsibilities to allow me time to focus on my studies.

I am also deeply grateful to my children, Caden and Cyan, for their patience, understanding, and support throughout this journey.

I would like to extend my gratitude to my parents, Clarence and Berenice, for their love, support, and prayers throughout my academic career. Their faith in me has been a constant source of strength and motivation.

Special thanks to my friend and colleague, Jason, for his support, guidance, and encouragement throughout this academic journey.

I would like to express my sincerest gratitude to my Supervisor, Dr Nakuze Chalomba, for her guidance, support, and encouragement throughout this research project. Her valuable insights and feedback have been instrumental in shaping this report, and I am deeply grateful for her mentorship.

Furthermore, I extend my appreciation to my employer, Dee Nel, for the support and flexibility granted to me to pursue this academic achievement.

Finally, I would like to acknowledge my Lord and Saviour, Jesus Christ, who has been my source of strength, wisdom, and inspiration throughout this research journey. Without His grace and guidance, this research project would not have been possible.

Thank you all for being a significant part of my academic journey, and for your invaluable contributions to the successful completion of this report.

TABLE OF CONTENTS

LIST OF TABLES viii

LIST OF FIGURES ix

LIST OF ACRONYMS xi

CHAPTER 1. INTRODUCTION 14

1.1 BACKGROUND 14
1.2 RESEARCH PROBLEM 17
1.3 RESEARCH QUESTION 18
1.4 OBJECTIVES AND GOALS 19
1.5 KEY CONCEPTS 19
1.5.1. SERVICE QUALITY 19
1.5.1.1 RELIABILITY 20
1.5.1.2. ASSURANCE 20
1.5.1.3. TANGIBILITY 21
1.6. SIGNIFICANCE OF THE RESEARCH STUDY 22
1.7. DELIMITATIONS AND ASSUMPTIONS 23
1.8. OUTLINE OF THE STUDY 24

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK 26

2.1. INTRODUCTION 26
2.2. PERFORMANCE OF THE TELECOMMUNICATIONS INDUSTRY 26
2.3. EXISTING BIG DATA APPROACHES FOR CUSTOMER RETENTION WITHIN THE TELECOMMUNICATIONS SECTOR 29
2.3.1. CHURN ANALYSIS FOR BETTER CUSTOMER ENGAGEMENT MANAGEMENT 30
2.3.2. PRODUCT AND SERVICE DEVELOPMENT 30
2.3.3. NETWORK TRAFFIC ROUTING IN REAL-TIME 31
2.4. FUTURE SCOPE 32
2.5. EMPIRICAL REVIEW 33
2.5.1. CLIENT RETENTION 33
2.5.1.1. RELIABILITY 36
2.5.1.2. ASSURANCE 37
2.5.2.1. TNPS MEASUREMENT 39
2.6. THEORETICAL FRAMEWORK 40

CHAPTER 3. RESEARCH METHODOLOGY 53

3.1. RESEARCH APPROACH 53
3.2. RESEARCH PROCESS 56
3.3. SAMPLING DESIGN 58
3.3.1. TARGET POPULATION 58
3.3.2. SAMPLE SIZE 59
3.4. DATA COLLECTION 60
3.5. DATA ANALYSIS 62
3.6. ETHICAL CONSIDERATION 64
3.7. CONCLUSION 64

CHAPTER 4. PRESENTATION OF RESULTS / FINDINGS 65

4.1. INTRODUCTION 65
4.2. DESCRIPTIVE STATISTICS 65
4.3. SAMPLE DESCRIPTION 66
4.4. RELIABILITY AND VALIDITY OF CONSTRUCTS 76
4.4.1. RELIABILITY TEST 77
4.4.1.1. CRONBACH ALPHA COEFFICIENT 77
4.4.1.2. COMPOSITE RELIABILITY (CR) 78
4.4.2. VALIDITY TESTING 79
4.4.2.1. FACTOR LOADINGS 79
4.4.2.2. AVERAGE VALUE EXTRACTED (AVE) 80
4.4.2.3. CORRELATION MATRIX 81
4.5. STRUCTURAL EQUATION MODELLING 82
4.6. MODEL FIT ASSESSMENT 82
4.8.1. CHI-SQUARE VALUE (CMIN) 82
4.8.2. BASELINE COMPARISONS 82
4.8.3. ROOT MEAN SQUARE ERROR OF APPROXIMATION (RMSEA) 83
4.9. STRUCTURAL MODEL RESULTS 84
4.10. TNPS DATA FOR CUSTOMER EXPERIENCE 85
4.11. TNPS DATA FOR NETWORK EXPERIENCE 86
4.12. CUSTOMER RETENTION 88
4.13. CHURN RATIO 89
4.14. CHURN RATIO PREDICTION 90
4.15. SUMMARY OF HYPOTHESES RESULTS 90

CHAPTER 5. DISCUSSION OF THE RESULTS OR FINDINGS . 92

5.1 INTRODUCTION 92
5.2 PRIMARY RESULTS 92
5.2.1 CLIENT SATISFACTION AND CLIENT RETENTION 92
5.2.2 IMPROVED CUSTOMER KNOWLEDGE 95
5.2.3 ENHANCED ANALYTICS 96

5.2.4 IMPROVED CLIENT RELATIONSHIP 97
5.2.5 IMPROVED CUSTOMER SATISFACTION - TNPS (TOUCHPOINT NET PROMOTER SCORES) 99
5.3 SUMMARY OF THE FINDINGS. 100
5.4 CONCLUSION 100

CHAPTER 6. CONCLUSIONS & RECOMMENDATIONS 102

6.1 INTRODUCTION 102
6.2 MAIN CONCLUSIONS FROM THE LITERATURE REVIEW 102
6.3 CONCLUSIONS FROM THE FINDINGS 103
6.4 MANAGERIAL IMPLICATIONS 104
6.5 RECOMMENDATIONS AND IMPLICATIONS OF THE STUDY 105
6.5.1 CONCEPTUAL CONTRIBUTION 105
6.5.2 THEORETICAL CONTRIBUTION 106
6.5.3 STRATEGIC CONTRIBUTION 107
6.6 LIMITATIONS OF THE STUDY 109
6.7 FUTURE RESEARCH 110
6.8 CONCLUSION 112

REFERENCES 114

APPENDIX A (participant information sheet) 128

APPENDIX B (participant agreement form) 130

APPENDIX C (instrument) 131

APPENDIX D (ethics approval) 137

APPENDIX E (permission letter) 138

APPENDIX F (turn-it-in report) 139

LIST OF TABLES

Table 1 - Gender ..... **Error! Bookmark not defined.**

Table 2 – Age Group ..... **Error! Bookmark not defined.**

Table 3 - Region ..... **Error! Bookmark not defined.**

Table 4 - Occupation ..... **Error! Bookmark not defined.**

Table 5 – Questionnaire Responses ..... **Error! Bookmark not defined.**

Table 6 – Questionnaire Stats ..... **Error! Bookmark not defined.**

Table 7 - Composite Reliability ..... **Error! Bookmark not defined.**

Table 8 - Average Value Extracted ..... **Error! Bookmark not defined.**

Table 9 - Correlation Coefficient Values ..... **Error! Bookmark not defined.**

Table 10 - Chi-square value ..... **Error! Bookmark not defined.**

Table 11 - Baseline Comparisons ..... **Error! Bookmark not defined.**

Table 12 - Root Mean Square Error of Approximation **Error! Bookmark not defined.**

Table 13 - Structural Model Results ..... **Error! Bookmark not defined.**

Table 14 – Churn Prediction 90

LIST OF FIGURES

Figure 1 - North American Telecommunication services market size (Global Telecommunication report, 2020) 28

Figure 2 - Model of Dynamic Capabilities Theory comparing business model and strategy (Teece, 2018) 42

Figure 3 - Conceptual model 44

Figure 4 - Graphical representation of inductive, deductive and abductive research approaches (Costa et al., 2017) 54

Figure 5 - The steps of the research process (Kassem et al., 2016) 57

Figure 6 - Customer Relationship Management 70

Figure 7 - Customer Centric Approach 71

Figure 8 - Customer Service 73

Figure 9 - Improved Customer Knowledge 74

Figure 10 - Customer Retention 75

Figure 11 - Structural Equation Model 84

Figure 12 - Before Starting implementation of Big Data to influence Customer experience to influence churn 86

Figure 13 - After Starting implementation of Big Data to influence Customer experience to influence churn 86

Figure 14 - Before Starting implementation of Big Data to influence Network experience to influence churn 87

Figure 15 - After Starting implementation of Big Data to influence Network experience to influence churn 88

Figure 16 - Customer Retention Stat..... 88

Figure 17 - Churn Ratio..... 89

LIST OF ACRONYMS

5G	5th Generation Mobile Network
AI	Artificial Intelligence
AVE	Average Value Extracted
CCA	Enhanced Analytics
CFI	Comparative Fit Index
CMIN	Chi-Square Minimum
CMIN/DF	Chi-Square to Degrees of Freedom Ratio
CR	Customer Retention
CRM	Customer Relationship Management
CS	Customer Service
DCT	Dynamic Capability Theory
Delta1	Difference in chi-square values divided by degrees of freedom of the null model
Delta2	Difference in chi-square values divided by degrees of freedom of the proposed model
DF	Degrees of Freedom
HI 90	Upper bound of the 90% confidence interval for RMSEA
ICK	Improved Customer Knowledge
ICT	Information and Communication Technology

IFI	Incremental Fit Index
IT	Information Technology
LO 90	Lower bound of the 90% confidence interval for RMSEA
NFI	Normed Fit Index
NPAR	Non-Parametric Analysis
P	Probability
PCLOSE	P-Value for the test of close fit
PLS	Partial Least Squares
RBV	Resource-Based View Theory
RFI	Relative Fit Index
RHO1	Correlation between residuals of the null model and proposed model
RHO2	Correlation between residuals of the proposed model and the residuals of the baseline model
RMSEA	Root Mean Square Error of Approximation
SEM	Structural Equation Modelling
SERVQUAL	Service Quality Model
Telecommunication	Telecommunications
TLI	Tucker-Lewis Index
tNPS	Touchpoint Net Promotor Score

CHAPTER 1. INTRODUCTION

The underlying motive of this research work is to investigate the influence of the use of Big Data and its applications on the customer retention process in the domain of telecommunications. Considering the growth of the telecommunications sector, it is important to explore the internal processes, knacks and strategies of the field to comprehend it appropriately. This research study revolves around employment of Big Data techniques for improved customer service and relationships. Contemporary studies reveal the positive impact of Big Data in helping the telecommunications business grow. The prediction, detection and analysis techniques of Big Data in identifying the satisfaction of customers, aid in the betterment of the telecommunications service (Ahmed & Linen, 2017).

Comprehensive research also states that the majority of telecommunications providers employ Big Data to analyse customer behaviour and to curate schemes on specific orientations to avoid customer churn (Bughin, 2016). In this research work, a quantitative analysis is carried out to determine the usefulness of Big Data in assisting telecommunication brands to retain customers. Various attributes, features, and calculations are made to attain the end result proposed in this research.

1.1 Background

Telecommunications is one of the booming fields of business in the digital age. No matter where one is located in the world, you can easily connect with anyone across the globe. The evolution of technology, the advent of internet access to the last mile and 5G connectivity have altered multiple domains and transformed the universal trends of telecommunication. With the help of digital telecommunications advancement and employing prudent techniques, the majority of businesses and schools were able to keep up with their work. The telecommunications industry made scientific and telecommunications

exponential advances during the pandemic. During these times, the vitality of the telecommunications sector was well established. During this period, many benefits were derived from the new developments. There was a worldwide surge in the use of telecommunication services during the pandemic than ever (Khan, 2021). A recent study conducted in Uzbekistan during the pandemic, presented the effective employment of interactive technologies to conduct online practical lessons for students. This form of e-learning was also found to be much more effective than regular classroom learning at the end of the research project (Khaydarova, 2020).

However, it is also equally important for telecommunication businesses to identify their consumers and cater to their specific needs. Customers are the foundational strength of all businesses and it is no different in the telecommunication industry. So, keeping their existing customers satisfied is extremely important to sustain their standing in the global markets. Considering the routine of Telecommunications organisations and businesses, the pandemic was a testing time. Firms had to employ innovative technologies and features to appeal to their customers, in order to boost their online presence. The attributes of modern telecommunication and the use of Big Data techniques, such as machine learning and other prediction algorithms, were competitive advantage to understand the shifted consumer behaviour in the midst of COVID-19. It assisted brands to alter their services in a way to enhance customer satisfaction (Chkalova, Bolshakova, Kopasovskaya, Mukhanova, & Gluhov, 2020). In the aftermath of the pandemic, most consumers were interested in the quality of the service when compared to other attributes. When telecommunications providers offer superior client services, customers would want to continue to use the service of the provider that offered the excellent service in the first place. It is quintessential for telecommunication providers to render noteworthy and distinguished services to stand apart from their fellow competitors. Customer relationship management is one of the effective ways to establish a smooth, professional and long-term relationship with customers to increase their retention in order to promote the profitability of the telecommunication brand (Sabbeh, 2018). One of the best ways

to establish meaningful customer relationship management protocols, in order to retain customers, is by employing the etiquettes of Big Data (Sabbeh, 2018).

The introduction of Big Data has abridged the traditional data-processing routine, thereby simplifying the huge data handling and curating procedures of data-driven information. As per a recent estimate, it has been established that around 2.5 quintillion bytes of data, which are created each day, will eventually lead to the pile-up of 40 zettabytes by the end of a year (LDN NEWS, 2018). The market value and scope for Big Data are on the rise. In 2020, the total estimated value of Big Data was around $189m dollars in the global market. In this short span of time, the worldwide Big Data market experienced an acceleration to $20 billion dollars, surpassing the superlative potential. The current value of the Big Data market is calculated to be around $247 billion dollars in 2022 and is estimated to rise above that in forthcoming years (Shah, 2020).

Apart from its varied applications, such as real-time customer insight, predictive analysis, and customer pattern detection, it is also highly employed in preventing customer churn and thus boost the growth of the telecommunication brand (Oracle, 2020). The Big Data indicators aid in reducing the higher data management problems to ensure seamless communication and authentic service to customers. With the absence of Big Data, all communication organisations and businesses would experience a huge downfall. The data management process would have been nearly impossible without Big Data techniques. Without the strategies of customer satisfaction analysis, preference identification and many more, the customisation of products and services, according to the client's wish, wouldn't have been possible. Further to this, online marketing would have not been possible without Big Data techniques. Without the click-through rate prediction and other attributes of Big Data, including machine learning, telecommunication companies would have not been able to promote their business to attract new customers (Hagiu & Wright, 2020). Without Big Data, customer retention would be found difficult to achieve and client churn would be on an increase (Paul & Bruns, 2013). Deloitte recently released its 2022

telecommunication industry outlook, where the organisation listed the top four ground-breaking trends that assist in pushing the telecommunication sector forward. One of the trends was the impact and rising interest of Big Data in assisting with customer retention (Deloitte, 2022).

From the collected resources mentioned above, it is evident that the impact of Big Data on the telecommunication sector to boost customer retention has a firm hold. In this research study, the aim is to analyse and investigate the process involved, influencing factors, applications, customer retention theories, examining Big Data work models through real-time case studies, identifying and plotting study variables to prove the claim mentioned.

1.2 Research Problem

With the increasing competitiveness in the global market, there is a huge demand for innovation to boost the visibility and status of the telecommunications brand or business. There is a tremendous need for telecommunication companies to revamp their Information and Communication Technology (ICT) to stay abreast with the altering trends of the digital revolution, in order to appeal to customers. It is also essential to look for tools that facilitate an easy interface to maintain the flexibility of the service for the ease of customer access (Adam, 2020). According to (Afiuc, et al., 2020), it is mandatory to bring authenticity and value to the service that customers can relate to. This author also reiterates the importance of personalised services, such as an omni-channel approach, credit of loyalty programmes, and the influx of modern technology tools such as AI, Big Data, Integrated Messaging, and more focus on Customer Satisfaction which ultimately results in customer retention (Afiuc, et al., 2020).

Since customer demand has been increasing, there is a greater need for the production and utilisation of data, which mandates the use of effective data handling strategies (DalleMule & Davenport, 2017). This is where the benefits of Big Data come into the picture. In order to successfully utilise Big Data,

telecommunications providers need to upgrade their connectivity and IT structures to increase reliability, ensure that the information is easily accessible, as well as ensuring that the information is of the appropriate quality (DalleMule & Davenport, 2017). I therefore posit that the increasing data demand also puts strain on VoIP services, integration, the automated billing process, and customer services. Poor customer satisfaction, lack of customer-centric services and inconsistency in the quality of the telecommunication service are identified to be some of the top factors that affect customer retention (Hossain, Chowdhury, & Jahan, 2017).

Another underlying concern for the telecommunication industry that emerges, as a result of technological advancement, is security threats. The presence of security issues lowers the reliability of the telecommunication provider and increases customer churn (Dixit, 2022). The role of Big Data techniques such as malware detection, using machine learning algorithms, assists in identifying and determining the presence of security threats in the telecommunication provider's networks. It also helps in boosting the security of the server, thereby keeping the data safe. Through ensuring that customer data is kept safe at all times, this contributes to an increase in customer retention (Apruzzese, et al., 2022).

1.3 Research question

This research answers the following primary research question – "How effective is the role of Big Data in customer retention in the domain of telecommunications?"

The following are sub-questions that arose from the primary question,

- Does the employment of Big Data techniques in Customer Relationship Management actually assist in boosting customer retention?
- How does the customer-centric approach of the CRM used by telecommunication service providers improve customer satisfaction?
- Does the service quality influence customer retention in the telecommunication domain?

- Does improved customer knowledge, as a result of Big Data, positively impact customer satisfaction?
- Does the relationship quality with the telecommunication provider play a vital role in customer retention?

1.4 Objectives and Goals

The objective of this research project is to investigate and analyse the impact of Big Data in customer retention in telecommunications within South Africa. The study seeks to understand how the employment of Big Data techniques in Customer Relationship Management (CRM) could boost customer retention. Particularly, this study will examine the influence of improved service quality, enhanced analytics, Improved client relationship and improved customer knowledge arising from the use of Big Data could boost customer satisfaction for customer retention. The utilization of these study variables also sheds light on whether the use of Big Data has a positive influence on customer retention, which thereby assists the telecommunication industry to grow. This research work also provides further recommendations and suggestions to the telecommunication sector on implementing beneficial strategies to help with customer retention to increase the value and profit of the brand.

1.5 Key Concepts

This section of the research gives a quick overview of the study variables that are taken into consideration. Some of the attributes taken for analysis are Service Quality, Customer Satisfaction, and Quality of Relationship. These form the basic foundation of the presented study and are explained as follows.

1.5.1. Service Quality

Better performance and enhanced efficiency together constitute the term “Quality”. Service quality is defined in varied ways by numerous authors. Gary

Armstrong and Kotler describe the term service quality as the potential of the business to exceed the expectations of its customers and get a firm hold on them (Kamikaze, 2011). The authors also state that service quality is the major determining factor of customer retention. Analysing all the dimensions of the SERVQUAL model, the authors (Ramya, Kowsalya, & Dharanipriya, 2019) present that a positive gap denotes the satisfaction of the customer while the negative gap means otherwise. They also emphasise that increased service quality would lead to higher customer satisfaction from their gap analysis and performance measures. The SERVQUAL model has the following attributes that are related to this study and they are;

1.5.1.1 Reliability

The reliability of a brand or business depends heavily on the level of customer trust and dependency on their services. Consistency and accuracy of the services also play a vital role in determining the reliability of the service provider. According to the authors (Midor & Kučera, 2018), a customer prefers a brand that provides excellent service that is reliable, consistent and accurate. It is also discovered to be an essential factor in improving the financial position of the company. If a brand is unreliable, then it is susceptible to losing its value, resulting in customer churn.

1.5.1.2. Assurance

Assurance closely relates to the ability of the business or brand to continually instil the level of confidence among its customers to opt for their service (Elassy, 2015). Commitments, trust and affirmations play a very crucial role in establishing such assurance among the customers. Elassy (Elassy, 2015) portrays the concept of quality assurance as a symbol of measure that increases customer retention. Assurance of a business or brand can be established by maintaining the confidentiality of the customer, building cordial staff and customer relationships.

1.5.1.3. Tangibility

The impression and perception of the service amount to the tangibility attribute of the service quality model. According to the claims presented by Norhuda (Norhuda, et al., 2017), the effect of tangibility depends on the service rendered by the personnel, options available, and the infrastructure of technology optimisation of the company. It can also be narrowed down to the first impression of the client towards a brand that will play a significant role in preventing customer churn.

1.5.2. Relationship quality

Maintaining a quality relationship with the customer has to be prioritised for a brand that wants to retain its people and increase its value. According to the authors (Mohan, Nyadzayo, & Casidy, 2021) establishing the attachment and maintaining a seamless connection with a customer is ideal for a better customer-organisation relationship. Courtesy, responsiveness, availability, intelligence and being futuristic are some of the attributes that help in improving customer-brand relationships (Prachi, 2020). It is also considered to be an essential metric for firms to be superior in the highly competitive global markets. The service quality also reflects a great deal in improving the relationship quality between the brand and clients.

1.5.3. Customer Satisfaction

In the book entitled, “Measuring customer satisfaction”, Hill, Brierly and Taylor (Hill, Brierley, & Taylor, 2017) posit that the main classifier between well-performing and failing businesses in the market is customer satisfaction. They further postulate that the level of client satisfaction boosts and drives the business. The majority of the top firms understand the criticality to satisfy their customers based on the ability to innovate, stay in accordance with global trends and offer extensive features, as conveyed by (Rita, Oliveira, & Farisa, 2019).

1.5.4. Customer Retention

Customer retention is a vital factor that a brand or business should focus on to boost its popularity and relevance in the global markets (Ascarza, et al., 2018). The ability to retain their present customers to make future sales with the firm is briefly termed customer retention. According to (Tarnowska, Ras, & Daniel, 2020), customer retention can also be denoted as the level of loyalty of the customers towards the business. The author also facilitates that the connection of the customer with the organisation must be considered as primary compared to the purchase of the respective product or service. Maintaining the connection successfully with the client boosts customer retention (Tarnowska, Ras, & Daniel, 2020).

1.6. Significance of the research study

The aim of this research work is to analyse and determine the influence of Big Data techniques that aid in the customer retention process, in the telecommunication industry. This research study is also aimed at investigating the bottom-line impact of Big Data in the same domain. The insights and details gathered from this research endeavour will assist telecommunication businesses and organizations in comprehending the vitality and significant role of Big Data. It will also aid brands in developing a meaningful customer retention strategy by leveraging the attributes of Big Data, such as predicting customer satisfaction and determining the likelihood of customers remaining with their providers, thus effectively mitigating the challenges posed by customer churn and client attrition. This research work will also contribute to the growth of the customer service executive domain within telecommunication companies by addressing client retention issues and enhancing brand visibility. In addition, the significance of this research will assist telecommunication brand executives, growth and development managers in recognizing the positive impact of Big Data and adopting evolving practices to increase customer retention, thereby boosting the brand's profitability.

Analysing the gist of client feedback before sketching out the telecommunication brand strategy is very important. Customising the products and services according to the preference of customers will assist the brand to retain its place in the most competitive global telecommunications industry. The complete marketing and brand re-evaluation strategy will rely on the client-centric focus.

As re-iterated earlier, customers are the biggest strength and growth potential of any organisation. So, retaining the customer is important for any business, including the telecommunications industry. According to (Mujayana, 2020), client retention and customer loyalty are interrelated to each other. This analysis will assist the telecommunications industry identify the disparity that revolves around the attributes of client retention and satisfaction. By employing the right Big Data techniques, the telecommunications organisation can retain their existing customers as well as improve their brand's visibility. If the products and services offered by the telecommunications provider match the preference of the customer, they stay with the same provider and avoid switching to any other brand (Mujayana, 2020).

The contribution of this study will serve as a crucial business tool and comprehensive guide that assists with identifying the appropriate Big Data strategy for businesses and organisations.

1.7. Delimitations and Assumptions

Delimitations

- It deals with the impact of Big Data on customer retention only in the telecommunication domain, analysing trends from one of the biggest telecommunications companies in South Africa.
- This research mainly concentrates on the relationship between customers and business and not from one business to another.

- The main focus of the research lies in the role of technologies, such as Big Data, in assisting telecommunications brands sustain their customers to grow in the global market.

Assumptions

- It is assumed that Big Data and other scaled-up technological strategies play a significant role in optimising the marketing strategy of telecommunications businesses and brands.
- It is assumed that the use of technology will assist organisations achieve greater customer retention.

1.8. Outline of the study

The presented research work has the following three chapters:

Chapter 1 – Introduction

This section of the research presents the background, purpose and scope of the chosen domain and presents its significance by exploring the research problem and objectives. It serves as a rudimentary element for further sections.

Chapter 2 – Literature Review

The literature review surveys the previous and contemporary works of the allied domain to strengthen the claims presented in this paper. The research of fellow scholars and eminent personalities are cited to showcase the current model of the research.

Chapter 3 – Research methodology

This chapter covers the research methodology part of the proposed framework. It outlines the approaches performed, research methods used, data collection

and case study analysis. Finally, the stipulated outcomes of this research are also presented here.

Chapter 4 – Presentation of Results and Findings

In this chapter, the results of the proposed framework are presented, discussed in-depth and interpreted. The outcomes of the questionnaire sampling and data analysis using the Structural Equation modelling are listed here.

Chapter 5 – Discussion of the Results or Findings

The impact of Big Data on customer retention in telecommunications is clearly depicted in this section of the research. All the necessary underpinnings and existing contemporary works are presented to prove the case.

Chapter 6 – Conclusions and Recommendations

The end results of the research study are clearly articulated in the conclusion part of the research paper. This section also comprises major recommendations for telecommunications sector companies on prudently employing Big Data techniques to boost customer retention.

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1. Introduction

This chapter of the research work revolves around the context of curating, analysing and reviewing existing literature that assists in understanding the impact of Big Data and how effectively it plays a pivotal role in improving customer retention. This is done through successfully bridging gaps that could lead to client churn. It also explores the telecommunications service provider's relationship with the process of customer attrition. This section of the research study also sheds light on the contemporary and existing practises of the telecommunications industry and how effectually Big Data practices can assist in the growth of the telecommunications domain, which also includes reducing customer attrition. This study also includes the study of the telecommunications sector's future scope along the lines of Big Data and how mandatory it is for the service providers to employ the techniques of enhanced service quality and better client treatment, according to the ever-changing dynamic needs of customers to improve customer satisfaction. At the end of this chapter, a brief theoretical framework analysis is carried out by reviewing the existing literature proofs of the SERVQUAL model which will serve as a basic foundational strength for the research work.

2.2. Performance of the Telecommunications Industry

With the rapid evolution of technological advancements and the advent of digitalization, the telecommunications industry has emerged as a significant player in the service sector of the global economy (Global Telecommunication Report, 2020). The concept of seamless telecommunication encompasses the transmission and reception of data to users through various modern devices such as mobile phones, radios, televisions, the internet, local area networks, and wide area networks (Budimir, 2014). The telecommunications domain has witnessed

a remarkable rise in its capabilities with the aid of wired and wireless high-performance communication channels such as broadband and satellites. Over the past decade, the telecommunications industry has demonstrated a steady growth trajectory and has outperformed other sectors in the economy. It is well-established that the telecommunications industry currently ranks as the fifth largest sector globally and continues to expand (Global Telecommunication Report, 2020). The Global Telecommunication Services Market Size Report provides an insightful analysis of this sector, revealing a global turnover value of approximately USD 1,657.7 billion in 2020. Given the escalating growth potential, the telecommunications industry is projected to grow at a rate of 5.8% by the fiscal year 2028, surpassing several trillion dollars (Global Telecommunication Report, 2020).

Over the past few years, the telecommunications industry has experienced substantial growth and undergone significant changes propelled by rapid technological advancements and the widespread adoption of digitalization. The Global Telecommunication Report (2020) highlights the industry's prominent position as a key player within the global service sector. The concept of seamless telecommunication entails the effective transfer and reception of data through contemporary devices such as mobile phones, radios, televisions, and the internet. These operations are made possible through the utilization of both wired and wireless communication channels, including broadband and satellite systems (Budimir, 2014).

The telecommunications industry has proven to be a standout performer when compared to other sectors, solidifying its position as the fifth largest sector in the global economy and demonstrating consistent growth (Global Telecommunication Report, 2020). In-depth insights from the Global Telecommunication Services Market Size Report unveil an impressive global turnover of approximately USD 1,657.7 billion in 2020. Encouraging projections indicate that the industry will sustain its expansion, with an estimated growth rate

of 5.8% by the fiscal year 2028, surpassing a value that exceeds several trillion dollars (Global Telecommunication Report, 2020).

These statistics underscore the immense significance and potential of the telecommunications industry within the service sector. With its ongoing growth trajectory and relentless advancements, it assumes a pivotal role in shaping the global economy and catering to the ever-increasing demands of users worldwide.

It is also very important to note the ever-changing pattern of the telecommunications domain as it is more dependent on innovative technological insights. Telecommunication service providers' need to cautiously consider applying recent technological features and attributes to stay relevant to the ever-changing global market (Borah, 2014). For example, in the Global Telecommunication Services Market Report (Global Telecommunication Report, 2020), the examination and analysis of the North American telecommunications industry are analysed;

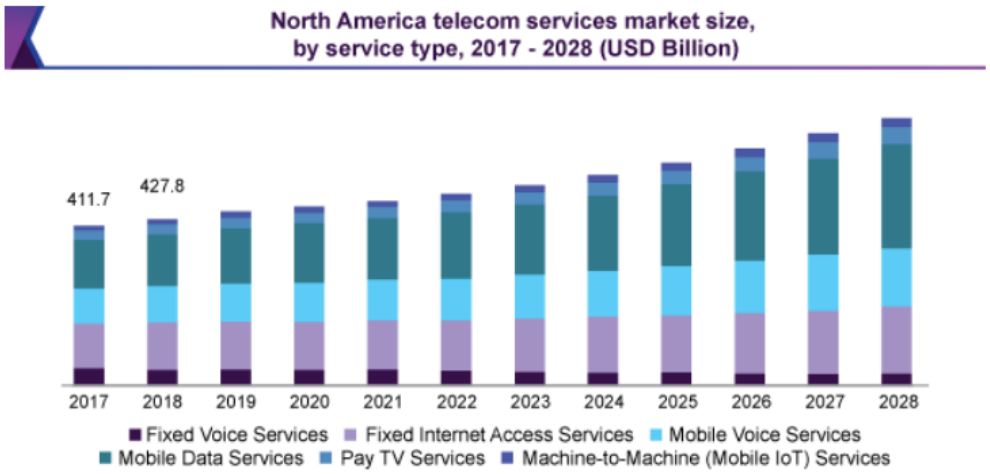


Figure 1 - North American Telecommunication services market size (Global Telecommunication Report, 2020)

Based on the depicted graph, it becomes apparent that the role of technology is of utmost importance when it comes to determining the relevance of a specific service. Specifically, with the introduction of 5G and smart digital services, a noticeable increase in the utilization of internet access, data services, and mobile services is observed. The availability of such extensive information enables telecommunications service providers to make informed business decisions, effectively addressing the demands of their customers and meeting their expectations (Borah, 2014). Additionally, the impact of the pandemic on economies and societies has led to a significant shift within the telecommunications sector, where access to services has become increasingly imperative (Law, 2020).

With the growing popularity of virtual trends, remote work, and the resurgence of the entertainment industry, the demand for telecommunications services remains steady and poised to make a significant impact on the global economy. However, this increased demand has also led to heightened competition, creating a space for innovation and customer-centric approaches to retain clients (Budimir, 2014). In the telecommunications sector, the impact of Big Data cannot be overstated. It plays a critical role in effectively identifying the customer base, understanding their preferences, accurately predicting churn, avoiding client attrition, and comprehending customer behaviour (M. Khan et al., 2018). In the post-pandemic world, businesses have increasingly relied on telecommunication services, surpassing residential consumers. Therefore, devising appropriate services and making informed business decisions are essential for telecommunications providers to maintain their position in the dynamic Global Telecommunication domain (Law, 2020).

2.3. Existing Big Data approaches for customer retention within the telecommunications sector

One of the remarkable advantages of utilizing Big Data techniques in the telecommunications industry is the simplification of operational processes and

strategic decision-making (M. Khan et al., 2018). By leveraging the benefits of Big Data and employing machine learning algorithms, telecommunication companies can gain valuable insights into customer preferences, behaviours, website traffic, purchases, and usage in real-time (Ruiz et al., 2016). This enables telecommunication organizations to curate effective services tailored to the specific needs and orientations of their clients. Notably, these Big Data techniques offer superior effectiveness and efficiency compared to traditional approaches and data handling solutions (M. Khan et al., 2018). The following are some of the existing analytical approaches employed by telecommunications providers to enhance customer retention:

2.3.1. Churn analysis for better customer engagement management

Customer engagement holds great significance for businesses, as idle customers do not contribute much value to an organization. Telecommunications providers employ effective methods, such as monitoring existing customers and curating preferential packages, to enhance sales (Bansal, 2016). Research suggests that retaining customers costs 50% less than acquiring new ones and converting them into potential buyers (Rituraj, 2019). In this regard, churn analysis emerges as a valuable strategy for organizations. Customer experience management, widely adopted by telecommunications service providers worldwide, plays a pivotal role in customer retention efforts (Popli & Madan, 2013). To successfully implement this strategy, telecommunications companies employ various techniques, including customer sentiment analysis, evaluation of purchase history, billing details, search results, service quality assessment, network connectivity analysis, monitoring network activity, ensuring effective data transmission, and customer behaviour analysis (Mohammed, 2013).

2.3.2. Product and service development

Enhancing sales and improving customer retention heavily rely on providing suitable services to the targeted customers (Hilbert, 2016). Telecommunication

providers achieve this by employing data accumulation methods to gain valuable insights into their customer base. This data encompasses various aspects, including client phone usage, preferences for products or services, and staying updated with the latest trends. By leveraging this wealth of information, telecommunications providers can deliver tailored services to the right customers at the right time, thereby increasing brand value and customer satisfaction (Hilbert, 2016). These tools enable customers to choose their preferred mode of service while minimizing costs, further reinforcing their loyalty to the same provider. However, collecting and analysing client data is no easy feat, which is where the proficiency of Big Data analytics becomes crucial. It simplifies the data collection and analysis process, empowering telecommunications companies to devise appropriate plans for individual clients (M. Khan et al., 2018).

2.3.3. Network traffic routing in real-time

Understanding the timing of customer orders and service usage allows companies to introduce targeted offerings that enhance customer satisfaction and ultimately improve customer retention. Prominent telecommunications retail giants such as Vodafone, Airtel, and Jio employ these techniques to bolster customer retention (Mohammed, 2013). In a study conducted by Wang et al. (2019), a sensor-based Big Data technology was developed to provide routing recommendations for separate and unified heterogeneous networks. The research findings suggest that the utilisation of Big Data techniques accurately routes real-time traffic (Wang et al., 2019). This data provides valuable insights into the location, usage patterns, and timing of the existing customer base. By leveraging Big Data techniques, the network can optimize the retrieval of necessary information (Wang et al., 2019). Employing other data analytical techniques, telecommunications service providers can maintain a stable website and network in response to varying traffic levels (Mohammed, 2013). A reliable network and seamless communication significantly contribute to increased customer satisfaction and retention (Schaeffer & Rodriguez Sanchez, 2020).

2.4. Future scope

The realm of Big Data and its continuous technological advancements exhibits boundless potential. Given the telecommunications industry's reliance on evolving technologies and global trends, there is always room for further enhancements. Already, the principles of Big Data have revolutionized decision-making and operational processes for the better (M. Khan et al., 2018). The challenges inherent in communication, such as network disruptions, channel interferences, and customer mismanagement, are effectively addressed through the implementation of Big Data techniques (Popli & Madan, 2013). In light of the ongoing pandemic, extensive research has been conducted on the sixth-generation network, expected to catalyse transformative changes within the telecommunications industry (Law, 2020). In a concise study conducted by Bhat and Alqahtani (2021), the authors underscore the significance of virtual and real-time communication modules and their implications across multifaceted domains, including robotics, automation, and artificial intelligence. Furthermore, sustainability has become the new norm in the telecommunications sector. The integration of technological advancements with the telecommunications industry has given rise to the concept of sustainable development, which promises long-term benefits for both customers and service providers (Popli & Madan, 2013).

Based on Wang et al.'s (2021) research findings, the development of telemedicine, intelligent AI-driven services, and personalized offerings tailored to customer preferences are highlighted as effective strategies for customer retention. This research also underscores the significant role played by Big Data in various contexts. Such studies emphasize the ever-changing potential and capabilities of technology, leaving room for further advancements. The field of telecommunication, similarly, is dynamic and necessitates adaptation to technological shifts. Telecommunications providers must exhibit prudence in comprehending and implementing the latest technological advancements to remain competitive in the global market and deliver high-quality services to their customers. The strategic integration of Big Data techniques in understanding and

fulfilling customer satisfaction requirements contributes to the improvement of telecommunications services.

2.5. Empirical Review

This section of the research thoroughly examines and elucidates the study's context, which focuses on several metrics crucial for customer retention. Specifically, we explore variables such as Client Retention, Service Quality model, and Client Satisfaction. These attributes are meticulously analysed, and their interrelationships are examined in the context of existing scholarly research conducted by renowned academics and fellow researchers. The subsequent paragraphs provide a succinct overview of these metrics.

2.5.1. Client retention

Client retention is a vital aspect for any business or organization to consider (Boakye, 2011). It is through the loyalty of existing customers that an organization can thrive and achieve profitability. Retaining and deriving profit from existing customers is generally easier compared to acquiring new ones (Boakye, 2011). According to the insights provided by (Muller, 2021), customer retention and profitability serve as invaluable assets for any organization. In his publication, (Muller, 2021) emphasizes the significance of customer relationship management as a strategy for customer retention, which plays a pivotal role in attracting and retaining the right customers. This approach is viewed as the most effective way, considering the effort invested, to drive organizational growth (Muller, 2021). The research conducted by the author highlights that customer relationship management serves as a robust attribute that can enhance customer satisfaction and retention.

In a similar research study conducted by the author (Singh, 2016), an analysis is carried out to examine customer retention strategies from the customer's perspective. According to the findings of the research, (Singh, 2016) emphasizes

the significance of the customer-firm relationship in driving customer retention within an organization. The author suggests that when a brand or service provider focuses on establishing and maintaining a friendly and accommodating relationship with customers by fulfilling their needs, it enhances customer satisfaction towards the brand (Singh, 2016). As a result, when an existing client base develops a preference for the business or organization, it significantly strengthens their loyalty and allegiance to the brand (Singh, 2016). Furthermore, it is recommended that by prioritizing the provision of personalized services to customers, their loyalty towards the business can be further enhanced.

Providing personalized and tailored products and services is an effective approach to enhance customer retention (Singh, 2016). This strategy can be successfully implemented through the utilization of Big Data techniques to gain insights into customers' preferences, likes, and behaviours. The concept of leveraging Big Data in customer relationship management (CRM) is elucidated by Anshari et al. (2019a) in their research. Their study highlights the use of Big Data tools to collect both structured and unstructured data, enabling informed decision-making and product enhancement strategies. The research also emphasizes that the emergence of Big Data has led to more personalized marketing techniques that cater to the individual needs and preferences of existing customers, thereby contributing to the improvement of the customer retention process.

When examining customer attrition, the author (Tarnowska, 2020) discusses client retention from the lens of loyalty. In their research, they emphasize the significance of establishing a strong bond between the brand and the customer, fostering a sense of loyalty that drives repeat purchases (Tarnowska, 2020). This finding is reinforced throughout their study. It is evident that understanding customers is vital for organizations aiming to cultivate a close and enduring relationship with them.

Additional insights on this topic can be gleaned from the research conducted by (Jahmani et al., 2020). The author provides a concise definition and describes the behavior of a loyal customer. According to her findings, a loyal customer demonstrates recurring purchases, refers friends and family to the brand, actively explores new products or services to support the brand, and exhibits strong resistance to competitor brands in the market. In the context of the telecommunications sector, brand retention can be enhanced through the use of customisable packages, booster options, regular communication, and an effective loyalty program. These strategies, facilitated by the implementation of Big Data tools and techniques, contribute to fostering brand loyalty (Schaeffer & Rodriguez Sanchez, 2020).

2.5.2. Service quality

Maintaining service quality is a crucial aspect across all sectors of the economy, and it holds particular significance in fostering customer retention (Dharmadasa & Gunawardane, 2017). The telecommunications industry is no exception. In addition to the attractiveness of the products and packages offered by telecommunications providers, the quality of their service plays a pivotal role in determining whether customers choose to continue their business relationship with them (Oraedu, 2019). While there are numerous competitors offering similar products, it is the level of service quality that showcases the reliability and authenticity of a business or organization. Consequently, service quality becomes a key differentiating factor among providers in the same customer context (Sahin, 2020). When the quality of service consistently meets or exceeds expectations, it leads to increased customer satisfaction and subsequently enhances customer retention rates (Dharmadasa & Gunawardane, 2017).

When exploring the research conducted on service quality and its connection to customer retention using Big Data techniques, the study by (Zhou et al., 2019) stands out for its valuable insights. The author undertakes an empirical study that focuses on measuring customer satisfaction and loyalty, with service quality as

the primary factor. Various metrics, including customer information, quality content, user interface, and customer sentiment, are carefully considered. The findings strongly emphasize that customer satisfaction is the fundamental basis for customer retention. However, achieving customer satisfaction requires providing the best quality of service to customers.

Similarly, another research conducted by Kalia et. al. (Kalia et al., 2021) presents a comprehensive analysis of the relationship between service quality, customer satisfaction, commitment, and loyalty. The author employs an advanced Big Data technique called "partial least squares structural equation modelling" (PLS-SEM) to obtain desired results through multi-group analysis. The research reveals that superior service quality can significantly influence the customer's perspective.

Collectively, these studies highlight the significance of the SERVQUAL model, which was introduced in 1985, in understanding customer-firm relationships. The insights derived from the original model greatly contribute to measuring the impact of customer retention. In this context, we will further explore and analyse the various domains of the SERVQUAL model.

2.5.1.1. Reliability

Reliability holds a paramount position within the SERVQUAL model. In simple terms, it refers to an organization or telecommunications provider's ability to consistently deliver top-notch and accurate services to their customers (Alnsour et al., 2014). According to Li and Lui, reliability revolves around the essence of trust and dependability that clients associate with an organization or business (Li & Liu, 2019). Their research on reputation and purchase behaviour highlights the significance of reliability as a key driver for gaining customer trust, and the findings provide clear evidence in support of this claim.

In a similar vein, Elrahman conducted research to measure reliability standards in the telecommunications industry (Elrahman, 2019). The author emphasizes that on-point reliability entails correct billing processes, catering to the specific needs of customers, fulfilling promised services, and treating customers in a respectful manner. Maintaining a high level of reliability within an organization is crucial, as it directly impacts the organization's performance and overall value.

Reliability plays a pivotal role in establishing trust, meeting customer expectations, and ultimately enhancing an organization's performance. By prioritizing reliability, organizations can instil confidence in their customers and cultivate long-lasting relationships based on trust and dependability.

2.5.1.2. Assurance

Assurance holds significant importance in our research study as another key variable of the SERVQUAL model. It encompasses the level of trust and confidence that customers derive from a business or organization. Employee behaviour plays a crucial role in establishing this sense of assurance (Alnsour et al., 2014). According to Almomani, assurance involves the extent to which telecommunications providers provide information and support to customers regarding their products and services (Almomani, 2018). The author emphasizes the importance of briefing clients in their native languages, ensuring inclusivity regardless of gender or age, and fostering customer motivation and confidence. Additionally, in the context of 5G networks, another researcher highlights that assurance also encompasses the courteous, gentle, and polite behaviour of employees when addressing customer inquiries or challenges (Teng et al., 2020). The overall customer experience provided by an organization plays a vital role in enhancing customer retention through the assurance factor.

2.5.1.3. Tangibility

The Tangibility module of the SERVQUAL model is another crucial metric we consider in our research. Tangibility refers to the measurable aspects of a

business or organization (Alnsour et al., 2014). In this study, I examine the level of technology utilization, the number of employees, the product options available, and the presence of towers, as these factors may influence customers' perceptions and potentially lead to negative sentiments towards the organization. These physical attributes are the primary elements that customers observe when evaluating the overall image of the business. Shava's correlation between service quality and the significance of tangibility is clearly demonstrated in his research (Shava, 2021). He specifically focuses on the South African telecommunications sector and examines the impact of customer service by evaluating tangibility, assurance, and quality. The author emphasizes that these tangible aspects are crucial in representing the performance of a service provider or company within the telecommunications sector.

2.5.2. Client Satisfaction

The primary strategy for acquiring new clients and retaining existing ones lies in prioritizing client satisfaction. In order to maintain their current client base and increase profitability, businesses and firms must focus on enhancing client satisfaction (Singh, 2016). Telecommunications companies, in particular, need to improve customer satisfaction to sustain their position in competitive global markets by adopting the latest trends and leveraging innovative technological options. An empirical study conducted by Khan analysing customer satisfaction and loyalty in the telecommunications sector highlights the interrelation between the two (Khan, et al., 2019). This author underscores that client satisfaction is a crucial driver of brand loyalty, ultimately leading to higher customer retention rates. These findings hold true for both product and service-oriented companies. To enhance client satisfaction, service providers must comprehend the fundamental concepts that contribute to it. In the research conducted by Chun, he delves deep into the key factors determining client satisfaction (Chun et al., 2019). The quality of service, cost-effectiveness, brand relationship, product or service efficacy, and customer service are all identified as critical elements influencing customer retention, substantiated by an extensive literature review.

These imperative variables listed above directly correlate with the level of customer satisfaction. According to Siddika, Big Data techniques have emerged as pivotal tools in identifying the factors associated with client satisfaction and retention (Siddika et al., 2021). The author employs churn prediction and factor identification methods to illustrate the significant role played by Big Data techniques. The study clearly indicates that poor client satisfaction contributes to customer attrition, thus highlighting the direct relationship between higher client satisfaction and client retention.

2.5.2.1. tNPS Measurement

When assessing customer satisfaction as a determinant of customer retention in the telecommunications industry, an important metric to consider is tNPS, which stands for transactional Net Promoter Score. tNPS is a standardized calculation used by businesses to gauge customer interactions, such as purchases made from the brand. This measure enables businesses to assess customer satisfaction and determine whether the customer is likely to remain with their current service provider (Lee et al., 2016). Conducting detailed surveys can provide further insights into the customer-brand relationship. It's worth noting that NPS, or Net Promoter Score, is a distinct metric that measures customer loyalty to the brand, while tNPS specifically focuses on customer satisfaction (Simplr, 2022).

In his research, Ngo (2015) employed the tNPS measurement technique as a valuable tool for assessing customer satisfaction. He emphasizes that it is not only a reliable method but also an effective means of evaluating the financial performance of a brand or business. By measuring tNPS, brands can gain deeper insights into customer behaviour patterns and gauge the level of affinity customers have with a specific service provider (Viitamäki, 2019).

2.6. Theoretical Framework

The main theory grounding this study revolves around the most effective and popularly used technique by researchers and businesses to know all about the impact of Big Data techniques on customer retention. Here, to present the concept with higher clarity, two widely known theories are used - Resource Based View (RBV) and Dynamic Capabilities Theory (DCT). Using these theories, the impact of Big Data Analytics is calculated with the help of a comprehensive research model. This research method works well in capturing the perspectives, preferences and calculations of the customer on the service rendered by the provider. Further to this, an organisation can determine the level of customer satisfaction with which they can analyse the client retention ratio (Bhasin, 2021). In this research, the impact of Big Data analytical attributes is taken into consideration. For years, the employment of the RBV is found to give an extra competitive edge to businesses and telecommunications service providers (Kraaijenbrink et al., 2010). Therefore, when using it from a theoretical point of view, it renders a lot of benefits. On the other hand, the DCT helps in understanding, analysing and creating more dynamic techniques in an organisation or a business to boost its performance and productivity (Teece, 2018). Together they provide more influential attributes that are very helpful for the research. However, to develop a theoretical model, the influential impacts of Big Data analytics, enhanced customer service, Personalised options, advanced analytics, and improved client relationships are taken into consideration (Merendino et al., 2018). Using existing literature as proof, a comparison of the variables mentioned above is done to estimate the relationship between RBV and DCT.

2.6.1. Resource Based View Theory (RBV) and Dynamic Capabilities Theory

In this study, the Resource-Based View (RBV) Theory is employed to identify the attributes of the proposed model, aligning with the realm of strategic management. The RBV Theory primarily focuses on analysing and examining

attributes that directly contribute to improving organizational performance (Kraaijenbrink et al., 2010). Over the past two decades, the RBV Theory has gained significant popularity and influence in measuring outcomes in the information technology field (Ployhart, 2021). Existing research supports the effectiveness of the RBV Theory in enhancing performance by considering various IT attributes that play a critical role in organizational operations (Fakhreddin & Foroudi, 2022), although differing thoughts on its approach exist within the literature. Isara and Masele posit that the RBV Theory has been successfully applied to measuring business strategies and the impact of Big Data tools in the telecommunications domain (Issara & Masele, 2021).

Recognizing the limitations of the previous RBV Theory, which neglected the functioning and development of organizational resources, the Dynamic Capabilities Theory was introduced as a means to address these shortcomings (Teece, 2018). It emphasizes the need to integrate attributes that foster the development of new qualities and capabilities beneficial for organizational operations. By incorporating the Dynamic Capabilities Theory, this study aims to overcome the limitations of the RBV Theory and provide a more comprehensive framework for analysing the impact of Big Data tools and strategies in the telecommunications industry.

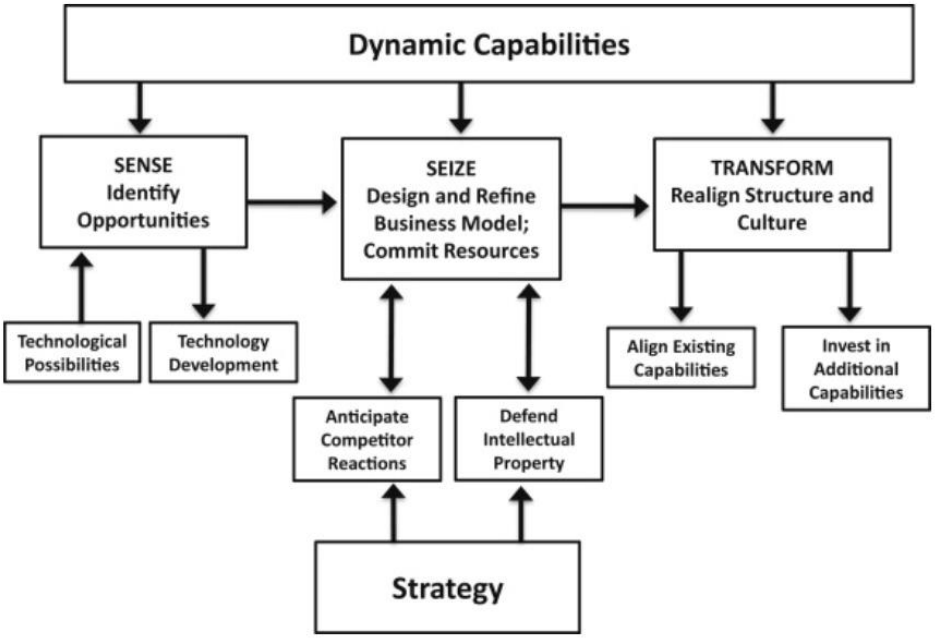


Figure 2 - Model of Dynamic Capabilities Theory comparing business model and strategy (Teece, 2018)

The Resource-Based View (RBV) focuses on leveraging existing factors and capabilities to improve organizational performance, while the Dynamic Capabilities Theory (DCT) emphasizes the development of new attributes from these existing factors to enhance performance in a dynamic environment (Wheeler, 2002). The DCT ensures optimal performance even amidst consistent changes in the technological landscape (Wheeler, 2002). Further research conducted by Wade demonstrates that the technological outcomes derived from the DCT can lead to significant performance improvements by utilizing attributes derived solely from information technology inputs.

According to Teece (2018), dynamic capabilities can be classified into two categories: base-level second-order dynamic capabilities and higher-order dynamic capabilities. The former includes routine activities, administration, and basic governance, which enable the organization to effectively pursue regular and routine production strategies. On the other hand, the second-order category comprises micro-foundations, which involve the adjustment and recombination of

existing approaches to create new products or services. This category encompasses prudent managerial decisions such as curating new products/services, assigning divisions, and facilitating expansions. In contrast, higher-order dynamic capabilities play a critical role by allowing strategic and operational processes to adapt to new service offerings. Attributes such as sensing, seizing, and transforming competencies are associated with higher-order dynamic capabilities and are considered vital for organizational success.

The dynamic capability-oriented business model or strategy plays a crucial role in highlighting the interconnectedness of multiple features (Teece, 2018), as depicted in Figure 2 above. This research work follows a similar approach by employing these two theoretical models to devise a comprehensive method. By utilizing the sense, cease, and transform protocols, the impact of Big Data techniques is evaluated through the developed model. This approach facilitates the identification of Big Data opportunities, structural adjustments, and business models that contribute to customer retention. Various technological attributes, enhanced product/service assistance, and other influential domains of Big Data are given equal consideration.

The objective of this research is to examine the influence of Big Data techniques on customer retention in the telecommunications industry, taking into account relevant attributes and the dynamic traits of organizations. Both the RBV and DCT theories are employed to transform data insights into actionable implications that enhance performance and customer retention in the telecommunications industry. Therefore, it is important to consider all the variables involved in this study. The data analytics attributes are derived with the assistance of the RBV Theory and the SERVQUAL model, while attributes are derived from the DCT. A comparison is made between these two approaches, and hypotheses are formulated to establish their interrelationships.

Building upon the existing literature and theories discussed in the previous chapter, the researcher develops a SERVQUAL conceptual model to understand

the theoretical relationships between the customer service variables of Reliability, Assurance, and Tangibility, and the outcomes of Client Satisfaction, Relationship Quality, and Client Retention. Figure 3 provides a visual representation of this model.

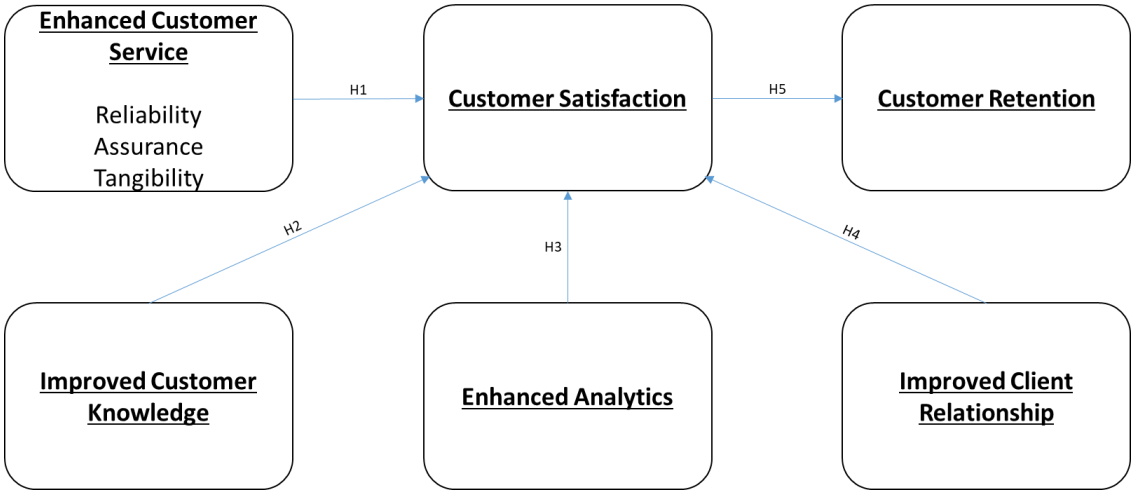


Figure 3 - Conceptual model

In this SERQUAL conceptual model, the Enhanced Customer Service element, including service quality with the elements of Reliability, Assurance, Tangibility, as well as Personalised Options, Enhanced Analytics and Improved Client Relationship are considered to be the “Independent variables”. Client Retention is the “Dependent Variable” and Client Satisfaction is the “Mediating Variable”. Using these notations, the relationship between these variables are identified and explained;

2.6.1. Hypothesis Development

Major impact Variables of Big Data Analytics

Below are the key attributes considered for assessing the impact of Big Data analytics on customer retention: enhanced customer service, personalized options, advanced analytics, and improved client relationships (Bajari et al.,

2019). These attributes are classified as "Independent Variables," while customer satisfaction and customer retention are referred to as the "Dependent Variables." The relationship between these selected variables, along with customer satisfaction and customer retention, is outlined below.

2.6.1.1. Enhanced Customer Service

Customer Service within the telecommunications realm can be conceptualized as the provision of assistance and advice by telecommunication entities to individuals who procure or utilize its services (Singh, 2016). It is widely acknowledged in the literature that efficacious customer service is fundamental to both the acquisition and retention of customers, serving as a cornerstone for customer satisfaction (Singh, 2016).

Customer service plays a crucial role in enhancing the performance and sales of products or services. Previous research studies have demonstrated that a superior and improved customer service experience not only attracts new clients but also fosters customer loyalty. The author's study highlights the significance of business analytics in improving customer service and emphasizes the collection of data insights from customers (Lavalle et al., 2011). By leveraging Big Data techniques, businesses can effectively elevate the level of customer satisfaction, thereby promoting customer retention. Strategies such as identifying key differentiators, selecting appropriate indicators, and analysing customer behaviour are proven techniques for enhancing customer service (Spiess et al., 2014). Furthermore, research conducted by Davenport provides substantial evidence of the positive relationship between the utilization of Big Data analytics and improved customer service (Davenport et al., 2012).

In-depth analysis of existing research on service quality and the utilization of Big Data techniques to enhance customer retention reveals valuable insights, as highlighted in the work of Zhou et al. (2019). The author conducted an empirical study focusing on customer satisfaction and loyalty, with service quality serving

as the primary factor. Metrics such as customer information, quality content, user interface, and customer sentiment were considered in the study.

Before we delve into the findings, it is important to understand what Customer Satisfaction and Loyalty means within the telecommunications context.

Customer Satisfaction in the telecommunications industry is defined as the measure of how the services and goods supplied by a telecommunications company meet or surpass the expectations of the customer (Singh, 2016). Singh (2016) argues that the enhancement of customer satisfaction is imperative for the retention of clientele and the augmentation of profitability. In the highly competitive telecommunications market, satisfaction is paramount as companies strive to fulfill and exceed customer expectations by integrating emerging trends and innovative technological advances.

Loyalty, as observed in the telecommunications sector, refers to a consumer's recurring patronage and the predilection for a company's services or products, often to the exclusion of competitors (Khan et al., 2019). The empirical research conducted by Khan et al. (2019) elucidates a pronounced interdependency between customer satisfaction and loyalty, indicating that satisfaction is a critical antecedent for the development of brand loyalty, which in turn, significantly contributes to the perseverance of customer retention.

With the above providing broader context, the findings of Zhou et al. (2019) strongly emphasize that customer satisfaction is fundamental to customer retention. However, achieving customer satisfaction requires the delivery of top-quality service. Similarly, Kalia et al. (2021) conducted research that explores the relationship between service quality attributes, customer satisfaction, commitment, and loyalty. The author employed an advanced Big Data technique called "partial least squares structural equation modelling" (PLS-SEM) to obtain meaningful insights through multi-group analysis. The research concludes that superior service quality has a positive impact on the client's perspective. Through these research works, the significance of the SERVQUAL model, introduced in

1985, is underscored. The model represents a foundational framework that elucidates customer-firm relationships.

2.6.1.1.1. Reliability and Client Satisfaction

Reliability serves as a crucial factor in predicting client satisfaction, as customers tend to favour brands or businesses that consistently provide authentic and reliable services tailored to their preferences (Midor & Kučera, 2018). In the context of the Lebanese banking sector, Hammoud et al. (2018) affirm the strong correlation between reliability standards and excellent client satisfaction. Based on these insights, we can conclude that there exists a positive relationship between reliability and client satisfaction.

2.6.1.1.2. Assurance and Client Satisfaction

Assurance plays a pivotal role as a backbone for businesses in retaining loyal and trustworthy customers, who remain committed to a particular brand or service despite market fluctuations and changing trends (Elassy, 2015). Alabboodi (2019) explores the attributes of service quality and uncovers a significant connection between customer satisfaction and assurance. The research findings highlight that elevating the standards of assurance contributes to enhanced customer satisfaction. Consequently, we can deduce a positive relationship between assurance and client satisfaction.

2.6.1.1.3. Tangibility and Client Satisfaction

Norhuda et al. (2017) emphasize that the tangible aspects encompass all physical attributes, including technological facilities, equipment, infrastructure, and artwork. In a comprehensive investigation of the impact of service quality on customer satisfaction, Afroz (2018) discovers a robust connection between customer satisfaction and tangibles. The research underscores the significance of incorporating diverse tangibles to enhance client satisfaction. Consequently, we can infer a positive relationship between tangibility and client satisfaction.

When reviewing the above research conducted, it is clear that Enhanced Customer service, with the elements of Reliability, Assurance and Tangibility, positively influences client satisfaction.

2.6.1.2 Client Satisfaction and Client Retention.

The fundamental strategy for acquiring and retaining clients hinges upon ensuring customer satisfaction. Singh (2016) highlights the importance of enhancing client satisfaction as a means to retain existing clients and drive profitability. In the telecommunications sector, where fierce competition reigns, companies must focus on improving customer satisfaction by embracing emerging trends and leveraging innovative technological solutions. A comprehensive empirical study conducted by A. Khan et al. (2019), in the telecommunications sector, reveals a strong interdependence between customer satisfaction and loyalty. The study underscores the pivotal role of client satisfaction in cultivating brand loyalty, ultimately leading to increased customer retention. These findings hold true for both product and service-oriented businesses.

Another empirical study by Ngo (2015) confirms the interrelationship between customer satisfaction and customer retention in the telecommunications sector. The author suggests that enhanced customer satisfaction is instrumental in securing and retaining clients, echoing the assertions of Saunders and Lewis (2017). This mutually reinforcing connection between customer satisfaction and retention offers businesses significant cost savings, as they can leverage Big Data techniques to identify customer preferences and tailor their offerings accordingly (Budur & Poturak, 2021).

In exploring the nexus between service quality, customer satisfaction, and customer loyalty, Arora (2018) identifies key attributes contributing to customer satisfaction, such as personalized service, customer-oriented products and services, favourable treatment, and cost-effectiveness. The author also posits that these attributes bolster client retention. To elevate client satisfaction, service

providers must grasp these fundamental concepts. Chun et al. (2019) provide in-depth insights into the critical determinants of customer satisfaction, including service quality, cost-effectiveness, brand relationships, product/service efficacy, and customer service. Extensive literature review corroborates the significance of these essential variables in fostering customer retention. Notably, Big Data techniques play a pivotal role in identifying the factors that drive customer satisfaction and retention, as illustrated by Siddika et al. (2021), who conducted churn prediction and factor identification research. Their study reveals a direct correlation between low customer satisfaction and customer attrition, affirming the proposition that higher customer satisfaction leads to increased customer retention. Thus, the literature unequivocally supports a positive relationship between customer satisfaction and customer retention.

H1a – By harnessing the power of Big Data and employing customer-centric techniques, businesses can significantly enhance customer service, thereby positively impacting customer satisfaction.

H1b: The utilization of Big Data and customer understanding techniques highlights the significance of enhanced customer service in fostering positive customer retention.

H5: The utilization of Big Data and customer understanding techniques suggests that customer satisfaction plays a crucial role in positively influencing customer retention.

2.6.1.3 Improved Customer Knowledge

Customization plays a pivotal role in impressing customers in a direct manner. In today's competitive and technologically advanced world, delivering personalized services to customers holds great appeal. In a study conducted by Barnes (Barnes et al., 2020), the author convincingly demonstrates how Big Data techniques enable businesses to offer a more personalized touch to their products and services. Practices such as customer relationship management,

data collection, and incorporating customer feedback are some of the personalized options facilitated by Big Data techniques (Anshari et al., 2019b).

In the telecommunications industry, Improved Customer Knowledge is characterized by a deeper understanding of customer preferences, behaviors, and needs, facilitated by the strategic utilization of Big Data techniques. This enhanced knowledge base allows for the delivery of highly personalized services, which are increasingly sought after in the technologically sophisticated market landscape. Barnes et al. (2020) illustrate how telecommunications companies leverage Big Data to customize their offerings, thereby significantly elevating the customer experience. Anshari et al. (2019b) further elucidate that through practices like customer relationship management and the assimilation of customer feedback into data analytics, companies can cultivate a more intimate understanding of their clientele. This, in turn, fosters improved customer satisfaction and retention, indicating a direct link between the employment of Big Data and the enrichment of customer knowledge.

Whether in the telecommunications industry or other sectors, a strong correlation is observed between personalized features, enhanced customer satisfaction, and improved customer retention.

H2 – Improved Customer Knowledge have a positive influence on a) customer satisfaction and b) customer retention, through the implementation of Big Data analytics.

2.6.1.4 Enhanced Analytics

Enhanced Analytics, in the context of the telecommunications industry, refers to the sophisticated use of data analysis techniques that go beyond traditional data processing and business intelligence. It involves the application of advanced algorithms, machine learning, and predictive analytics to process large volumes of data, or "Big Data," to uncover patterns, correlations, and insights that were previously inaccessible. Enhanced Analytics allows telecommunications

companies to understand customer behaviors, preferences, and trends in real-time, which facilitates more strategic decision-making related to service improvements, customer experience personalization, and operational efficiency (Chawda & Thakur, 2016). Many multinational companies, including Amazon, IBM, and Hive, rely on sophisticated data analytics to gather customer information, leading to enhanced services, performance, and productivity (Chawda & Thakur, 2016). Consequently, there exists a strong correlation between data analytics techniques and improved customer satisfaction.

H3 – Employment of Big Data techniques renders advanced analytical techniques, which has a positive influence on a) customer satisfaction and b) customer retention.

2.6.1.5 Improved Client Relationship

The bond between customers and service providers is a critical factor that determines the success of a brand or business. Big Data techniques have proven to be valuable in fostering direct client relationships. By tailoring products or services to individual customers, providing personalized insights, and streamlining operations, Big Data practices ensure a seamless connection between the brand and the customer (Kambatla et al., 2014). Therefore, there is a significant impact of Big Data on promoting enhanced client relationships.

Maintaining a high-quality relationship with customers should be a top priority for brands aiming to retain their customers and increase their value. According to Mohan (Mohan, Nyadzayo, & Casidy, 2021), establishing a strong connection and nurturing ongoing engagement with customers is vital for a successful customer-organization relationship. Attributes such as courtesy, responsiveness, availability, intelligence, and future orientation contribute to improving customer-brand relationships (Prachi, 2020). These factors also play a crucial role in enabling companies to excel in highly competitive global markets. Additionally, service quality has a profound influence on the quality of the relationship between

the brand and its clients. Hence, based on these findings, we can affirm a positive relationship between relationship quality and client satisfaction.

H4 – Improved customer relationships, resulting from Big Data, has a positive influence on a) customer satisfaction and b) customer retention.

2.6.2 Summary of the hypothesis

H1a – Enhanced customer service has a positive influence on customer satisfaction.

H1b – Enhanced customer service has a positive influence on customer retention.

H2 – Personalised options have a positive influence on customer satisfaction and customer retention.

H3 – Enhanced analytics has a positive influence on customer satisfaction and customer retention.

H4 – Improved client relationship has a positive influence on customer satisfaction and customer retention.

H5 – Customer Satisfaction has a positive influence on customer retention.

CHAPTER 3. RESEARCH METHODOLOGY

In this chapter, we delve into the research methodology, providing a concise overview of the procedures involved. We particularly focus on the quantitative data collection process, employing surveys as the primary tool. After gathering the data, the analysis phase ensues, where the researcher utilizes Structural Equation Modelling, an effective Big Data technique, to forecast the customer churn ratio and compare it with the actual churn, thereby assessing the performance and accuracy of the developed model. This section elucidates the relationship between service quality attributes, customer satisfaction, and customer retention, encompassing all the relevant variables. By adopting a quantitative approach, we gain a comprehensive understanding of how customer satisfaction influences customer retention.

3.1. Research approach

Having a clear understanding of the research approach is vital for selecting the appropriate technique for this study. In their book, authors (Saunders & Lewis, 2017) provide a concise explanation of the various research approaches, highlighting three key perspectives: inductive, deductive, and abductive research methods. Figure 3 below illustrates a preliminary outline of these techniques.

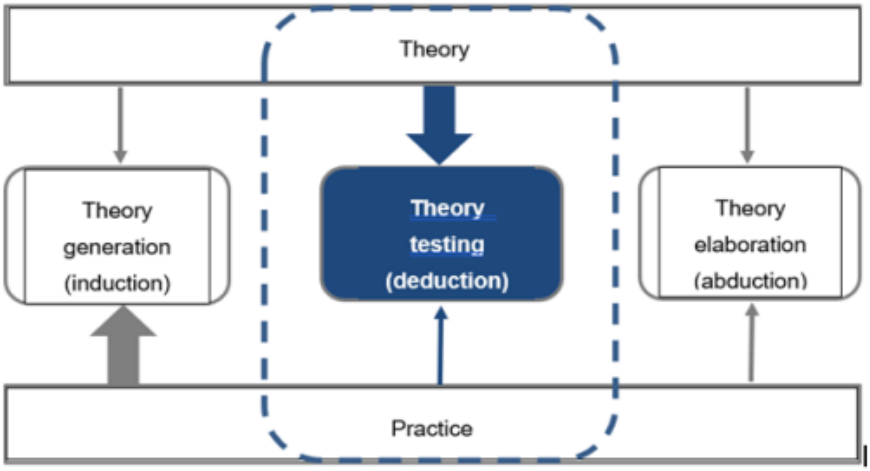


Figure 4 - Graphical representation of inductive, deductive and abductive research approaches (Costa et al., 2017)

In the first approach called an inductive research technique, data collection is done first followed by the analysis of the existing patterns from the procured data, in order to draft specific research theories and concepts with the assistance of myriad hypotheses (Osman et al., 2018). The foundational course of this research strategy lies on the groundwork of generating theories according to the collected input and thereby gives the intellectual freedom to the research to alter the research groundings even after the initiation of the research work (Poosarala & Jayashree, 2021).

The deductive approach serves as the second research strategy, wherein the formulated hypotheses are derived from existing literature and collected data (Osman et al., 2018). According to Pandey, the deductive approach involves testing existing theories by comparing them against the gathered data, while the inductive approach utilizes collected data to generate specific concepts (Pandey, 2019).

The abductive approach, as the final tactic, combines insights from both the inductive and deductive research techniques. It explores the limitations and

shortcomings of these approaches and provides justifications and explanations by analysing the collected data (Osman et al., 2018).

In addition to these three research strategies, two other widely used research methodologies should also be considered: qualitative methodology and quantitative methodology (Basias & Pollalis, 2018). The qualitative methodology focuses on understanding the "how" and "why" of research questions through data collection and analysis within a theoretical framework (Taguchi, 2018). This method is often employed to explore human perspectives and interpretations through interviews, which are subsequently analyzed to establish connections.

On the other hand, the quantitative methodology is analytical in nature and involves measuring real-time variables through surveys, statistical procedures, and numerical analysis (Mehrad & Tahriri, 2019). The author highlights that the research approach and methodology are closely intertwined.

With the discussion on research approach and methodology covered, the research study focuses on evaluating the impact of Big Data techniques on customer retention in the telecommunications sector. Specifically, it analyses data from one of the largest telecommunications providers in Africa. The study also considers the Service Quality (SERVQUAL) model, its variables, and their relationship to customer satisfaction, aiming to measure client retention and examine their interconnections. Based on these factors, this research aligns with the deductive approach.

As mentioned earlier, the quantitative methodology proves most effective in testing existing theories through surveys, utilizing an extensive sample size, and conducting data collection and analysis (Basias & Pollalis, 2018). Consequently, this study employs the quantitative methodology to support its research objectives.

3.2. Research process

The research process entails a systematic and iterative approach that encompasses the planning and execution stages of the research study. It provides a comprehensive roadmap for conducting the study and addressing the research aim by effectively answering the research questions. In Figure 4 (Kassem et al., 2016) outlines the essential steps involved in the research process, including the analysis of existing literature, identification of research questions, development of a conceptual framework, and the subsequent collection and analysis of data.

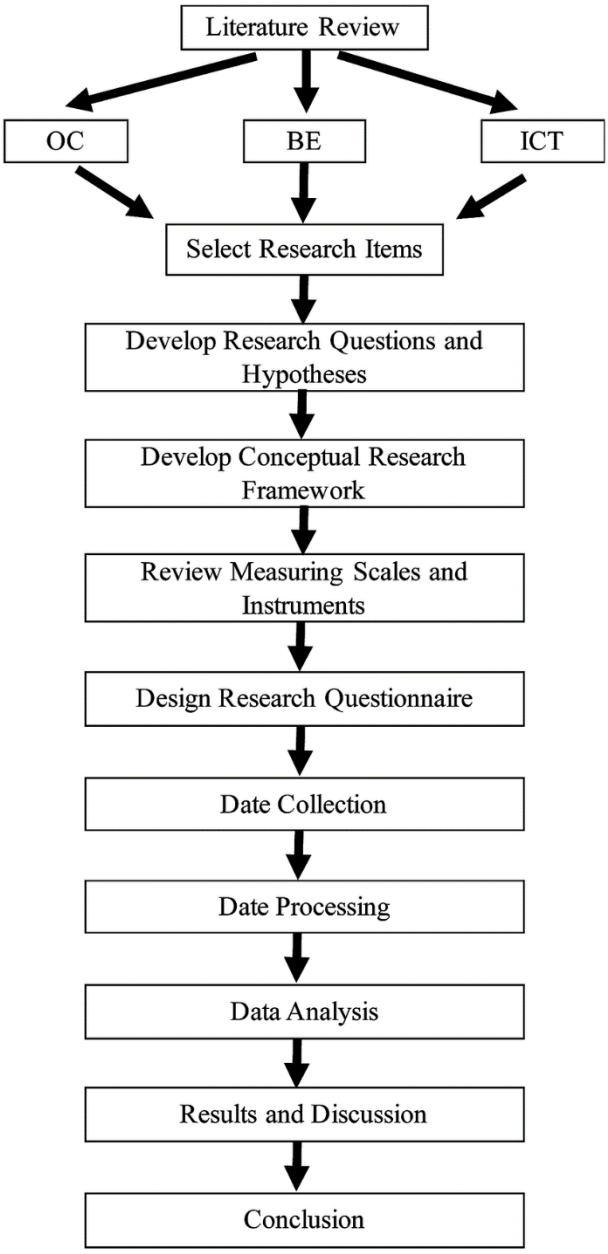


Figure 5 - The steps of the research process (Kassem et al., 2016)

The research process begins by formulating the research question to establish the research goals, followed by designing the research to execute the steps outlined in the proposed model. Subsequently, data collection and analysis are conducted, leading to the compilation of outcomes (Fisher & Bloomfield, 2019). While many scholars perceive the research process as a top-down approach, Kassem argues that it can also work in a bottom-up manner (Kassem et al.,

2016). During the design phase, researchers may revisit and revise the research questions, resulting in a newly conceptualized design aligned with the updated research question (Kassem et al., 2016).

Understanding the five key stages of research design, as suggested by the author, is crucial. These stages include descriptive research, experimental research, correlational research, review research, and meta-analysis (Fisher & Bloomfield, 2019). Given that the research work involves case studies, surveys, and questionnaires to address the research questions, it falls under the category of descriptive research.

3.3. Sampling design

Research standards emphasize the importance of using appropriate sampling techniques to gain insights into the expectations, preferences, characteristics, and dislikes of a specific group or population. Sampling allows researchers to gather specific information about the population of interest for further analysis and investigation (Kabir, 2016). In this study, we provide a comprehensive description of the sampling process implemented.

3.3.1. Target Population

In adherence to research standards, the sampling process involves gathering insights from a group of individuals through surveys or questionnaires, as previously mentioned. This method focuses on the target population, which refers to the specific population or group of individuals that the researcher aims to investigate (Barnsbee et al., 2018). The purpose of this investigation is to conduct data analysis and draw conclusions based on the collected information.

For the present research, the target population encompasses individuals from diverse backgrounds who possess a deep understanding of Big Data and its

applications. These individuals represent various domains and industries, ensuring a comprehensive data collection process.

The reason for selecting the target population of individuals from different avenues of work is to have an equally levelled survey. To avoid anomalies, such as lurking attributes and the Simpsons paradox, which gives out a separate survey result when separating individuals of the target population according to different attributes like sex, domain, the field of expertise and many more (Grigg, 2019), individuals of varied industries have been included in this research work.

3.3.2. Sample size

In accordance with research standards, the determination of an appropriate sample size holds significant importance. Insufficient sample size has the potential to compromise the reliability and credibility of the resulting conclusions (Bujang & Adnan, 2016). The author emphasizes the criticality of achieving an adequate sample size to ensure the accuracy and dependability of the research. Furthermore, the author suggests that the selection of an appropriate sample size should align with the study objectives (Bujang & Adnan, 2016), giving equal consideration to all variables.

Based on previous research conducted by Mujere, it is recommended that the sample size should maintain a ratio of approximately 5:1 in relation to the variables involved, with around 10 to 15 observations per variable to establish a robust variable ratio (Mujere, 2016). This approach strengthens the quality and accuracy of the research outcomes.

For this particular research, the target population consists of approximately 100-120 individuals. Considering the present study, the researcher aims to employ a 20:1 observation-to-variable ratio to determine the sample size for the 100 individuals included in this research. Notably, this sample size has been successfully implemented in a research method used by Nanjundeswaraswamy and Divakar, yielding effective and accurate results (Nanjundeswaraswamy &

Divakar, 2021). Their research also employed a minimal sample size, analysing the study variable based on insights from 100 individual survey and questionnaire responses.

3.4. Data collection

The data collection process will involve both primary and secondary data gathering methods. Primary data, as stated by Creswell and Clark (2017), is considered the most reliable source of information as it is directly collected from the original sources for the specific purpose of the research. In line with the descriptive research methodology, surveys, such as questionnaires, are crucial for analysing the research study from a primary data collection perspective (Fisher & Bloomfield, 2019). Surveys serve as a prominent tool for collecting specific information, perspectives, opinions, and preferences from a targeted group of the population within a particular domain, providing factual evidence for the research analysis (Yaddanapudi & Yaddanapudi, 2019).

A survey has been chosen as the primary means of data collection. Employing a survey in the form of a questionnaire is chosen for several reasons. Firstly, it is a cost-effective approach. Additionally, surveys are efficient and effective in obtaining qualitative and quantitative insights. Moreover, surveys offer the advantage of collecting a substantial amount of information from a large number of participants within a limited timeframe (Creswell & Clark, 2017). The survey questions were carefully crafted to gather information directly relevant to the research topic, and the respondents were selected based on predefined criteria outlined in the research design (Neuman, 2014).

Secondary data refers to information that has been previously collected and published by other sources (Creswell, 2017).

For this research, secondary data was obtained through existing statistical performance records. This type of data offers accessibility and can provide valuable contextual information to support the study. In this case, the secondary

data was acquired from a prominent telecommunications organization in South Africa. The collected data was analysed to gain a comprehensive understanding of past performance and to identify any patterns or trends that can enhance the research outcomes (Creswell, 2017).

In order to design an effective questionnaire, it is essential to understand the principles involved. Drawing insights from a relevant research paper (Iessa, 2022), guidelines for constructing a well-crafted questionnaire have been considered.

Design of questionnaire

The questionnaire utilized in this research adheres to research standards and encompasses all the variables and derivatives necessary to comprehend the preferences and perspectives of the selected target population. The survey questions are designed in alignment with the existing literature on the subject matter of this research (Iessa, 2022). Given that the chosen population possesses substantial knowledge of Big Data techniques, all the survey questions revolve around this topic.

Through the constructed questionnaire, we aim to gain insights into various aspects, including customers' attitudes towards the adoption of the latest technology, their satisfaction levels with personalized services, the quality of service provided, the nature of their relationship with the service provider, and the factors that contribute to customer loyalty towards a particular business or brand.

To measure the responses obtained from the questionnaire, a scale is utilized, ranging from the lowest measure to the highest measure. According to Iessa (2022), questionnaires are effective tools for exploring the relationships between different variables and the population under consideration. In this research, we seek to understand the customer orientation regarding variables such as reliability, assurance, tangibility, customer satisfaction, and customer retention.

To assess these dimensions, the survey employs a rating scale ranging from 1 (strongly disagree) to 5 (strongly agree).

When utilizing questionnaires for data collection, it is crucial to address potential challenges related to data management and obtaining consent from participants (Yaddanapudi & Yaddanapudi, 2019). In order to uphold ethical standards in this research, clear explanations regarding the usage of collected data are provided to the targeted population. Verbal consent is obtained from the selected 100 individuals before distributing the questionnaire to them through channels such as email, WhatsApp, and LinkedIn. Only after receiving consent, the survey is administered, and the responses are collected for subsequent data analysis.

3.5. Data analysis

3.5.1. Structural Equation Modelling

Data analysis plays a fundamental role in the research process, as emphasized by Saunders and Lewis (2017). In this study, the analysis technique employed is "Structural Equation Modelling" (SEM), which aims to determine the nature of churn, accurately predict churn, and assess its effectiveness (Ullman & Bentler, 2012). SEM is a suitable approach for both theoretical and empirical research, as it establishes the connections and theoretical relationships among variables and attributes under investigation (Mueller & Hancock, 2018).

Structural Equation Modelling (SEM) remains a vital analytical tool in various research domains, including telecommunications, due to its ability to model complex relationships between observed and latent variables. Recent advancements in SEM have further enhanced its capabilities, incorporating Bayesian methods for estimation, which allow for more flexible assumptions regarding the data distribution and the incorporation of prior information into the analysis (Van de Schoot, Kaplan, Denissen, Asendorpf, Neyer, & Aken, 2014).

The effectiveness of Structural Equation Modelling is evident in the research conducted by Chatterjee et al. (2019), wherein churn prediction analysis was performed in a telecommunications company. The outcomes of that study demonstrated that SEM outperformed other algorithms, providing accurate information and insights. This affirms the reliability and efficacy of SEM for prediction, detection, and rational problem-solving purposes.

An alternative to SEM that has gained prominence in the last decade is Machine Learning (ML) algorithms. These algorithms can handle large datasets and are particularly adept at prediction tasks. Techniques like Random Forests and Support Vector Machines have been applied successfully in customer churn prediction, which is a common research area in telecommunications (Verbeke, Martens, Mues, & Baesens, 2014).

In a related study focusing on churn forecasting among South African prepaid service providers, Morgan and Govender (2017) highlight the suitability of Structural Equation Modelling (SEM) as a statistical model for revealing patterns and relationships between variables.

Drawing from the manifold advantages associated with SEM, it has been selected as the preferred statistical model for this research study.

3.5.2. Correlation analysis

Correlation analysis is a widely employed statistical method utilized across various research fields, including social sciences, psychology, and finance. Its purpose is to examine the relationship between two variables and quantify the strength and direction of that relationship. Babbie (2016) acknowledges the utility of correlation analysis in identifying data patterns and testing hypotheses concerning variable relationships. Field (2013) further highlights its predictive capabilities, enabling researchers to make forecasts based on observed patterns. Additionally, Warner (2013) underscores the significance of correlation analysis in research studies, as it unveils valuable insights into variable relationships.

To summarize, correlation analysis serves as a valuable statistical tool, enabling researchers to gain insights into the relationships between variables. By understanding these relationships, researchers can make more accurate predictions and draw robust conclusions from their data.

3.6. Ethical consideration

I. Maintaining ethical standards is essential for ensuring the integrity of the research paper (Enago Academy, 2022). To uphold the ethical nature of the study, the following processes will be implemented:
II.
III. I. The researcher will obtain clearance from the University's Ethical Committee.
IV. II. Each participant involved in the research study will be requested to provide informed consent.
V. III. Strict confidentiality and anonymity of the respondents will be maintained to protect their privacy.
VI. IV. The research objectives of the study will be clearly communicated to the participants.
VII. By adhering to these ethical practices, the researcher ensures the trustworthiness and credibility of the study while safeguarding the rights and well-being of the participants.

3.7. Conclusion

This section of the research paper provides a comprehensive overview of the research methodology. The approach and process have been carefully developed through extensive research. The sampling process involved distributing a questionnaire to approximately 100-120 individuals with significant experience in Big Data and its impact. Upon collecting the pre- and post-Big Data inputs, the data analysis will be conducted using Structural Equation Modelling. This statistical technique enables an accurate assessment of churn potential and actual churn. A more detailed account of the methodology and data analysis forecasts will be presented in Chapter 4 of the research paper.

CHAPTER 4. PRESENTATION OF RESULTS / FINDINGS

4.1. Introduction

The purpose of this chapter is to present the statistical analysis and findings derived from the data collected on "The Impact of Big Data in Customer Retention in Telecommunications within South Africa." The chapter will encompass participant demographic information, questionnaire results, SEM analysis outcomes, and predictions of churn rate values for 2023, as well as hypotheses testing.

A total of 143 responses were obtained for each question in the survey. However, only 123 responses were included in the data analysis due to missing data in certain questions. It is important to note that this sample size is deemed representative of the target population.

By adhering to research standards, this chapter provides a comprehensive account of the statistical analysis and results, offering insights into the relationship between Big Data and customer retention in the telecommunications sector within South Africa.

4.2. Descriptive Statistics

The initial section of this chapter will provide an overview of participant demographics, encompassing variables such as gender, age group, education level, and area of employment. The subsequent section will focus on the questionnaire results, specifically addressing customer retention and satisfaction, as well as the perceived influence of Big Data on these factors. Furthermore, participants' perspectives on the impact of customer engagement, customer knowledge, and customer satisfaction on customer retention will be documented. By presenting these findings, the chapter aims to offer valuable insights into the

relationship between Big Data and customer retention in the context of customer engagement, knowledge, and satisfaction.

4.3. Sample Description

Out of the 123 responses considered for data analysis, 32.5% of participants identified as female, 66.7% as male, and 0.8% preferred not to disclose their gender. These percentages are displayed in Table 1. Participants were divided into six age groups: 18-24 years (1.6%), 25-34 years (15.4%), 35-44 years (44.7%), 45-54 years (29.3%), 55-64 years (8.1%), and 65+ years (0.8%). The largest proportion of participants fell within the 35-44 age group, as shown in Table 4.3.2.

Regarding occupation industries, the responses indicated a distribution among various sectors: 38.2% of respondents were from the Telecommunications Industry, 20.3% from Contact Centre jobs, 14.6% from Information Technology, 13% from Financial Services, 1.6% from Education, 0.8% from the Energy Sector, 0.8% from the Construction Sector, and 10.6% from other unmentioned industries. Further information on the participants' occupations can be found in Table 4.3.4. These findings provide insights into the demographic characteristics and occupational backgrounds of the participants involved in the study.

Table 1 - Gender

Gender				
	Frequency	Percent	Valid Percent	Cumulative Percent
Female	40	32.5	32.5	32.5
Male	82	66.7	66.7	99.2
Prefer not to say	1	.8	.8	100.0
Total	123	100.0	100.0	

The participants in the study were classified into three categories based on gender: male, female, and participants who preferred not to disclose their gender.

Out of the total number of participants, 82 identified as male and 40 identified as female, while some participants chose not to disclose their gender.

Table 2 – Age Group

Age Group				
	Frequency	Percent	Valid Percent	Cumulative Percent
18 – 24	2	1.6	1.6	1.6
25 – 34	19	15.4	15.4	17.1
35 – 44	55	44.7	44.7	61.8
45 – 54	36	29.3	29.3	91.1
55 – 64	10	8.1	8.1	99.2
65+	1	.8	.8	100.0
Total	123	100.0	100.0	

Table 2 above, provides an overview of the distribution of participants across different age groups. The study included six age groups: 18-24, 25-34, 35-44, 45-54, 55-64, and above 65. The largest proportion of participants (44.7%) fell within the age range of 35-44. The distribution of participants across the other age groups was as follows: 18-24 (1.6%), 25-34 (15.4%), 45-54 (29.3%), 55-64 (8.1%), and above 65 (0.8%).

Table 3 - Region

Region				
	Frequency	Percent	Valid Percent	Cumulative Percent
Eastern Cape	3	2.4	2.4	2.4
Gauteng	94	76.4	76.4	78.9
KwaZulu-Natal	12	9.8	9.8	88.6
Limpopo	1	.8	.8	89.4
Mpumalanga	1	.8	.8	90.2
North West	2	1.6	1.6	91.9
Western Cape	10	8.1	8.1	100.0
Total	123	100.0	100.0	

Table 3 presents the distribution of participants across different regions in the study, encompassing a total of seven regions: Eastern Cape, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, North West, and Western Cape. The results reveal that the majority of participants (76.42%) were located in Gauteng. The remaining regions had lower representation, with Eastern Cape accounting for 2.44%, KwaZulu-Natal for 9.76%, Limpopo for 0.81%, Mpumalanga for 0.81%, North West for 1.63%, and Western Cape for 8.13% of the total participants.

Table 4 - Occupation

Occupation				
	Frequency	Percent	Valid Percent	Cumulative Percent
Construction	1	.8	.8	.8
Contact Centre	25	20.3	20.3	21.1
Education	2	1.6	1.6	22.8
Energy	1	.8	.8	23.6
Financial Services	16	13.0	13.0	36.6
Information Technology	18	14.6	14.6	51.2
Other	13	10.6	10.6	61.8
Telecommunications	47	38.2	38.2	100.0
Total	123	100.0	100.0	

Table 4 presents the distribution of participants across different job fields. The categories included Construction, Contact Centre, Education, Energy, Financial Services, Information Technology, Telecommunications, and Others. Among the participants, the Telecommunications sector had the highest representation, accounting for 38.21% of the respondents. On the other hand, the fields of Construction, Contact Centre, Education, Energy, Financial Services, Information Technology, and Others had respective representations of 0.81%, 20.33%, 1.63%, 0.81%, 13.01%, 14.63%, and 10.57%.

Table 5 – Questionnaire Responses

	Strongly disagree %	Disagree %	Slightly disagree %	Neutral %	Slightly agree %	Agree %	Strongly agree %	Total %
Customer Relationship Management								
CRM1	6.5	0	0	0	2.4	34.1	56.9	100
CRM2	4.1	0.8	0	3.3	6.5	32.5	52.8	100
CRM3	4.1	0.8	3.3	11.4	8.9	34.1	37.4	100
CRM4	4.9	4.1	0.8	14.6	14.6	31.7	29.3	100
CRM5	4.1	0.8	1.6	6.5	8.1	38.2	40.7	100
CRM6	3.3	0	1.6	2.4	7.3	43.1	42.3	100
Enhanced Analytics								
CCA1	5.7	1.6	0	1.6	6.5	44.7	39.8	100
CCA2	4.1	0.8	0.8	4.1	8.9	43.1	38.2	100
CCA3	3.3	1.6	0	3.3	5.7	33.3	52.8	100
Customer Service								
CS1	3.3	0.8	0	0.8	4.9	37.4	52.8	100
CS2	4.9	0	0	0.8	1.6	31.7	61.0	100
CS3	2.4	0	0	0.8	3.3	34.1	59.3	100
CS4	2.4	0	1.6	4.9	8.9	40.7	41.5	100
CS5	1.6	0.8	1.6	8.9	10.6	43.1	33.3	100
CS6	2.4	4.9	9.8	13.8	33.3	26.0	9.8	100
CS7	2.4	3.3	5.7	8.9	18.7	48.8	12.2	100
CS8	3.3	5.7	6.5	11.4	24.4	32.5	16.3	100
Improved Customer Knowledge								
ICK1	4.1	0	0.8	1.6	8.1	48.0	37.4	100
ICK2	4.1	0.8	2.4	8.9	12.2	44.7	26.8	100
ICK3	3.3	0.8	0.8	0	5.7	50.4	39.0	100
ICK4	3.3	4.1	1.6	11.4	11.4	38.2	30.1	100
Customer Retention								
CR1	3.3	0	2.4	4.1	13.8	43.9	32.5	100

CR2	3.3	0.8	0	3.3	13.0	47.2	32.5	100
CR3	2.4	0.8	1.6	1.6	13.8	51.2	28.5	100
CR4	3.3	1.6	2.4	5.7	11.4	43.9	31.7	100
CR5	2.4	0	1.6	7.3	13.0	33.3	42.3	100

The survey participants' perceptions of the methods applied for each of the seven constructs are summarized in Table 5. Below, in Figure 6, Figure 7, Figure 8, Figure 9, and Figure 10, the histograms demonstrate a rightward shift, indicating that the majority of participants accept the statements mentioned in the survey.

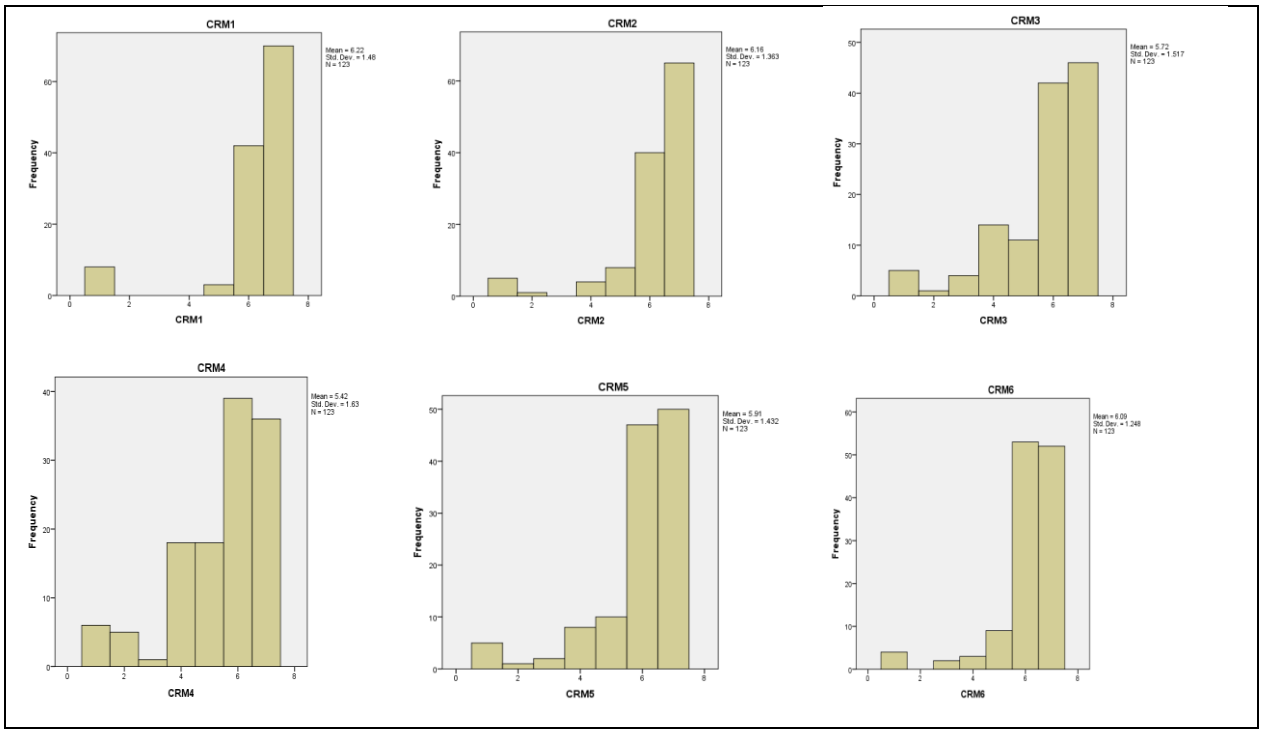


Figure 6 - Customer Relationship Management

The Customer Relationship histogram is presented in Figure 6. The histogram represents the participants' perceptions of various statements related to Customer Relationship Management (CRM). The statements are as follows:

1. CRM 1: "Big Data analytics assists in the identification of major trends and customer needs in the business world."
2. CRM 2: "Big Data analytics assists in enhancing customer relationships."

3. CRM 3: "Big Data aids first-hand in ensuring seamless communication with the customer to boost the relationship between the customer and organization."
4. CRM 4: "Big Data analytics techniques ensure there is two-way communication between customers and the brand."
5. CRM 5: "Big Data techniques are effective in monitoring customer engagement management."
6. CRM 6: "The implementation of Big Data assists in customer retention."

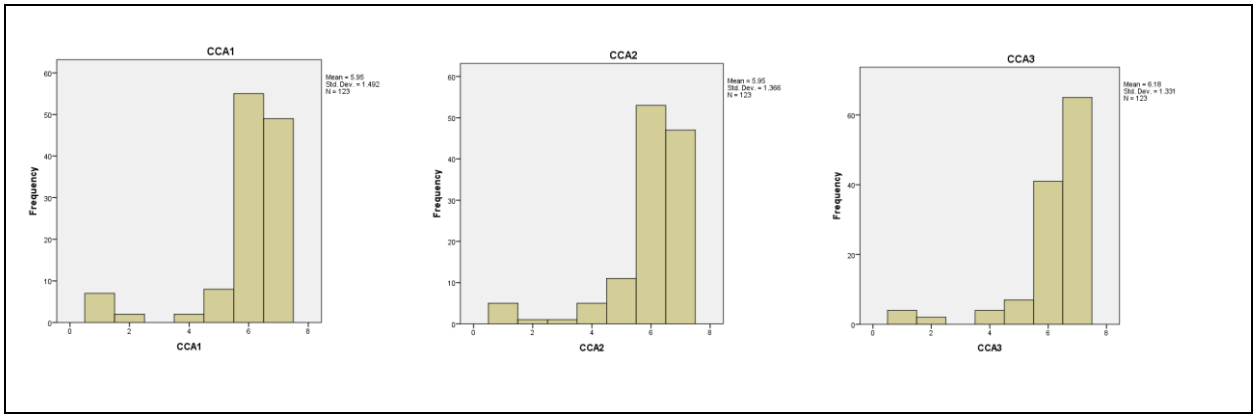


Figure 7 – Enhanced Analytics

Figure 7 above, illustrates the representation of Enhanced Analytics. The histogram depicts the participants' perceptions of the following statements:

CCA 1: "Big Data analytics assists in providing more customer-centric and client-preferred products and services."

CCA 2: "Customer-curated products, with the help of Big Data insights, play a vital role in customer satisfaction."

CCA 3: "There is a positive correlation between Customer Satisfaction and Customer Retention."

In Figure 8 below, a histogram representing Customer Service is presented. The histogram showcases the participants' views on the following statements:

CS 1: "The quality of a product or service should meet customer expectations prior to a sale."

CS 2: "Service quality plays a crucial role in attracting customers to a brand's offerings."

CS 3: "Service quality significantly impacts customer loyalty and repeat purchases."

CS 4: "Big Data analytics plays a role in managing customer relationships."

CS 5: "Customers are likely to purchase products from brands they are familiar with."

CS 6: "Customers consider the aftersales support provided by a brand before making a purchase."

CS 7: "Ease of communication is an important factor in customer brand choice."

CS 8: "Customer perceptions of a brand are shaped by the quality of its service, rather than its affordability."

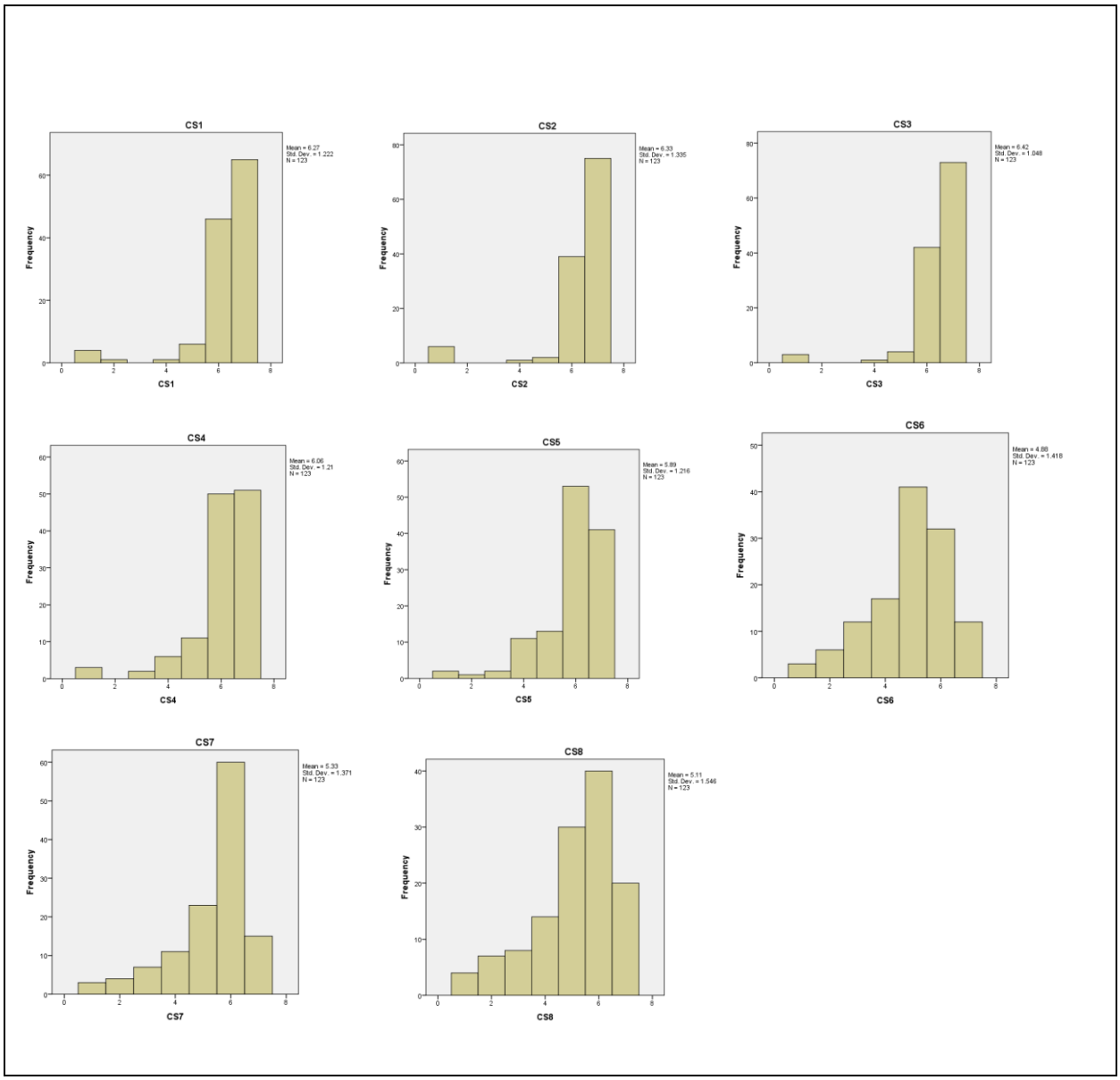


Figure 8 - Customer Service

Figure 9 below, displays a histogram representing Improved Customer Knowledge (ICK). The histogram illustrates the participants' perceptions of the following statements:

ICK 1: "Big Data analytics can help comprehend and fulfil customer requirements."

ICK 2: "Big Data techniques can enhance the resolution of customer inquiries."

ICK 3: "Big Data can assist in comprehending customer preferences and orientations to design suitable products and services."

ICK 4: "Big Data analytics can determine whether customers would recommend a particular brand to their loved ones."

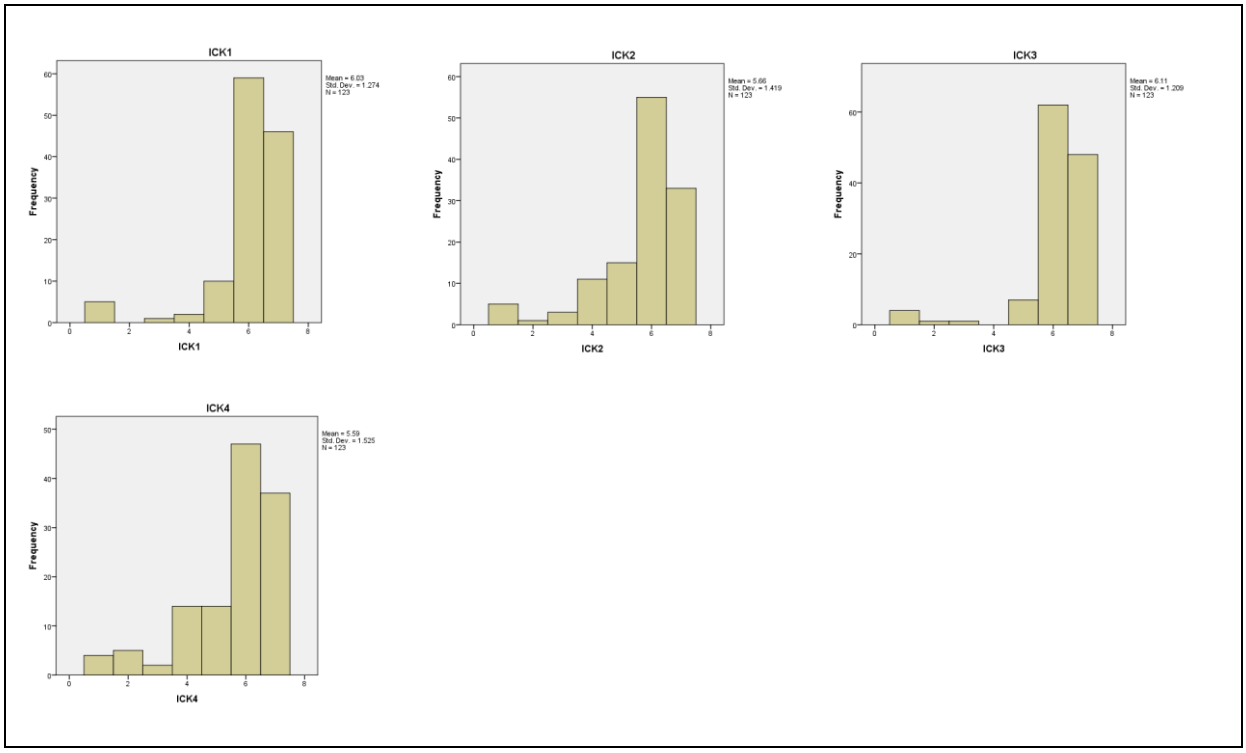


Figure 9 - Improved Customer Knowledge

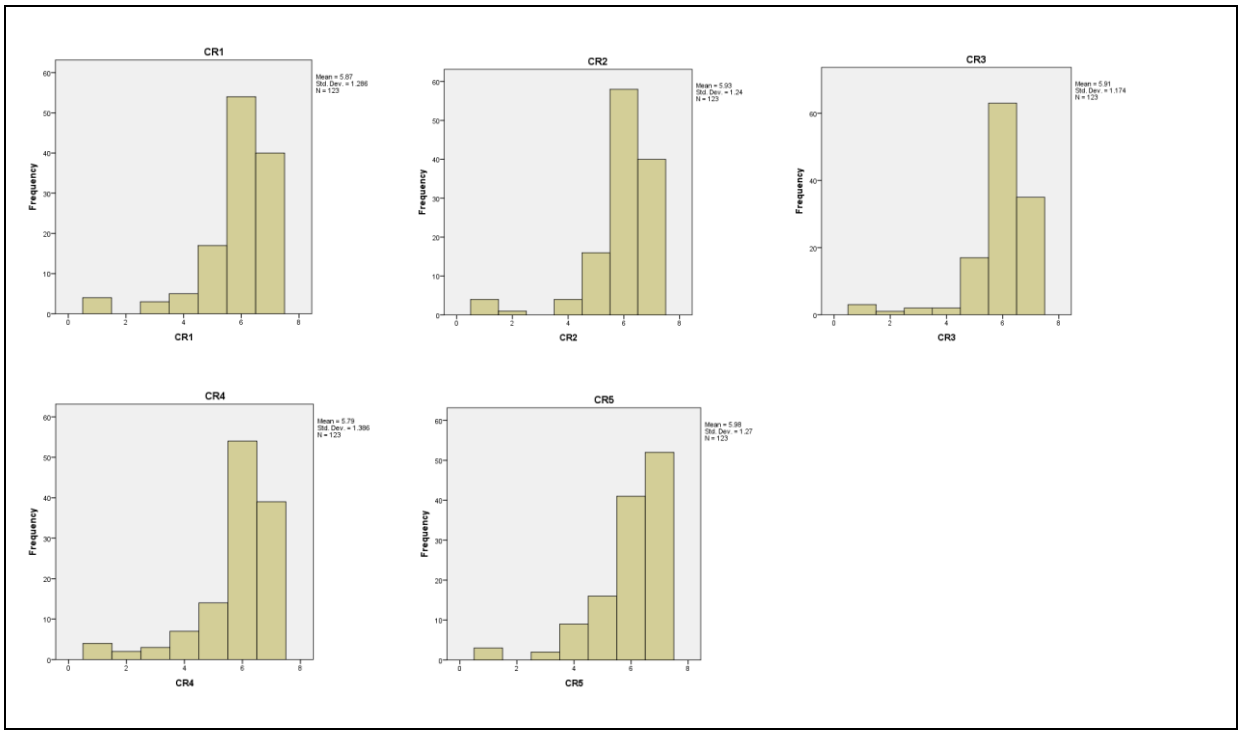


Figure 10 - Customer Retention

Figure 10 above, presents a histogram representing Customer Retention (CR). The histogram reflects the participants' perceptions of the following statements:

CR 1: "Big Data tools can be utilized to assess a customer's level of satisfaction with a product or service."

CR 2: "Big Data can help in determining the appropriate loyalty programs to introduce to customers. "CR 3: "The utilization of Big Data can offer valuable insights into the impact of a customer's behaviour on the brand."

CR 4: "Big Data can provide organizations with insights on whether or not to engage with customers."

CR 5: "Big Data has the capability to determine a customer's likelihood of churning."

4.4. Reliability and Validity of Constructs

To assess the research constructs, a Likert scale with seven response options ranging from "Strongly Disagree" to "Strongly Agree" was employed. A total of 123 participants completed the survey. The survey encompassed five constructs, each consisting of several questions. The constructs and their respective question labels are as follows:

Customer Relationship (CRM): This construct was evaluated using six questions (CRM 1 to CRM 6).

Customer Satisfaction (CCA): This construct was assessed through three questions (CCA 1 to CCA 3).

Customer Service (CS): This construct was analysed using eight questions (CS 1 to CS 8).

Improved Customer Knowledge (ICK): This construct was measured through four questions (ICK 1 to ICK 4).

Customer Retention (CR): This construct was evaluated through five questions (CR 1 to CR 5).

The mean and standard deviation for each construct are summarized in a tabulated format below.

Table 6 – Questionnaire Stats

Research Construct		**Descriptive Statistics**					
		Mean		**Standard Deviation**		**Cronbach's Apha**	**Factor Loadings**
Customer Relationship Management	CRM1	6.22	5.92	1.480	1.445	0.912	0.695
	CRM2	6.16		1.363			0.560
	CRM3	5.72		1.517			0.773
	CRM4	5.42		1.630			0.672

	CRM5	5.91		1.432			0.676
	CRM6	6.09		1.248			0.577
Enhanced Analytics	CCA1	5.95	6.02	1.492	1.396	0.771	0.506
	CCA2	5.95		1.366			0.608
	CCA3	6.18		1.331			0.708
Customer Service	CS1	6.27	5.78	1.222	1.295	0.864	0.792
	CS2	6.33		1.335			0.750
	CS3	6.42		1.048			0.555
	CS4	6.06		1.210			0.506
	CS5	5.89		1.216			0.549
	CS6	4.88		1.418			0.826
	CS7	5.33		1.371			0.763
	CS8	5.11		1.546			0.720
Improved Customer Knowledge	ICK1	6.03	5.84	1.274	1.356	0.870	0.665
	ICK2	5.66		1.419			0.655
	ICK3	6.11		1.209			0.618
	ICK4	5.59		1.525			0.792
Customer Retention	CR1	5.87	5.896	1.286	1.2712	0.909	0.620
	CR2	5.93		1.240			0.801
	CR3	5.91		1.174			0.774
	CR4	5.79		1.386			0.717
	CR5	5.98		1.270			0.585

4.4.1. Reliability Test

4.4.1.1. Cronbach Alpha Coefficient

The internal consistency or reliability of the survey items was assessed using Cronbach's alpha coefficient. Cronbach's alpha quantifies the level of agreement on a standardized scale ranging from 0 to 1. Higher values indicate higher

agreement between the items. A high Cronbach's alpha value suggests that participant responses are consistent across the set of questions.

The Cronbach's alpha values for each variable are presented in Table 6. An alpha value greater than 0.9 is considered excellent, between 0.9 and 0.8 is considered good, between 0.8 and 0.7 is considered acceptable, between 0.7 and 0.6 is considered questionable, between 0.6 and 0.5 is considered poor, and less than 0.5 is considered unacceptable. Based on the calculated Cronbach's alpha values, the results were deemed good.

4.4.1.2. Composite Reliability (CR)

There is another approach to assess the internal consistency of measurement items. It is generally recommended for a construct's reliability to be at least 0.70. However, some researchers argue that values above 0.6 indicate high consistency among the measurement items (Gu et al., 2019). Based on this criterion, we can conclude that the measurement items in our study demonstrate satisfactory reliability.

Table 7 - Composite Reliability

Composite reliability (CR)						
			$(\sum \lambda Yi)^2$	summation of error terms		**CRη= (Σλyi)2/[(Σλyi)2+(Σεi)]**
		Estimate		ɛi	∑ɛi	CR
Customer Relationship Management	CRM1	0.695	15.626	0.517	3.364	0.823
	CRM2	0.560		0.686		
	CRM3	0.773		0.402		
	CRM4	0.672		0.548		
	CRM5	0.676		0.543		
	CRM6	0.577		0.667		
	CCA1	0.506	3.320	0.744	1.873	0.639

Enhanced Analytics	CCA2	0.608		0.630		
	CCA3	0.708		0.499		
Customer Service	CS1	0.792	29.823	0.373	4.162	0.878
	CS2	0.750		0.438		
	CS3	0.555		0.692		
	CS4	0.506		0.744		
	CS5	0.549		0.699		
	CS6	0.826		0.318		
	CS7	0.763		0.418		
	CS8	0.720		0.482		
Improved Customer Knowledge	ICK1	0.665	7.453	0.558	2.120	0.779
	ICK2	0.655		0.571		
	ICK3	0.618		0.618		
	ICK4	0.792		0.373		
Customer Retention	CR1	0.620	12.229	0.616	2.519	0.829
	CR2	0.801		0.358		
	CR3	0.774		0.401		
	CR4	0.717		0.486		
	CR5	0.585		0.658		

4.4.2. Validity Testing

The validity of the measurement instrument was assessed through the examination of factor loadings, correlation matrix, and average variance extracted (AVE). These analyses provided insights into the instrument's validity.

4.4.2.1. Factor Loadings

According to Lee, Jo, and Park (2019), factor loading is a statistical measure that reflects the correlation between a variable and a factor in factor analysis. It indicates the degree to which the variance in the variable can be explained by

the underlying factor. In this study, all factor loading values reported in Table 6 were found to be greater than 0.5. These results suggest that the measurement items possess strong convergent validity, as evidenced by their high factor loadings.

4.4.2.2. Average Value Extracted (AVE)

The Average Variance Extracted (AVE) is a measure commonly employed to assess the reliability of a construct within a structural equation model (Hair, Black, Babin, & Anderson, 2019). It quantifies the proportion of variance captured by a construct in relation to the variance attributed to measurement error. Typically, an AVE value of 0.4 or greater is considered indicative of satisfactory reliability. Table 8 provides the computed AVE values for the constructs under investigation.

Table 8 - Average Value Extracted

		Estimate	**λyi²**	**∑λyi²**	**ε̇i**	**∑ε̇i**	**∑λyi² / (∑λyi² + ∑ε̇i)**
Customer Relationship Management	CRM1	0.695	0.483	2.636	2.636	5.483	0.3246398
	CRM2	0.560	0.314		0.686		
	CRM3	0.773	0.598		0.402		
	CRM4	0.672	0.452		0.548		
	CRM5	0.676	0.457		0.543		
	CRM6	0.577	0.333		0.667		
Enhanced Analytics	CCA1	0.506	0.256	1.127	0.744	1.873	0.3756547
	CCA2	0.608	0.370		0.630		
	CCA3	0.708	0.501		0.499		
Customer Service	CS1	0.792	0.627	3.838	0.373	4.162	0.4797589
	CS2	0.750	0.563		0.438		
	CS3	0.555	0.308		0.692		
	CS4	0.506	0.256		0.744		
	CS5	0.549	0.301		0.699		

	CS6	0.826	0.682		0.318		
	CS7	0.763	0.582		0.418		
	CS8	0.720	0.518		0.482		
Improved Customer Knowledge	ICK1	0.665	0.442	1.880	0.558	2.120	0.4701095
	ICK2	0.655	0.429		0.571		
	ICK3	0.618	0.382		0.618		
	ICK4	0.792	0.627		0.373		
Customer Retention	CR1	0.620	0.384	2.481	0.616	2.519	0.4962782
	CR2	0.801	0.642		0.358		
	CR3	0.774	0.599		0.401		
	CR4	0.717	0.514		0.486		
	CR5	0.585	0.342		0.658		

4.4.2.3. Correlation Matrix

Table 9 presents the correlation coefficient values among the variables. It is worth noting that all correlation coefficient values were found to be statistically significant, except for the correlation coefficient between CR and CS.

Table 9 - Correlation Coefficient Values

	CRM	CCA	CS	ICK	CR
CRM	1				
CCA	0.379	1			
CS	0.927	0.377	1		
ICK	0.740	0.180	0.970	1	
CR	-0.170	0.355	-0.280	0.911	1

4.5. Structural Equation Modelling

A structural equation model (SEM) was constructed using IBM's SPSS Amos graphics, as illustrated in Figure 7. The model incorporated several variables, including Customer Relationship, Customer Satisfaction, Customer Service, Improved Customer Knowledge, and Customer Retention

4.6. Model Fit Assessment

The adequacy of the model for the given data was assessed by conducting comprehensive evaluations of model fit. This involved employing various tests such as the Chi-square (CMIN) test, baseline comparisons, and the root mean square error of approximation (RMSEA) to demonstrate how well the model fits the data.

4.8.1. Chi-square value (CMIN)

Table 10 - Chi-square value

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	127	326.512	250	.121	1.306
Saturated model	377	.000	0		
Independence model	52	2949.619	325	.000	9.076

The CMIN metric is used to evaluate whether the observed data aligns with the predicted results in a statistically meaningful manner. If the ratio of CMIN to degrees of freedom is less than three, it indicates that the model fits adequately.

4.8.2. Baseline Comparisons

Table 11 - Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.901	.906	.972	.962	.971

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

According to O'Keefe (2018), baseline comparison is a research method that involves measuring a specific variable or outcome at the beginning of a study to establish a reference point for comparison with subsequent measurements or outcomes. The baseline value serves as a basis for assessing changes or differences over time or in response to an intervention or treatment. By controlling for pre-existing differences or variables that could influence the outcome of interest, researchers can evaluate the effectiveness of an intervention or treatment and make causal inferences about the impact of various factors on the outcome of interest (O'Keefe, 2018).

During the data analysis process, the Normal Fit Index (NFI), Relative Fit Index (RFI), Incremental Fit Index (IFI), Tucker-Lewis Coefficient (TLI), and Comparative Fit Index (CFI) values were observed to be close to 1, indicating a very good fit.

4.8.3. Root Mean Square Error of Approximation (RMSEA)

Table 12 - Root Mean Square Error of Approximation

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.050	.033	.065	.485
Independence model	.257	.249	.266	.000

The Root Mean Square Error of Approximation (RMSEA) is a statistical measure that evaluates the discrepancy between the observed covariance matrix and the predicted covariance matrix, taking into account the degrees of freedom. A RMSEA value of 0.05 or less is generally considered as indicative of an excellent fit for the model (Fan & Sivo, 2015). Based on the information provided, it can be concluded that the model exhibits an excellent fit.

4.9. Structural Model Results

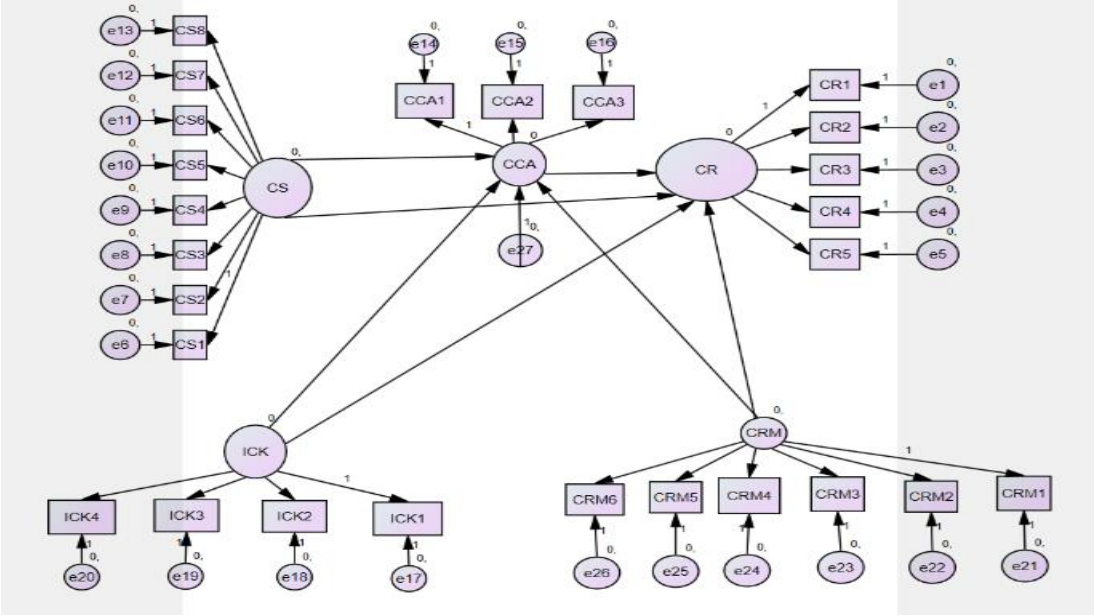


Figure 11 - Structural Equation Model

The data analysis reveals significant findings regarding the relationships between different variables. Specifically, there is a statistically significant and strong relationship between Customer Service and Customer Satisfaction. Furthermore, Customer Satisfaction demonstrates a significant correlation with Improved Customer Knowledge. Similarly, a significant and strong relationship exists between Improved Client Relationships and Customer Satisfaction. Moreover, Customer Satisfaction significantly impacts Customer Retention, and there is a noteworthy association between Customer Retention and Improved Customer Knowledge.

However, it is important to note that while the relationship between Customer Retention and Customer Relationship is statistically significant, there exists a negative correlation between them. Conversely, the relationship between Customer Retention and Customer Service does not exhibit statistical significance.

Table 13 - Structural Model Results

			Estimate	S.E.	C.R.	P	Result
Customer Satisfaction	<---	Customer Service	.377	.084	4.505	***	Supported
Customer Satisfaction	<---	Improved Customer Knowledge	.180	.076	2.373	***	Supported
Customer Satisfaction	<---	Customer Relationship	.379	.074	5.121	***	Supported
Customer Retention	<---	Enhanced Analytics	.355	.160	2.212	***	Supported
Customer Retention	<---	Customer Service	-.028	.076	-.368	.713	Not Significant
Customer Retention	<---	Improved Customer Knowledge	.911	.100	9.123	***	Supported
Customer Retention	<---	Customer Relationship	-.170	.071	-2.380	***	Supported

4.10. tNPS Data for Customer Experience

A research study conducted by Reichheld (2015) highlights the significance of Touchpoint Net Promoter Scores (tNPS) as a metric for evaluating customer satisfaction in specific transactions. According to the study, a tNPS score exceeding 20 is deemed good, while a score surpassing 50 is considered excellent.

Examining Figure 12, it is evident that prior to the implementation of Big Data, the tNPS value consistently fell within the range of 40 to 50, indicating a good level of customer satisfaction. However, following the adoption of Big Data, the tNPS value exhibited an increase, surpassing the 50 threshold. This finding suggests that the integration of Big Data contributed to a higher degree of customer satisfaction.

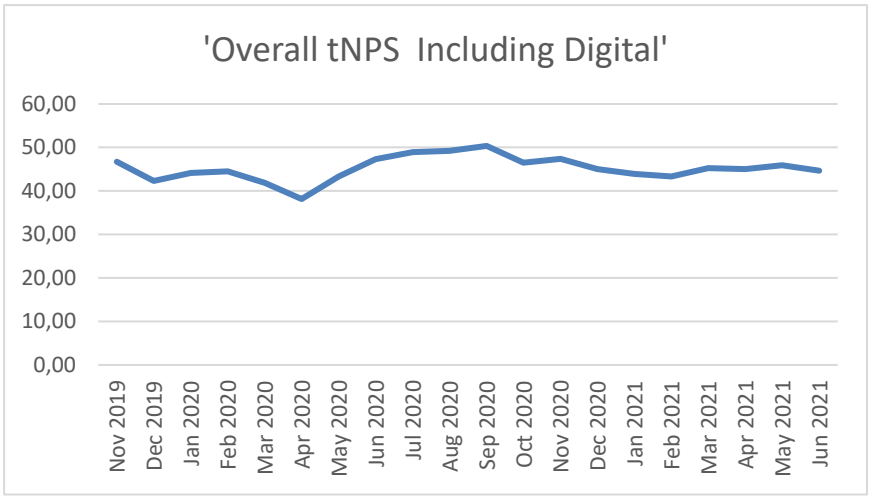


Figure 12 - Before Starting implementation of Big Data to influence Customer experience to influence churn

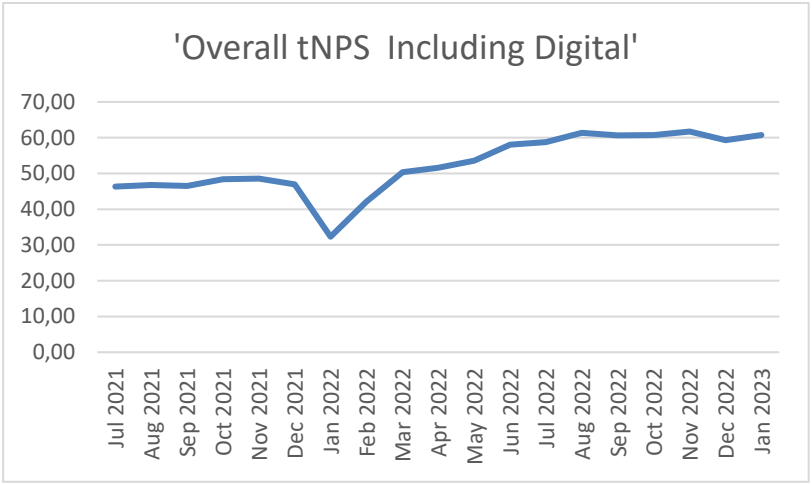


Figure 13 - After Starting implementation of Big Data to influence Customer experience to influence churn

Based on the findings obtained, there is compelling evidence to suggest that improved customer service has a positive impact on customer satisfaction.

4.11. tNPS Data for Network Experience

The study also utilized tNPS data collected from telecommunications customers to assess their satisfaction with a telecommunications network quality. Figure 13

illustrates that the tNPS value exceeded 50 following the implementation of Big Data, indicating a high level of customer satisfaction. However, as depicted in Figure 12, the tNPS values were consistently below 20 from November 2021 to December 2021, suggesting a low level of customer satisfaction prior to the implementation of Big Data. Subsequently, the tNPS values demonstrated growth from February 2022 to November 2022, but experienced a decline from November 2022 to January 2023. This decline can be attributed to the impact of Stage 6 loadshedding within South Africa, which negatively affects telecommunications networks and their ability to remain operational during extended loadshedding periods. Based on these findings, there is substantial evidence to support the assertion that enhanced customer service positively influences customer satisfaction.

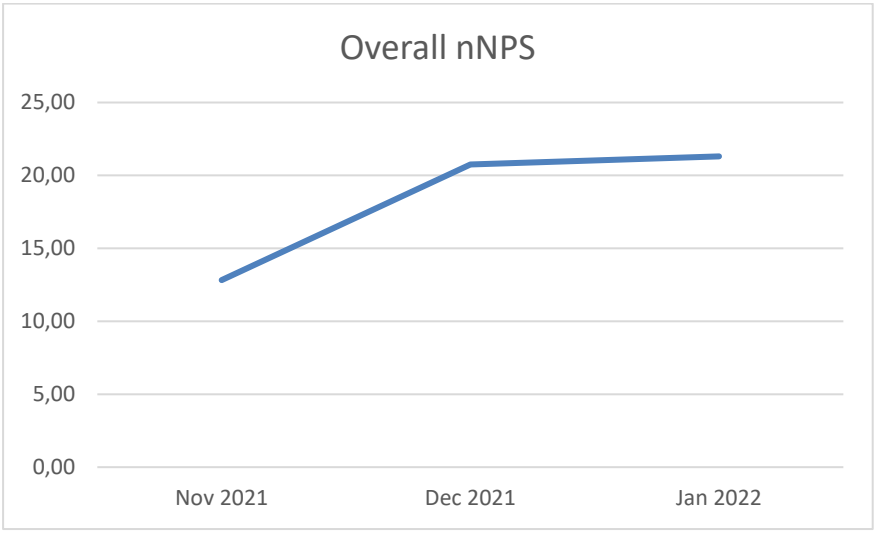


Figure 14 - Before Starting implementation of Big Data to influence Network experience to influence churn

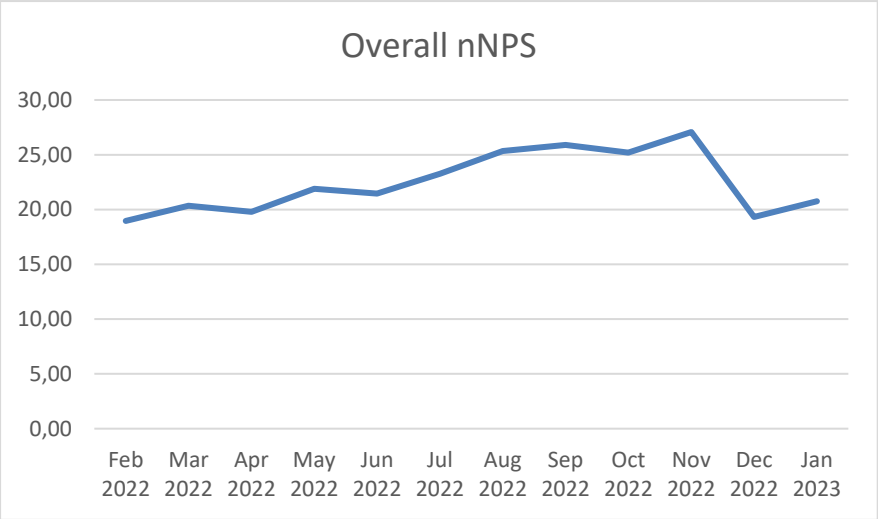


Figure 15 - After Starting implementation of Big Data to influence Network experience to influence churn

4.12. Customer Retention

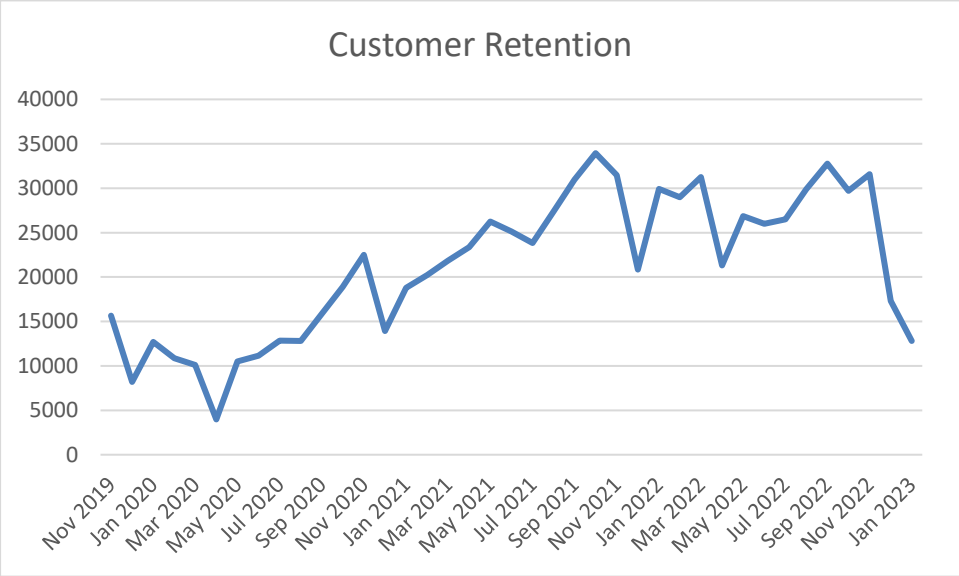


Figure 16 - Customer Retention Stat

Based on the data presented in Figure 16, it can be observed that customer retention improved after the implementation of Big Data compared to the pre-implementation period. However, a significant decline in customer retention was

observed from January 2023 onwards. This decline can be attributed to the impact of nationwide Stage 6 loadshedding, which likely disrupted services and negatively affected customer satisfaction and loyalty.

4.13. Churn Ratio

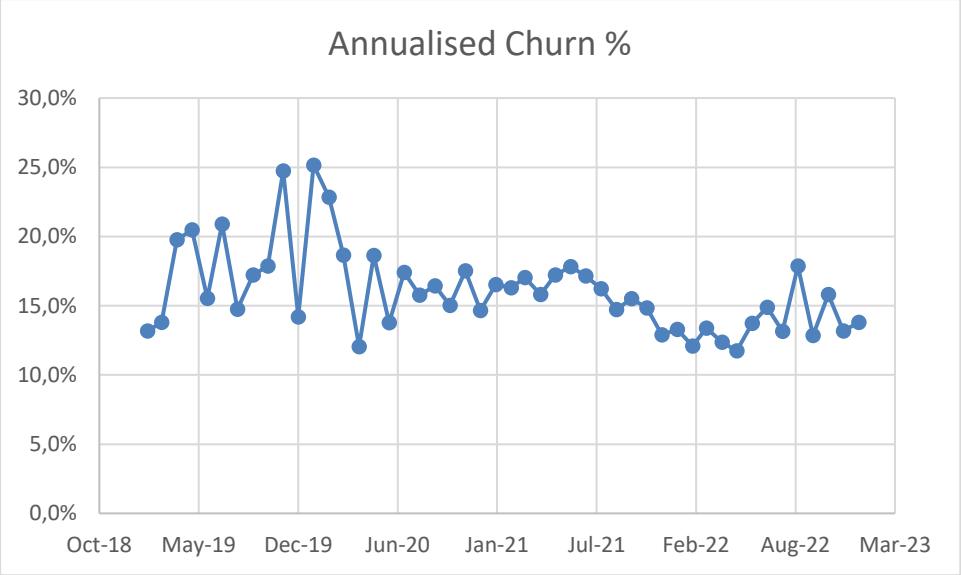


Figure 17 - Churn Ratio

After the implementation of Big Data, there was a noticeable improvement in the customer churn rate, indicating a decrease in the number of customers lost. Prior to the implementation, the average churn rate between October 2018 and June 2021 was 16.5%. However, after the introduction of Big Data in July 2021, the average churn rate decreased to 14.6%. This reduction in churn rate signifies an improvement in customer retention following the implementation of Big Data.

4.14. Churn Ratio Prediction

The Churn Ratio Prediction analysis was conducted with a limited dataset of 47 observations. This small sample size may have implications for the accuracy of the churn ratio predictions. Although it is challenging to obtain highly precise results with this limited data, Table 14 suggests that the implementation of Big Data will lead to a lower churn rate compared to before. This indicates a reduction in the number of customers lost.

	Churn forecast	Churn Rate Forecast
Jan-23	49 954	13,8%
Feb-23	49 947	13,8%
Mar-23	53 028	14,6%
Apr-23	47 319	13,0%
May-23	52 064	14,3%
Jun-23	51 487	14,1%
Jul-23	52 111	14,3%
Aug-23	51 935	14,3%
Sep-23	50 946	14,0%
Oct-23	54 103	14,9%
Nov-23	53 524	14,7%
Dec-23	49 135	13,5%
Jan-24	52 345	14,4%
Feb-24	52 231	14,3%
Mar-24	53 270	14,6%

Table 14 – Churn Prediction

4.15. Summary of Hypotheses Results

H1: The analysis report supports the hypothesis that Enhanced Customer Service has a positive influence on Customer Satisfaction. However, the analysis suggests that Enhanced Customer Service does not necessarily have an influence on Customer Retention.

H2: The results indicate that Improved Customer Knowledge, through the implementation of Big Data analytics, has a positive influence on both Customer Satisfaction and Customer Retention.

H3: The output results show that advanced analytics has a positive influence on both Customer Retention and Customer Satisfaction.

H4: The results reveal that Customer Relationship has a positive influence on Customer Satisfaction. However, there is no evidence to suggest that Customer Relationship influences Customer Retention. This finding suggests that an increase in Customer Relationship may not necessarily lead to improved Customer Retention. It is important to note that this result may be influenced by the limited number of observations.

H5: The results indicate a positive influence of Customer Satisfaction on Customer Retention.

CHAPTER 5. DISCUSSION OF THE RESULTS OR FINDINGS

5.1 Introduction

This chapter presents a comprehensive discussion of the results obtained from testing the hypotheses and compares them with the relevant findings from the existing literature. By examining the gaps identified between the hypotheses and the empirical results, this section explores potential avenues for future research in this field.

5.2 Primary Results

In this section, we provided a detailed analysis of the effects of Big Data on customer retention within the telecommunications industry in South Africa. We examined the findings and discussed their implications for understanding the relationship between Big Data and customer retention in this specific context.

5.2.1 Client Satisfaction and Client Retention

In this study, we investigated the relationship between enhanced customer service, customer satisfaction, and customer retention. Hypothesis 1a proposed that enhanced customer service has a positive influence on customer satisfaction, which was supported by the findings. The analysis revealed that after the implementation of Big Data, there was an improvement in service quality factors such as accuracy, responsiveness, confidence, compassion, and tangibles, which contributed to higher customer satisfaction. These findings align with previous research by NGO (2015) that emphasized the importance of excellent customer service in driving customer satisfaction.

However, hypothesis 1b, which suggested a positive influence of enhanced customer service on customer retention, was not supported by the data. The correlation analysis yielded a non-significant p-value of 0.713, indicating that customer service and customer retention were not significantly correlated in this study. This finding contradicted the hypothesis and differed from the claims made by Alkitbi (2020), who proposed that improved customer service contributes to customer retention through factors like satisfaction, service quality, confidence, dedication, and loyalty. Unfortunately, this study did not provide evidence to support that claim.

It is important to note that while customer satisfaction and service quality are closely related, the link between customer service and customer retention in the telecommunications industry is complex and may involve additional factors beyond the scope of this study. Future research should explore other variables that could influence customer retention and examine the interplay between customer service, customer satisfaction, and customer loyalty in greater detail to gain a comprehensive understanding of their relationships.

The study conducted by Siddika et al. (2021) focused on prediction models for identifying potential churners with high accuracy and determining the factors influencing customer churn. Customer retention is a crucial aspect of effective customer relationship management, and predicting customer turnover is an interesting topic in this context. By accurately predicting subscription churn and understanding the key drivers of customer dissatisfaction, customer relationship management can effectively retain valuable customers. It is evident that low customer satisfaction contributes to customer attrition, highlighting the importance of customer satisfaction in customer retention.

In this study, a significant correlation between customer retention and customer satisfaction was observed, which is consistent with previous research findings. Singh (2016) emphasized that customer satisfaction is determined by evaluating all interactions between customers and a company's products or services, taking into account their intentions. It is logical to expect that highly satisfied customers will continue to engage with the same company, and this expectation was supported by the findings of this study. The analysis of churn rates based on Big Data showed a decline in customer churn following the implementation, indicating a decrease in lost customers. Additionally, the expected churn ratio indicated a reduction in lost customers. This reduction in the churn ratio is likely to contribute to increased customer satisfaction, and the relationship between customer retention and satisfaction ultimately leads to an increase in customer retention.

These findings highlight the importance of understanding and managing customer satisfaction in order to enhance customer retention. Further research should explore additional factors that influence customer satisfaction and retention, and investigate strategies that effectively improve customer satisfaction and thereby promote customer retention.

Based on the findings discussed above, it can be concluded that enhancing customer service has a positive impact on customer satisfaction. The results also indicate a significant correlation between customer satisfaction and customer retention, even though there might not be a strong relationship between customer service and retention. Therefore, it is important to focus on enhancing customer satisfaction as it can ultimately lead to increased customer retention. These findings have significant implications for the growth and success of the telecommunications sector, highlighting the importance of providing excellent customer service to foster customer satisfaction and promote customer retention. Further research can delve into exploring specific strategies and interventions for enhancing customer service in the telecommunications industry to achieve these outcomes.

5.2.2 Improved Customer Knowledge

H2a – Improved Customer Knowledge through the implementation of Big Data analytics have a positive influence on customer satisfaction

H2b- Improved Customer Knowledge through the implementation of Big Data analytics have a positive influence on customer retention.

The results of hypothesis 2 provide evidence of a positive relationship between improved customer knowledge and both customer satisfaction and customer retention through the implementation of Big Data analytics. This suggests that expanding customer knowledge about the services offered in the telecommunications industry is dependent on knowledge expansion. When companies provide customers with welcoming and educational information, customer loyalty increases. Consequently, a robust client onboarding process leads to benefits such as faster scaling, increased customer happiness, and longer customer retention.

The findings demonstrate that improved customer knowledge positively influences both customer satisfaction and customer retention following the implementation of Big Data analytics. This supports previous research conducted by Anshari et al. (2019b), which revealed a link between personalized features and higher levels of customer satisfaction and retention. Leveraging Big Data analytics allows organizations to gain comprehensive insights into customer behaviour and lifecycle, facilitating the development of services tailored to attract and engage customers through customization, interaction, and involvement. By better understanding consumer behaviours and habits, Big Data enhances customer relationship management strategies, fostering long-term relationships.

By improving personalized options through Big Data analytics, organizations can effectively understand and meet specific customer demands, address customer inquiries more efficiently, develop appropriate products and services, and assess customer willingness to recommend a particular brand to others. Consequently,

this research supports the notion that enhancing personalized options through Big Data analytics can significantly improve both customer satisfaction and customer retention in the telecommunications sector.

Future research can further explore specific strategies and techniques for leveraging Big Data analytics to personalize customer experiences, meet individual customer needs, and enhance satisfaction and retention in the telecommunications industry.

5.2.3 Enhanced Analytics

H3a – Employment of Big Data techniques renders advanced analytical techniques, which has a positive influence on customer satisfaction.

H3b– Employment of Big Data techniques renders advanced analytical techniques, which has a positive influence on customer retention.

The findings of this study provide evidence that advanced analytics positively influences both customer satisfaction and customer retention. This aligns with a previous study conducted by Chawda and Thakur (2016), which also demonstrated a strong relationship between data analytical techniques and improved customer satisfaction. Accurate analysis of Big Data can lead to more effective decision-making, resulting in increased operational effectiveness, cost reduction, and risk mitigation. Many international businesses leverage advanced data analysis tools to gather insights about their customers, aiming to enhance their services, effectiveness, and efficiency. By utilizing advanced analytics, organizations can make timely and informed decisions with confidence in achieving better future outcomes. It empowers businesses to make data-driven decisions and gain valuable insights into market trends, consumer preferences, and critical company operations. Consequently, Big Data analysis has a significant impact on customer satisfaction and retention.

Following the implementation of Big Data, the analysis of the tNPS value (>20) (Simplr, 2022) for customer experience revealed a high level of customer satisfaction post-implementation. This indicates that the application of Big Data analysis methods has a positive effect on customer satisfaction. Additionally, the churn ratio forecast findings demonstrate that the churn rate decreased after the implementation of Big Data compared to the pre-implementation period. This implies a reduction in the number of lost customers. Lower churn rates result in a higher customer retention rate at the beginning of the period, indicating an improvement in customer retention. Therefore, the utilization of advanced analytical methodologies signifies an enhancement in both client retention and satisfaction.

Further research can explore specific techniques and approaches for leveraging advanced analytics in the telecommunications industry to maximize customer satisfaction and retention.

5.2.4 Improved Client Relationship

H4a: Improved customer relationships, resulting from Big Data, have a positive influence on customer satisfaction.

H4b: Improved customer relationships, resulting from Big Data, have a positive influence on customer retention.

The findings from hypothesis 4 revealed a positive relationship between improved customer relationships and customer satisfaction, but a negative relationship between improved customer relationships and customer retention. Big Data techniques have been identified as beneficial in fostering strong customer relationships, which are crucial in highly competitive markets. Meeting customer requirements and addressing their demands leads to increased customer satisfaction. Businesses aim to maintain long-term relationships with their customers by recognizing and fulfilling their needs. Therefore, understanding the

connection between enhanced customer relationships and customer satisfaction is crucial.

Building and nurturing positive customer relationships is vital for business success. Kambatla et al. (2014) emphasize the role of Big Data etiquette in establishing seamless relationships between brands and customers. Existing literature confirms that the quality of customer relationships directly impacts a company's financial performance, underscoring the significance of businesses defining the type of relationships they strive to establish with their customers.

Personalized communication is considered an effective approach for cultivating customer relationships and fostering loyalty. Xiang et al. (2018) highlight the potential of personalized communication on social media platforms in creating a sense of intimacy and enhancing the customer experience. Similarly, Chen and Popovich (2018) suggest that the adoption of customer relationship management (CRM) systems enabling personalized communication can improve customer retention and satisfaction.

Furthermore, social media platforms have emerged as effective channels for building customer relationships and enhancing brand image. Chen and Popovich (2018) argue that businesses can leverage social media for real-time customer interactions, personalized offerings, and responsive customer feedback. Oh et al. (2020) also stress the importance of effective customer relationship management strategies in creating long-term customer value and driving business growth.

The results of this study, which demonstrate the positive impact of improved customer relationships on customer satisfaction, can guide the telecommunications industry in achieving similar outcomes. However, the study also identified a negative correlation between customer relationships and retention. Further investigation is required to explore the potential reasons behind this finding, such as potential decline in customer care over time leading to decreased customer retention. The relationship between customer relationships

and retention warrants additional examination to gain a comprehensive understanding.

In the telecommunications sector, this study demonstrated the valuable role of Big Data analytics in identifying significant trends and customer needs, as well as enhancing customer relationships. The implementation of Big Data contributes to customer retention, as supported by evidence. The improvement in customer relationships through Big Data has a positive impact on customer satisfaction in the telecommunications sector.

5.2.5 Improved Customer Satisfaction - tNPS (Touchpoint Net promoter scores)

H5 – Customer Satisfaction has a positive influence on customer retention.

Customers have the opportunity to provide feedback on their interactions with brands across various touchpoints throughout the customer journey through the use of tNPS surveys. The preference of customers for a brand or service is strongly associated with their happiness and loyalty, which, in turn, affects the growth and sustainability of a business. Consequently, evaluating customer satisfaction is of utmost importance. tNPS surveys enable the measurement of customer satisfaction at a granular level.

The study observed that prior to the implementation of Big Data techniques, the tNPS values for the customer experience ranged between 40 and 50. However, with the utilization of Big Data, the values surpassed 50. This indicates that employing Big Data approaches can enhance customer satisfaction (Simplr, 2022).

Furthermore, the study noted an increase in tNPS values for network experience following the implementation of Big Data. However, there was a significant decline in tNPS scores after November 2022, specifically for network experience. This decline can be attributed to prolonged power disruptions in South Africa,

which impacted the participants' network experience. Nevertheless, the findings demonstrated that higher tNPS scores have a positive impact on customer satisfaction when Big Data is utilized. Additionally, when examining the correlation between positive tNPS scores and the churn rate, it becomes evident that positive scores contribute to a reduction in customer churn.

5.3 Summary of the findings.

H1a	Enhanced customer service has a positive influence on customer satisfaction	Supported
H1b	Enhanced customer service has a positive influence on customer retention	Supported
H2	Improved Customer Knowledge has a positive influence on customer satisfaction and customer retention	Supported
H3	Enhanced analytics has a positive influence on customer satisfaction and customer retention	Supported
H4	Improved customer relationships, resulting from Big Data, have a positive influence on customer satisfaction and customer retention	Not Supported
H5	Customer Satisfaction has a positive influence on customer retention.	Supported

5.4 Conclusion

In this chapter, significant findings were presented and compared with previous literature, followed by a discussion on the practical implications of these findings.

The findings from previous research supported the hypotheses H2 and H3, highlighting the positive impacts of enhanced customer knowledge and advanced analytics on customer satisfaction and retention. However, the assumptions regarding the effects of enhanced customer service and improved customer relationships on customer satisfaction and retention were only partially supported.

CHAPTER 6. CONCLUSIONS & RECOMMENDATIONS

6.1 Introduction

This chapter aims to present the primary findings and conclusions of the research report. It provides a thorough summary of the results obtained from the literature review and primary research, focusing on the managerial implications of implementing Big Data. Furthermore, a critical evaluation of the study's strengths and weaknesses is conducted, along with recommendations for future research in this field. By addressing these objectives, this chapter contributes to an improved comprehension of the potential advantages and challenges related to Big Data, offering valuable insights for both practitioners and researchers.

6.2 Main Conclusions from the Literature Review

Based on the literature review, Big Data techniques have proven to be highly effective and efficient compared to traditional methods and data processing systems. These techniques have streamlined operational procedures and strategic decision-making for telecommunications providers. Revenue generation and customer retention are two vital components for any business, and Big Data techniques are extensively utilized to minimize customer churn and promote the growth of telecommunications brands. In the corporate world, customers hold great importance, and factors such as dependability, assurance, and tangibility contribute to better customer service, ultimately leading to higher customer satisfaction. Customer satisfaction and customer retention are closely interconnected.

When considering customer retention, customer care, brand associations, cost-effectiveness, and service standards have been identified as crucial factors. Offering personalized and customized services has been found to be the most effective strategy for boosting customer retention. Big Data tools play a key role

in understanding customer preferences, interests, and behaviors, thus facilitating the delivery of personalized options. Consequently, customer satisfaction and retention increase with a high level of service quality. Big Data methods enable the provision of personalized choices, which have a strong positive impact on customer retention and happiness. Moreover, Big Data protocols ensure a seamless connection between the brand and the customer, fostering improved customer interactions.

Service quality significantly enhances the effectiveness of the relationship between a brand and its customers. Based on these findings, the literature concludes that there is a positive correlation between customer satisfaction and the quality of customer relationships.

6.3 Conclusions from the Findings

This study investigates the influence of service quality, increased customer knowledge, advanced analytical techniques, and customer relationships on customer satisfaction and retention in the telecommunications industry in South Africa, focusing on the implementation of Big Data techniques. The findings demonstrate that personalized options and advanced analytics, facilitated by the Big Data approach, significantly contribute to customer retention and satisfaction. Furthermore, the study identifies a positive correlation between customer satisfaction and various elements of customer service quality, including dependability, tangibility, and assurance, emphasizing the significance of maintaining high-quality customer service.

While improved customer service and customer relationships did not show a significant correlation with customer retention, the study reveals that the utilization of Big Data analysis techniques has a positive impact on customer satisfaction. This is evident through the tNPS values (>20) obtained for customer experience, indicating higher customer satisfaction with the implementation of Big Data techniques. Despite fluctuations in tNPS values for the Network experience,

including a decline during Stage 6 load-shedding in South Africa, the overall trend suggests improved consumer satisfaction when employing Big Data techniques. Additionally, the churn rate prediction demonstrates a reduction in customer attrition, reflecting increased client retention resulting from the implementation of Big Data analytics in the telecommunications industry in South Africa.

In summary, this study highlights the positive effects of Big Data techniques on customer satisfaction and retention within the telecommunications industry. The utilization of advanced analytics and personalized options through Big Data is particularly influential in enhancing customer satisfaction and retention. Furthermore, the study emphasizes the crucial role of customer service quality in fostering customer satisfaction.

6.4 Managerial Implications

The findings of this research offer valuable insights for managers seeking to improve decision-making in various business functions, including analytics and customer experience. The study highlights the significance of gathering and analysing large volumes of data to deliver successful customer interactions. To enhance customer satisfaction and retention, the study recommends the utilization of Big Data analytics by businesses.

Customer satisfaction serves as a crucial foundation for any industry, and Big Data analytics can play a pivotal role in enhancing satisfaction levels by providing deeper insights into customer preferences, enabling the provision of personalized services. Additionally, the presence of friendly and relatable personnel creates a positive psychological response from customers, contributing to increased satisfaction and retention. Furthermore, enhanced customer perceptions of a company's reliability have a positive impact on customer satisfaction.

It is important for businesses to ensure the accuracy of the data used, as the increased volume of data may introduce inaccuracies. While more data can lead to better results, maintaining high standards for acceptable errors can yield more reliable and useful data, resulting in better outcomes. The study emphasizes the importance of utilizing refined and integrated customer data, which leads to higher levels of customer loyalty and retention, increased customer acquisition, revenue growth, and improved customer interactions.

Furthermore, Big Data analytics can be leveraged to anticipate future customer needs and provide superior customer experiences. By utilizing Big Data, companies can identify profitability issues and optimize their operational procedures, ultimately enhancing employee performance.

In conclusion, the study highlights the benefits of employing Big Data analytics for enhancing decision-making and improving customer satisfaction and retention. The findings emphasize the significance of accurate data, personalized services, and effective customer interactions in achieving these goals.

6.5 Recommendations and Implications of the Study

This study offers three contributions including conceptual, theoretical, and strategic. This will be explained below.

6.5.1 Conceptual contribution

This study makes a valuable contribution to the existing research on the implementation of Big Data analytics in the telecommunications industry in South Africa. The research specifically focuses on clients who are familiar with Big Data approaches in the telecommunications sector and examines how these strategies impact customer satisfaction and retention, taking into account various service quality standards such as dependability, tangibility, assurance, customer knowledge, advanced analytics, and customer relationships.

While previous studies have explored the influence of Big Data on customer retention, loyalty, satisfaction, and service quality, this research provides unique insights by investigating the specific impact of Big Data approaches on customer satisfaction and client retention, which have not been extensively covered in previous surveys. By identifying the specific factors that contribute to enhanced customer satisfaction and retention, this study offers conceptual clarity and practical implications that can guide decision-making processes in the telecommunications industry.

The findings of this study provide valuable insights for telecommunications companies seeking to leverage Big Data analytics to improve customer satisfaction and retention. The study's focus on the South African context enhances its applicability to the local industry, allowing for more targeted and relevant recommendations. Overall, this research adds to the existing knowledge base and helps fill gaps in the understanding of how Big Data strategies can impact customer satisfaction and retention in the telecommunications sector.

6.5.2 Theoretical contribution

This study makes a significant theoretical contribution to the existing literature on the implementation of Big Data approaches in the telecommunications industry, providing a comprehensive understanding of their impact on customer satisfaction and retention. The study's first contribution lies in elucidating the relationship between client retention and satisfaction with the quality of services provided. To achieve this, the study employs the SERVQUAL model, which considers tangibility, reliability, and assurance, to identify discrepancies between customer expectations and actual service delivery.

The second contribution of this study lies in assessing the influence of enhanced customer knowledge on customer satisfaction and retention. In today's technologically advanced and highly competitive environment, offering personalized services to customers is crucial. By identifying this strategy, the study addresses knowledge gaps among participants and enhances data collection processes. Furthermore, the study sheds light on how the utilization of advanced analytical tools affects customer satisfaction and retention, aligning with previous literature that links sophisticated analytical procedures with higher levels of customer satisfaction.

As research continues to explore how customer retention and satisfaction can provide companies with a competitive edge, this study reveals that Big Data approaches play a pivotal role in fostering both client retention and satisfaction. Building on earlier literature, the study further investigates satisfaction and retention through the prediction of churn ratios and tNPS values. Lastly, this research contributes to the understanding of how customer relationship management influences customer satisfaction and retention, showcasing the use of Big Data to enhance customer experiences, particularly through personalization and service customization.

Overall, this study advances the knowledge base by deepening our understanding of the impact of Big Data approaches on customer satisfaction and retention in the telecommunications industry. The findings provide valuable insights for companies seeking to leverage Big Data to improve customer experiences and drive business success.

6.5.3 Strategic contribution

This study highlights several challenges associated with the adoption of Big Data approaches in the telecommunications industry. One of the primary challenges is the potential for data mismanagement and consent issues when using questionnaires to collect data from specific participants. To mitigate this

challenge, it is recommended that organizations implement strategies to enhance participants' understanding of Big Data approaches before administering questionnaires. Additionally, alternative data collection methods, such as pre- and post-implementation data gathering, can be employed to assess customer retention and reveal the impact generated, enabling the identification of churn areas.

Another significant challenge in implementing Big Data approaches is data preparation, which can be time-consuming due to the diverse data sources, sizes, and speeds involved. To address this challenge, establishing a centralized data environment in the telecommunications sector can yield significant time and cost savings by adopting universal data format standards and eliminating redundant data. Centralizing data enables organizations to have a comprehensive view of their operations, facilitating easier data analysis across the entire dataset.

Data security and privacy are critical concerns for consumers, and it is essential for organizations to ensure that data is encrypted and secured throughout the collection, transmission, and monitoring processes to prevent unauthorized access or manipulation. Adhering to data protection regulations and implementing robust security protocols is crucial for safeguarding, managing, accessing, and monitoring data. By prioritizing data security and privacy, organizations can foster consumer trust, leading to increased acceptance and adoption of Big Data approaches.

The successful implementation of Big Data analytics requires leaders with the necessary analytical skills to accurately interpret the data gathered. Insufficient training or skills among executives can impede the effective interpretation of data from Big Data analytics tools. Therefore, organizations should consider providing relevant training to develop leaders' analytical abilities before proceeding with the implementation of Big Data analytics. Alternatively, organizations may opt to hire data scientists who specialize in the operational application of advanced Big Data analytics to support the organization's analytical needs.

6.6 Limitations of the Study

This study, investigating the impact of big data on customer retention in the telecommunications industry within South Africa, has provided valuable insights into the subject matter. However, it is essential to acknowledge the limitations that may have influenced the findings and interpretations.

Firstly, the sample size of 123 individuals who participated in the survey might restrict the generalizability of the results to a larger population. While efforts were made to ensure representation across various demographics, the sample size may not fully encompass the diverse range of individuals within the telecommunications industry in South Africa. Future studies with larger and more diverse samples would yield a more comprehensive understanding of the relationship between big data and customer retention.

Secondly, the primary research method employed in this study involved a 7-point Likert scale survey. While this method facilitated the collection of quantitative data and measurement of participants' attitudes and perceptions, it may have limited the depth of exploration and understanding of the topic. Incorporating qualitative research methods, such as interviews or focus groups, could have provided richer insights into the experiences and perspectives of individuals regarding big data and its impact on customer retention.

Thirdly, it is important to note that this study specifically focused on the telecommunications industry in South Africa. Therefore, the generalizability of the findings to other industries or countries with different market dynamics, cultural contexts, and regulatory environments may be limited. Conducting similar research in diverse industries and regions would provide a more comprehensive understanding of the implications of big data on customer retention.

Furthermore, this study relied on secondary data statistics as a complement to the survey findings. While this approach provided contextual information and historical trends, it may have limited the depth of analysis and exploration of

specific variables and their relationships. Future research could consider incorporating primary data collection through more extensive surveys or interviews to allow for a more comprehensive examination of the research questions.

Lastly, it is important to recognize that self-reported data, which was used in this study, is subject to certain limitations, including response biases and inaccuracies. Despite efforts to ensure the validity and reliability of the survey instrument, participants' responses may have been influenced by factors such as social desirability or recall biases. Future research could address these limitations by incorporating objective measures or additional data sources to provide a more robust analysis.

Acknowledging these limitations highlights areas for further research and provides insights into the scope and applicability of the study's findings. While these limitations exist, this study contributes to the existing literature on the impact of big data on customer retention and serves as a foundation for future research in this field.

6.7 Future research

This study has made valuable contributions to our understanding of how Big Data impacts customer satisfaction and retention in the telecommunications industry. However, there are several areas that warrant further research to build upon these findings.

One important area for future research is to investigate the impact of Big Data in industries beyond telecommunications. While this study focused on telecommunications, Big Data approaches have the potential to be applied across various industries. Exploring the impact of Big Data in different sectors can provide insights into its benefits and challenges, and help establish best practices for its implementation.

Another area for future research is the evaluation of Big Data's influence on the quality of customer experience in the telecommunications industry. While this study examined customer satisfaction and retention, assessing factors such as ease of use, timeliness of service, and personalized attention can provide a comprehensive understanding of customer experience. Surveys and data analytics can be utilized for this purpose.

Furthermore, future research should investigate the impact of Big Data on customer churn and acquisition. While customer retention was considered in this study, it is important to explore how Big Data can effectively reduce churn and enhance customer acquisition. This could involve identifying at-risk customer segments and implementing targeted marketing and retention strategies.

Ethical implications of Big Data utilization in the telecommunications industry is another crucial area for future research. The use of Big Data raises concerns about data privacy, security, bias, and discrimination. Examining these ethical implications can help establish guidelines and strategies for the ethical and responsible use of Big Data.

Lastly, future research can explore the impact of Big Data on organizational culture and leadership in the telecommunications industry. The adoption of Big Data requires organizations to adapt their strategies and processes for data collection, management, and analysis. Understanding how organizations can effectively manage the cultural and leadership challenges associated with Big Data utilization will be valuable for successful implementation.

Addressing these areas of future research will contribute to a deeper understanding of the broader implications and potential of Big Data across industries, its impact on customer experience and business outcomes, ethical considerations, and organizational dynamics.

6.8 Conclusion

Based on the findings and limitations of this study, it is evident that further research is necessary to expand upon the results and address the identified limitations. One area that merits further investigation is the influence of customer service and relationships on customer retention within the context of Big Data analytics. Future studies should also consider increasing the sample size to obtain more precise measurements and enhance the generalizability of the findings.

Furthermore, future research could explore the application of Big Data analytics in other industries to understand its effectiveness in diverse contexts. For instance, conducting studies in healthcare, finance, or retail sectors would enable the evaluation of the impact of Big Data analytics on customer satisfaction and retention.

It is crucial to acknowledge that while Big Data analytics holds promise for improving customer satisfaction and retention, several challenges must be addressed to fully unlock its potential. These challenges encompass issues related to data privacy, data security, and the need for leaders to possess analytical skills. Subsequent research should prioritize finding solutions to these challenges, ensuring the responsible and effective implementation of Big Data analytics.

In conclusion, this study has made a valuable contribution to the existing literature on Big Data analytics and its impact on customer satisfaction and retention within the South African telecommunications industry. Despite the study's limitations, the findings offer insights into the potential of Big Data analytics in enhancing customer satisfaction and retention. Further research is warranted to build upon these findings and overcome the study's limitations, with the ultimate objective of enhancing customer experiences and organizational performance.

REFERENCES

Ahmed, A., & Linen, D. M. (2017). A review and analysis of churn prediction methods for customer retention in telecommunication industries. *2017 4th International Conference on Advanced Computing and Communication Systems (ICACCS)*, 1–7. https://doi.org/10.1109/ICACCS.2017.8014605

Alkitbi, A., Salama, A., Alshurideh, M., Al Kurdi, B., & Salloum, S. (2020). Factors affecting customer retention: A systematic review. In H. C. Chen, K. L. Kuo, & K. C. Li (Eds.), Industrial Engineering and Intelligent Manufacturing: Proceedings of the International Conference on Industrial Engineering and Intelligent Manufacturing (IEIM) 2020 (pp. 521-528). Springer. https://doi.org/10.1007/978-3-030-58669-0_59

Almomani, G. (2018). *Measuring Service Quality and Customers Satisfaction in the UK Mobile Telecommunications Market Using the SERVQUAL Instrument*. https://doi.org/10.13140/RG.2.2.20846.10564

Alnsour, M., Tayeh, B., & Alzyadat, M. (2014). Using SERVQUAL to assess the quality of service provided by Jordanian telecommunications Sector. *International Journal of Commerce and Management*, *24*, 209–218. https://doi.org/10.1108/IJCoMA-03-2012-0021

Anshari, M., Almunawar, M. N., Lim, S. A., & Al-Mudimigh, A. (2019a). Customer relationship management and Big Data enabled: Personalization & customization of services. *Applied Computing and Informatics*, *15*(2), 94–101. https://doi.org/10.1016/j.aci.2018.05.004

Anshari, M., Almunawar, M. N., Lim, S. A., & Al-Mudimigh, A. (2019b). Customer relationship management and Big Data enabled: Personalization & customization of services. *Applied Computing and Informatics*, *15*(2), 94–101. https://doi.org/10.1016/j.aci.2018.05.004

Babbie, E. (2016). The basics of social research (7th ed.). Cengage Learning.

Bajari, P., Chernozhukov, V., Hortaçsu, A., & Suzuki, J. (2019). The Impact of Big Data on Firm Performance: An Empirical Investigation. *AEA Papers and Proceedings*, *109*, 33–37. https://doi.org/10.1257/pandp.20191000

Bansal, R. (2016). CUSTOMER ENGAGEMENT – A LITERATURE REVIEW. *Global International Research Thoughts ISSN: 2347-8861*, *2*, 15–20.

Barnes, S. J., Mattsson, J., Sørensen, F., & Jensen, J. F. (2020). Measuring employee-tourist encounter experience value: A Big Data analytics approach. *Expert Systems with Applications*, *154*, 113450. https://doi.org/10.1016/j.eswa.2020.113450

Barnsbee, L., Barnett, A. G., Halton, K., & Nghiem, S. (2018). Chapter 24—Cost-effectiveness. In S. D. Gregory, M. C. Stevens, & J. F. Fraser (Eds.), *Mechanical Circulatory and Respiratory Support* (pp. 749–772). Academic Press. https://doi.org/10.1016/B978-0-12-810491-0.00024-2

Basias, N., & Pollalis, Y. (2018). *Quantitative and Qualitative Research in Business & Technology: Justifying a Suitable Research Methodology*. *7*(1), 15.

Bhasin, H. (2021, April 27). *The Servqual Model—Definition, Dimensions, Gaps and Advantages Service*. Marketing91. https://www.marketing91.com/servqual/

Bhat, J. R., & Alqahtani, S. A. (2021). 6G Ecosystem: Current Status and Future Perspective. *IEEE Access*, *9*, 43134–43167. https://doi.org/10.1109/ACCESS.2021.3054833

BOAKYE, E. (2011). *Customer Retention*. https://doi.org/10.13140/RG.2.1.4633.4809

Borah, N. (2014). The Changing Indian Telecommunication Industry. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2539956

Budimir, M. (2014). An overview of research on technological and telecommunication development. *Ekonomski Vjesnik / Econviews: Review of Contemporary Business, Entrepreneurship and Economic Issues*, *27*, 171–182.

Bughin, J. (2016). Reaping the benefits of Big Data in telecommunication. *Journal of Big Data*, *3*(1), 14. https://doi.org/10.1186/s40537-016-0048-1

Bujang, M. A., & Adnan, T. H. (2016). Requirements for Minimum Sample Size for Sensitivity and Specificity Analysis. *Journal of Clinical and Diagnostic Research : JCDR*, *10*(10), YE01–YE06. https://doi.org/10.7860/JCDR/2016/18129.8744

Chatterjee, S., Chaudhuri, B. R., & Dutta, D. (2019). Determinants of Adoption of New Technology in Telecommunication Sector: A Structural Equation Modeling Approach. *Global Business Review*, *20*(1), 166–178. https://doi.org/10.1177/0972150918802534

Chawda, R. K., & Thakur, G. (2016). Big Data and advanced analytics tools. *2016 Symposium on Colossal Data Analysis and Networking (CDAN)*, 1–8. https://doi.org/10.1109/CDAN.2016.7570890

Chen, Y., & Popovich, K. (2018). Understanding customer relationship management (CRM) adoption in businesses. Information & Management, 55(4), 431-441. https://doi.org/10.1016/j.im.2017.11.001

Chun, L., Tham, J., & Azam, S. M. F. (2019). CORPORATE COMPETENCE DETERMINING FACTORS IN CHINA TELECOMMUNICATION INDUSTRY IN ACHIEVING CUSTOMER SATISFACTION. *European Journal of Management and Marketing Studies*, *0*, Article 0. https://doi.org/10.46827/ejmms.v0i0.684

Costa, E., Soares, A., & Pinho de Sousa, J. (2017). Institutional networks for supporting the internationalisation of SMEs: The case of industrial business associations. *Journal of Business & Industrial Marketing*, *32*, 1182–1202. https://doi.org/10.1108/JBIM-03-2017-0067

Creswell, J. W. (2017). Research design: qualitative, quantitative, and mixed methods approaches. Sage publications.

Creswell, J. W., & Clark, V. L. P. (2017). Designing and conducting mixed methods research (3rd ed.). Sage publications.

Davenport, T. H., Barth, P., & Bean, R. (2012). *How 'Big Data' Is Different*. 5.

Dharmadasa, S. A., & Gunawardane, N. (2017). Impact of Service Quality on Customer Satisfaction with Special Reference to Mobile Telecommunication Industry of Sri Lanka. *Sri Lanka*, *3*(1), 25.

Elrahman, A. (2019). A REVIEW OF TELECOMMUNICATIONS SERVICE QUALITY DIMENSIONS. *Proceedings on Engineering Sciences*, *1*(2), 533–546. https://doi.org/10.24874/PES01.02.052

Fakhreddin, F., & Foroudi, P. (2022). The impact of market orientation on new product performance through product launch quality: A resource-based view. *Cogent Business & Management*, *9*(1), 2108220. https://doi.org/10.1080/23311975.2022.2108220

Fan, X., & Sivo, S. A. (2015). Sensitivity of fit indices to misspecification of structural equation models. Educational and Psychological Measurement, 75(6), 876-903.

Field, A. (2013). Discovering statistics using IBM SPSS statistics (4th ed.). Sage Publications.

Fisher, M. J., & Bloomfield, J. (2019). Understanding the research process. *Journal of the Australasian Rehabilitation Nurses Association*, *22*(1), 22–27. https://doi.org/10.3316/informit.500673642524420

Global Telecommunication report. (2020). *Global Telecommunication Services Market Size Report, 2021-2028*. https://www.grandviewresearch.com/industry-analysis/global-telecommunication-services-market

Grigg, T. (2019, January 8). *Simpson's Paradox and Interpreting Data*. Medium. https://towardsdatascience.com/simpsons-paradox-and-interpreting-data-6a0443516765

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate data analysis (8th ed.). Cengage Learning.

Hilbert, M. (2016). Big Data for Development: A Review of Promises and Challenges. *Development Policy Review*, *34*(1), 135–174. https://doi.org/10.1111/dpr.12142

Iessa, D. A. K. (2022). How to Design the Questionnaire. *Journal of Administration and Economics*, *132*, 317–319.

Issara, A. I., & Masele, J. J. (2021). Implementation of Business Strategies in Parastatals in Developing Countries: Analysis of Influencing Factors using Tanzania Telecommunications Company Limited (TTCL). *ORSEA JOURNAL*, *11*(1), Article 1. http://www.journals.udsm.ac.tz/index.php/orsea/article/view/4462

Jahmani, A., Bourini, I., & Jawabreh, O. A. (2020). The relationship between service quality, client satisfaction, perceived value and client loyalty: A case study of Fly Emirates. *Cuadernos de Turismo*, *45*, Article 45. https://doi.org/10.6018/turismo.426101

Kabir, S. M. (2016). *SAMPLE AND SAMPLING DESIGNS* (pp. 168–180).

Kalia, P., Kaushal, R., Singla, M., & Parkash, J. (2021). Determining the role of service quality, trust and commitment to customer loyalty for telecommunication service users: A PLS-SEM approach. *The TQM Journal*, *33*(7), 377–396. https://doi.org/10.1108/TQM-04-2021-0108

Kambatla, K., Kollias, G., Kumar, V., & Grama, A. (2014). Trends in Big Data analytics. *Journal of Parallel and Distributed Computing*, *74*(7), 2561–2573. https://doi.org/10.1016/j.jpdc.2014.01.003

Kassem, R., Ajmal, M., & Khan, M. (2016). The Relationship Between Organizational Culture and Business Excellence: Case Study from United Arab Emirates. *International Journal of Information Systems in the Service Sector*, *8*, 16–35. https://doi.org/10.4018/IJISSS.2016070102

Khan, A., Ahmed, J., & Khan, F. U. (2019). An Empirical Study of Customer Satisfaction and Loyalty: An Evidence of Telecommunication Sector in Pakistan. *Journal of Business & Tourism*, *5*(2), Article 2. https://doi.org/10.34260/jbt.v5i2.139

Khan, M., Khan, M., Alam, M., & Ali, W. (2018). Impact of Big Data over Telecommunication Industry. *Pakistan Journal of Engineering, Technology & Science*, *6*. https://doi.org/10.22555/pjets.v6i2.1958

Kraaijenbrink, J., Spender, J.-C., & Groen, A. J. (2010). The Resource-Based View: A Review and Assessment of Its Critiques. *Journal of Management*, *36*(1), 349–372. https://doi.org/10.1177/0149206309350775

Lavalle, S., Lesser, E., Shockley, R., Hopkins, M. S., & Kruschwitz, N. (2011). *How the smartest organizations are embedding analytics to transform information into insight and then action. Findings and recommendations from the first annual New Intelligent Enterprise Global Executive study.* 14.

Law, C. (2020, May 11). *Covid-19: Its Impact On The Telecommunications Sector In India.* Conventus Law. https://conventuslaw.com/report/covid-19-its-impact-on-the-telecommunications/

Lee, S., Jo, Y., & Park, E. (2019). Understanding and using factor scores in longitudinal research. Social Science Research, 82, 1-14. doi: 10.1016/j.ssresearch.2019.02.006

Lee, Y.-C., Wang, Y.-C., Lu, S.-C., Hsieh, Y.-F., Chien, C.-H., Tsai, S.-B., & Dong, W. (2016). An empirical research on customer satisfaction study: A consideration of different levels of performance. *SpringerPlus*, *5*. https://doi.org/10.1186/s40064-016-3208-z

Li, Y.-Q., & Liu, C.-H. S. (2019). Understanding service quality and reputation effects on purchase behavior through image: The moderating roles of service reliability. *Transportation Letters*, *11*(10), 580–588. https://doi.org/10.1080/19427867.2018.1478929

Mehrad, A., & Tahriri, M. (2019). *Comparison between Qualitative and Quantitative Research Approaches: Social Sciences*.

Merendino, A., Dibb, S., Meadows, M., Quinn, L., Wilson, D., Simkin, L., & Canhoto, A. (2018). Big Data, big decisions: The impact of Big Data on board level decision-making. *Journal of Business Research*, *93*, 67–78. https://doi.org/10.1016/j.jbusres.2018.08.029

Mohammed, M. F. (2013). Customer Relationship Management (Telecommunication Industry) Comparison Between (Airtel) And (Zain). *Customer Relationship Management*, 7.

Morgan, S., & Govender, K. (2017). Exploring customer loyalty in the South African mobile telecommunications sector. *Cogent Business & Management*, *4*(1), 1273816. https://doi.org/10.1080/23311975.2016.1273816

Mueller, R. O., & Hancock, G. R. (2018). Structural Equation Modeling. In *The Reviewer's Guide to Quantitative Methods in the Social Sciences* (2nd ed.). Routledge.

Mujere, N. (2016). *Sampling in Research* [Chapter]. Mixed Methods Research for Improved Scientific Study; IGI Global. https://doi.org/10.4018/978-1-5225-0007-0.ch006

Muller, J. (2021). *CUSTOMER RELATIONSHIP MANAGEMENT AS A STRATEGY TOWARDS CUSTOMER RETENTION*. 73.

Nanjundeswaraswamy, T. S., & Divakar, S. (2021). DETERMINATION OF SAMPLE SIZE AND SAMPLING METHODS IN APPLIED RESEARCH. *Proceedings on Engineering Sciences*, *3*(1), 25–32. https://doi.org/10.24874/PES03.01.003

Neuman, W. L. (2014). Social research methods: Qualitative and quantitative approaches (7th ed.). Pearson.

Ngo, V. (2015, April 23). *MEASURING CUSTOMER SATISFACTION: A LITERATURE REVIEW*.

O'Keefe, M. (2018). Doing research to improve teaching and learning: A guide for college and university faculty. Routledge.

Oh, S., Kim, M., & Kim, J. (2020). The impact of customer relationship management on customer lifetime value in mobile services. Telematics and Informatics, 49, 101367. https://doi.org/10.1016/j.tele.2020.101367

Oraedu, C. (2019). Structural Equation Test of Service Quality Dimensions on the Relationship Quality Construct: Evidence from an Emerging Telecommunication Market. *Journal of Relationship Marketing*, *18*(2), 146–171. https://doi.org/10.1080/15332667.2018.1534066

Osman, S., Mohammad, S., Abu, M. S., Mokhtar, M., Ahmad, J., Ismail, N., & Jambari, H. (2018). Inductive, Deductive and Abductive Approaches in Generating New Ideas: A Modified Grounded Theory Study. *Advanced Science Letters*, *24*(4), 2378–2381. https://doi.org/10.1166/asl.2018.10958

Pandey, J. (2019). *Deductive Approach to Content Analysis* [Chapter]. Qualitative Techniques for Workplace Data Analysis; IGI Global. https://doi.org/10.4018/978-1-5225-5366-3.ch007

Ployhart, R. E. (2021). Resources for What? Understanding Performance in the Resource-Based View and Strategic Human Capital Resource Literatures. *Journal of Management*, *47*(7), 1771–1786. https://doi.org/10.1177/01492063211003137

Poosarala, A., & Jayashree, R. (2021). Survey of Transfer Learning and a Case Study of Emotion Recognition Using Inductive Approach. In N. Sharma, A. Chakrabarti, V. E. Balas, & J. Martinovic (Eds.), *Data Management, Analytics and Innovation* (pp. 147–161). Springer. https://doi.org/10.1007/978-981-15-5619-7_9

Popli, G. S., & Madan, D. (2013). *Determinants of Customer Satisfaction in Telecommunication Industry—A Study of Indian Telecommunication Industry* (SSRN Scholarly Paper No. 2277570). https://doi.org/10.2139/ssrn.2277570

Reichheld, F. F. (2015). The ultimate question 2.0 (Revised edition). Harvard Business Review Press.

Rituraj. (2019). *6 Big Data Transformation Strategies in Telecommunications—DZone Big Data*. Dzone.Com. https://dzone.com/articles/6-big-data-transformation-strategies-in-telecommunicationmun

Ruiz, M., Germán, M., Contreras, L. M., & Velasco, L. (2016). Big Data-backed video distribution in the telecommunication cloud. *Computer Communications*, *84*, 1–11. https://doi.org/10.1016/j.comcom.2016.03.026

Sahin, O. (2020). *Service Quality Perspectives in Telecommunication Sector: Trust and Loyalty Investigation*.

Saunders, M., & Lewis, P. (2017). *Doing Research in Business and Management*. Pearson.

Schaeffer, S. E., & Rodriguez Sanchez, S. V. (2020). Forecasting client retention—A machine-learning approach. *Journal of Retailing and Consumer Services*, *52*, 101918. https://doi.org/10.1016/j.jretconser.2019.101918

Shava, H. (2021). The relationship between service quality and customer satisfaction in the South African mobile network telecommunications industry. *Journal of International Studies*, *14*, 70–83. https://doi.org/10.14254/2071-8330.2021/14-2/5

Siddika, A., Faruque, A., & Masum, A. K. M. (2021). Comparative Analysis of Churn Predictive Models and Factor Identification in Telecommunication Industry. *2021 24th International Conference on Computer and Information Technology (ICCIT)*, 1–6. https://doi.org/10.1109/ICCIT54785.2021.9689881

Simplr. (2022). *Transactional Net Promoter Score (tNPS) [Defined and Explained]*. Simplr. https://www.simplr.ai/glossary/transactional-net-promoter-score-tnps

Singh, I. R. J. M. S. (2016). *A STUDY OF CUSTOMER RETENTION STRATEGIES BY TELECOMMUNICATION SERVICE PROVIDERS WITH REFERENCE TO ALLAHABAD DISTRICT*. https://www.academia.edu/32954620/A_STUDY_OF_CUSTOMER_RETENTION_STRATEGIES_BY_TELECOMMUNICATION_SERVICE_PROVIDERS_WITH_REFERENCE_TO_ALLAHABAD_DISTRICT

Spiess, J., T'Joens, Y., Dragnea, R., Spencer, P., & Philippart, L. (2014). Using Big Data to improve customer experience and business performance. *Bell Labs Technical Journal*, *18*(4), 3–17. https://doi.org/10.1002/bltj.21642

Taguchi, N. (2018). Description and explanation of pragmatic development: Quantitative, qualitative, and mixed methods research. *System*, *75*, 23–32. https://doi.org/10.1016/j.system.2018.03.010

Tarnowska. (2020). *Customer Attrition Problem | SpringerLink*. https://link.springer.com/chapter/10.1007/978-3-030-13438-9_9

Teece, D. J. (2018). Dynamic capabilities as (workable) management systems theory. *Journal of Management & Organization*, *24*(3), 359–368. https://doi.org/10.1017/jmo.2017.75

Teng, C.-C., Chen, M.-C., Hung, M.-H., & Chen, H.-J. (2020). End-to-end Service Assurance in 5G Crosshaul Networks. *2020 21st Asia-Pacific Network Operations*

and Management Symposium (APNOMS), 306–309. https://doi.org/10.23919/APNOMS50412.2020.9236977

Ullman, J. B., & Bentler, P. M. (2012). Structural Equation Modeling. In *Handbook of Psychology, Second Edition*. John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118133880.hop202023

Van de Schoot, R., Kaplan, D., Denissen, J., Asendorpf, J. B., Neyer, F. J., & Van Aken, M. A. G. (2014). A gentle introduction to Bayesian analysis: Applications to developmental research. Child Development, 85(3), 842-860.

Verbeke, W., Martens, D., Mues, C., & Baesens, B. (2014). Building comprehensible customer churn prediction models with advanced rule induction techniques. Expert Systems with Applications, 41(3), 645-656.

Viitamäki, A. (2019). *Measuring Cost of Quality against Service Quality in a Telecommunication firm* [Fi=Ylempi AMK-opinnäytetyö|sv=Högre YH-examensarbete|en=Master's thesis|]. http://www.theseus.fi/handle/10024/168674

Wang, X., Wu, H., & Lu, L. (2021). A Novel Service Provision Mode for Sustainable Development of the Telecommunication Industry. *Sustainability*, *13*(9), Article 9. https://doi.org/10.3390/su13095164

Wang, X., Yang, L. T., Kuang, L., Liu, X., Zhang, Q., & Deen, M. J. (2019). A Tensor-Based Big-Data-Driven Routing Recommendation Approach for Heterogeneous Networks. *IEEE Network*, *33*(1), 64–69. https://doi.org/10.1109/MNET.2018.1800192

Warner, R. M. (2013). Applied statistics: From bivariate through multivariate techniques (2nd ed.). Sage Publications.

Wheeler, B. C. (2002). NEBIC: A Dynamic Capabilities Theory for Assessing Net-Enablement. *Information Systems Research*, *13*(2), 125–146. https://doi.org/10.1287/isre.13.2.125.89

Xiang, Z., Du, Q., & Ma, Y. (2018). Personalized communication on social media: A framework of perceived customization, intimacy, and privacy. Computers in Human Behavior, 81, 216-228. https://doi.org/10.1016/j.chb.2017.12.006

Yaddanapudi, S., & Yaddanapudi, L. (2019). How to design a questionnaire. *Indian Journal of Anaesthesia*, *63*(5), 335–337. https://doi.org/10.4103/ija.IJA_334_19

Zhou, R., Wang, X., Shi, Y., Zhang, R., Zhang, L., & Guo, H. (2019). Measuring e-service quality and its importance to customer satisfaction and loyalty: An empirical study in a telecommunication setting. *Electronic Commerce Research*, *19*(3), 477–499. https://doi.org/10.1007/s10660-018-9301-3

APPENDIX A (participant information sheet)

Dear Sir / Madam or Good day or (similar)

My name is Clint Pereira. I am a Masters student in the field of Digital Business at the University of the Witwatersrand, Johannesburg. My supervisor is Dr Nakuza Chalomba. I am conducting a research study about Big Data and the Impact thereof. The study title is The Impact of Big Data in Customer Retention in Telecommunications within South Africa.

I am inviting you to take part in a questionnaire related to the topic. If you decide to take part, your participation in this research study will last about 30 days in the form of an online survey, which will not take you more than 15 minutes to complete.

With your permission, your responses will be captured and analysed. This data will be stored in a secure location for 2 years and/or deleted after 2 years. Only the researcher will have access to the data.

During the research activity, I will have no need to ask for some personal information about you, but only questions pertaining to the research being conducted.

The questionnaire will be confidential and anonymous. When I share the results of the research study, I will not include your name or anything else that could identify you. With your permission, other researchers may use the data collected from this research study, but your name and any personal information will not be used or passed on.

If you decide to take part in the research study, it should be because you want to volunteer. You do not have to take part. You can stop being in the study at any time. You do not have to answer any questions if you do not want to. You will not get any direct benefits if you choose to join the research study. You will not lose any services, benefits or rights you would normally have if you decide not to join. Taking part in the research study will not cost you anything. You will not be paid for being in this research study.

This research study will be written up as a research report. The report will be available on the university library website. If you would like to receive a summary of this report, I will be happy to send it to you.

If you have any questions during or afterwards about this research study, feel free to contact me or my supervisor on the details listed below. If you have any concerns or complaints about the ethical procedures of this research study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecnon-medical@wits.ac.za.

Yours sincerely,

Clint Pereira

Researcher:

Clint Pereira, clint.pereira@students.wits.ac.za, 082 997 3258

Supervisor:

Dr Nakuza Chalomba, nakuze.chalomba@wits.ac.za, 071 2877 232

APPENDIX B (participant agreement form)

The Impact of Big Data on Customer Retention in Telecommunications within South Africa

I, ……., agree to participate in this research project.

I agree to the following:

(Please circle the relevant options below)

The research study was explained to me. I understand what this study is about.	YES	NO
I understand that I can volunteer to take part in the study	YES	NO
I agree that my responses may be used by the researcher in their research report	YES	NO
I agree that my participation will remain anonymous (my name will not be used by the researcher in their research report	YES	NO
I agree that other researchers may use the information I provide in my responses (depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on	YES	NO

…… (signature)

…… (name of participant)

…… (date)

APPENDIX C (instrument)

This Survey questionnaire drafted for the research initially identifies the demography of the target population. The rest of the questionnaire explores the avenues of service quality (Reliability, Assurance and Tangibility), Relationship Quality, Customer Satisfaction and Customer Retention. The scales vary from 1 (strongly disagree) to 7 (strongly agree).

The questions have been formulated based on the Research Questions, as explained in Chapter 1 of the Research Proposal.

- **Demography based questions**

1. Your gender
2. Your age
3. Your region
4. Your occupation
5. Do you belong to the telecommunication industry? If not mention your industry.
6. Do you have prior insight into Big Data techniques and methods?

- **Customer Relationship Management**

Please indicate to what extent you agree/disagree with the following statements/ questions							
	Strongly	**Disagree**	**Slightly**	**Neutral**	**Slightly**	**Agree**	**Strongly agree**
CRM1: Big Data analytics assists in the identification of major trends and	1	2	3	4	5	6	7

customer needs in the business world.							
CRM2: Big Data analytics assists in enhancing customer relationships.	1	2	3	4	5	6	7
CRM3: Big Data aids first-hand in ensuring seamless communication with the customer to boost the relationship between the customer and organization.	1	2	3	4	5	6	7
CRM4: Big Data analytics techniques ensure there is two-way communication between customers and the brand.	1	2	3	4	5	6	7
CRM5: Big Data techniques are effective in monitoring customer engagement management.	1	2	3	4	5	6	7
CRM6: The implementation of Big Data assist in customer retention.	1	2	3	4	5	6	7

- **Enhanced Analytics**

Please indicate to what extent you agree/disagree with the following statements/ questions							
	Strongly	**Disagre**	**Slightly**	**Neutral**	**Slightly**	**Agree**	**Strongly agree**

CCA1 - Big Data analytics assists in providing more customer-centric and client-preferred products and services.	1	2	3	4	5	6	7
CCA2 – Customer-curated products, with the help of Big Data insights, play a vital role in customer satisfaction.	1	2	3	4	5	6	7
CCA3 - 12. There is a positive correlation between Customer Satisfaction and Customer Retention.	1	2	3	4	5	6	7

- **Better Customer Service**

Please indicate to what extent you agree/disagree with the following statements/ questions							
	Strongly	**Disagree**	**Slightly**	**Neutral**	**Slightly**	**Agree**	**Strongly agree**
CS1: The quality of products or services should align with customers' expectations before a purchase is made.	1	2	3	4	5	6	7

CS2: Service quality matters when attracting customers to your Products and Services.	1	2	3	4	5	6	7
CS3: There is a huge influence of service quality on recurring customer purchases.	1	2	3	4	5	6	7
CS4: Big Data analytics helps in managing both existing and new customers.	1	2	3	4	5	6	7
CS5: Customers purchase products from brands they are familiar with.	1	2	3	4	5	6	7
CS6: Customers assess aftersales support before purchasing a product.	1	2	3	4	5	6	7
CS7: Customers assess the ease of communication with a brand as a measure to use the brand.	1	2	3	4	5	6	7
CS8: Customers values a brand through the service they provide, instead of its affordability.	1	2	3	4	5	6	7

- **Improved Customer Knowledge**

Please indicate to what extent you agree/disagree with the following statements/ questions							
	Strongly	**Disagre**	**Slightly**	**Neutral**	**Slightly**	**Agree**	**Strongly agree**
ICK1: Big Data analytics can assist in understanding and providing the particular demands of the customers.	1	2	3	4	5	6	7
ICK2: Big Data techniques assist in relieving customer queries in a better manner.	1	2	3	4	5	6	7
ICK3: Big Data can assist in understanding customer needs and orientations to develop appropriate products and services.	1	2	3	4	5	6	7
ICK4: Big Data analytics can assist in identifying whether or not customers would recommend a specific brand to friends and family.	1	2	3	4	5	6	7

- **Customer Retention**

Please indicate to what extent you agree/disagree with the following statements							
	Strongly	**Disagree**	**Slightly**	**Neutral**	**Slightly**	**Agree**	**Strongly agree**

CR1: Big Data tools can be implemented to determine whether or not a customer is satisfied with a product or service.	1	2	3	4	5	6	7
CR2: Big Data can assist with identifying appropriate loyalty programs to implement for customers.	1	2	3	4	5	6	7
CR3: The Implementation of Big Data can provide insights on whether or not customer's behaviour towards a brand has been negatively impacted.	1	2	3	4	5	6	7
CR4: Big Data is able to provide insights to organisations on whether or not to engage with customers	1	2	3	4	5	6	7
CR5: Big Data is able to identify the propensity a customer has in churning.	1	2	3	4	5	6	7

APPENDIX D (ethics approval)

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg

Wits Business School Ethics Committee
Constituted under the University Human Research Ethics Committee (Non-Medical)

Ethics Clearance Certificate

Ethics protocol number: WBS/DB523962/470
This certificate is only valid with a legitimate ethics protocol number and signed by the Researcher (below).

Project title	The impact of big data in customer retention in telecommunications within South Africa.
Investigator / Researcher	Mr Clint Pereira
Nature of Project	MM (Digital Business)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed anonymity and confidentiality.
Issue Date of Certificate	2023-02-28
Expiry date	Date of submission of the project / research report
Chairperson	Dr Pius Oba ☎ +27 11 717 3976 +27 82 733 6587 pius.oba@wits.ac.za

APPENDIX E (permission letter)

TO:	Mr. Clint Pereira.
CC:	Sandi Nwendamutswu Principal Specialist: Public Affairs
From:	Dr. Andrew Barendse Managing Executive: Public Affairs, Vodacom SA
Date:	23 February 2023
Subject:	Letter of permission to conduct research on *investigating "The Impact of Big Data in Customer Retention in Telecommunications within South Africa"* at the University of the Witwatersrand, WITS Business School

Dear Mr Pereira,

This letter serves to confirm that Vodacom permits you to conduct research on investigating the "***impact of Big Data in Customer Retention in Telecommunications within South Africa***" at the University of the Witwatersrand, WITS Business School. Please note that the approval does not guarantee participation of Vodacom employees in the programme, as it is voluntary.

Vodacom permits you to conduct the research on the following conditions:

- All information gathered during interviews or surveys will only be used for academic purposes relating to your study programme at the at the at the University of the Witwatersrand, WITS Business School.
- All information accessed and shared is not categorised as ***"company confidential"***.
- No information acquired from Vodacom or its employees will be used in another academic programme or case study, without prior consent by Vodacom.
- No information will be shared in any public platform, except in an academic journal or platform only as it relates to the aforementioned programme.

During the interviews, the respondents are not allowed to provide you with information that is classified as confidential at Vodacom and not for public use. This letter is not an official endorsement of the content or findings of the research, views and opinions expressed during interviews or collected through surveys do not represent the position of Vodacom on any issue probed.

Should you have any questions, kindly contact Ms. Sandi Nwendamutswu on mobile: +27 66 4743030 or by email on sandi.nwendamutswu@vodacom.co.za

Sincerely yours,



Dr. Andrew Barendse
Managing Executive: Regulatory Affairs

APPENDIX F (turn-it-in report)

Dr Nakuze Chalomba
19/06/2023

