

Asymmetry in Quality of Service (QoS) Regulation among Over-the- Top (OTT) Providers and Mobile Network Operators: from a South African Consumers Perspective

Charity Ledwaba

1571422

1571422@students.wits.ac.za and 0829986155

**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, 2024

Supervisor: Dr Thembekile Mayayise

ABSTRACT

This study aimed to understand the unique characteristics of Over-the-Top (OTT) services and to determine relevant dimensions that could be used to determine service quality on OTT platforms. The study focused on Group-1 OTT, meaning OTT providers that offered services like traditional mobile network operators. An example of such an OTT would be WhatsApp. Input was collected from consumers, regulatory bodies, and businesses to determine the most important dimensions required to determine service quality in users of the platforms. The study went further to determine the most important dimensions to help guide any future regulations. The challenges and opportunities that come with incorporating OTT into the regulatory framework were investigated, utilising input from the regulatory and experts. It was recommended that changes would need to be incorporated into our existing End-user and Subscriber Service Charter (EUSSC) to measure and incorporate the OTT service quality effectively into regulation. These were investigated along equity and competition, sustainability of the sector, consumer welfare, innovation, and regulatory aspects to obtain a view of the impact of introducing quality of service (QoS) regulations. The paper concludes by highlighting the importance of how regulations in OTTs will bring accountability for all players within the sector and ensure that quality is at the cornerstone.

KEYWORDS

Quality of Service, Quality of Experience, Over-the-Top, Regulation, Mobile Network Operators

DECLARATION

I, Charity Lesiba Ledwaba, declare that the report that is titled Asymmetry in Quality of Service (QoS) Regulation among Over-the-Top (OTT) Providers and Mobile Network Operators: from a South African Consumers Perspective, is my own work that was done independently. All work that was obtained from other scholars and sources was adequately acknowledged and referenced. The report was submitted in partial fulfilment of the requirements of the degree of Master of Management in the field of Digital Business at the University of the Witwatersrand, Johannesburg. This report was never submitted before for any other degree or examination at any other institution.



Charity Lesiba Ledwaba

Signed at Hartbeespoort on 28 August 2024

ACKNOWLEDGEMENTS

Dedicated to my number one supporter, Masechaba. Ditlou di a leboga!!! Dr Mayayise, thanks for the robust and honest engagements.

Table of Contents

ABSTRACT	i
DECLARATION.....	ii
ACKNOWLEDGEMENTS.....	iii
LIST OF TABLES.....	ix
LIST OF FIGURES	xiii
LIST OF ACRONYMS	xiv
CHAPTER 1 – INTRODUCTION	1
1.1 STATEMENT OF PURPOSE	1
1.2 BACKGROUND OF THE STUDY	1
1.2.1 TELECOMMUNICATIONS IN SOUTH AFRICA	1
1.2.2 THE RISE OF OTT PROVIDERS.....	1
1.2.3 REGULATORY ENVIRONMENT	2
1.2.4 WHY OTTs ARE GAINING POPULARITY.....	5
1.2.5 ASYMMETRY IN REGULATION	6
1.3 RESEARCH PROBLEM	9
1.4 RESEARCH QUESTIONS.....	11
1.5 RATIONALE.....	11
1.5.1 TECHNOLOGY ADOPTION, ADAPTION AND ASSIMILATION.....	11
1.5.2 TIME FOR ICASA TO ASSIMILATE OTT INTO REGULATION	12
1.6 DELIMITATIONS OF THE STUDY.....	12
1.7 DEFINITION OF TERMS	13
1.8 ASSUMPTIONS	14
1.9 CHAPTER OUTLINE	14

CHAPTER 2 – LITERATURE REVIEW AND THEORETICAL FRAMEWORK.....15

2.1	INTRODUCTION	15
2.2	DEFINITION OF TOPIC OR BACKGROUND DISCUSSION	16
2.2.1	How OTT AND MNOS RELATE	16
2.2.2	REGULATORY FRAMEWORK FOR TELECOMMUNICATIONS.....	16
2.3	IMPORTANT INDICATORS AROUND QUALITY-OF-SERVICE IN RELATION TO OTT PROVIDERS.....	17
2.3.1	QUALITY AS DEFINED FROM A REGULATORY PERSPECTIVE	17
2.3.2	QUALITY FROM A CONSUMER PERSPECTIVE	18
2.3.3	IDENTIFYING THE MOST IMPORTANT DIMENSION.....	19
2.4	OPPORTUNITIES AND CHALLENGES OF INCORPORATING OTT INTO REGULATORY FRAMEWORK	20
2.4.1	OPPORTUNITY: REGULATORY FRAMEWORK	20
2.4.2	OPPORTUNITY: SHARED RESPONSIBILITY FOR QoS	22
2.4.3	CHALLENGE: OTT DEPENDENCE ON THE INTERNET	22
2.4.4	CHALLENGE: NO UNIFORM DEFINITION OF OTT	23
2.5	SIMILAR WORKS	24
2.5.1	REGULATORY OPINION.....	24
2.5.2	SERVICE QUALITY EVALUATION.....	26
2.6	ANALYTICAL FRAMEWORK	27
2.6.1	THEORETICAL FRAMEWORK	27
2.6.2	CONCEPTUAL FRAMEWORK	33
2.6.3	CONCEPTUAL FRAMEWORK	36
2.7	CONCLUSION	38

CHAPTER 3 – RESEARCH METHODOLOGY.....40

3.1	RESEARCH APPROACH	40
3.1.1	CHOSEN APPROACH	40
3.1.2	WHY MIXED METHODS	42
3.1.3	TYPE OF MIXED METHODS PROPOSED	42
3.2	RESEARCH DESIGN	44

3.2.1	DEDUCTIVE APPROACH.....	44
3.2.2	INDUCTIVE APPROACH	45
3.2.3	RESEARCH STRATEGY	45
3.2.4	UNITS OF ANALYSIS	46
3.3	DATA COLLECTION METHODS	46
3.3.1	QUANTITATIVE ASPECT	46
3.3.2	QUALITATIVE ASPECT	47
3.4	POPULATION AND SAMPLE.....	47
3.4.1	QUANTITATIVE STUDY: E-SERVICE QUALITY	48
3.4.2	QUALITATIVE STUDY: PUBLIC REGULATION THEORY	49
3.5	THE RESEARCH INSTRUMENTS	51
3.6	PROCEDURE FOR DATA COLLECTION.....	53
3.7	DATA ANALYSIS STRATEGIES AND INTERPRETATION.....	54
3.7.1	QUANTITATIVE DATA ANALYSIS STRATEGIES.....	55
3.7.2	QUALITATIVE METHODS.....	56
3.7.3	MIXED METHODS	56
3.8	LIMITATIONS AND CHALLENGES OF THE STUDY	57
3.9	QUALITY ASSURANCE	57
3.9.1	EXTERNAL AND INTERNAL VALIDITY	58
3.9.1	TRANSFERABILITY	58
3.9.2	RELIABILITY	59
3.9.3	DEPENDABILITY.....	60
3.9.4	CREDIBILITY.....	60
3.9.5	OBJECTIVITY	60
3.9.6	CONFORMABILITY	61
3.10	ETHICAL CONSIDERATIONS.....	61

CHAPTER 4 – PRESENTATION OF QUANTITATIVE RESULTS 62

4.1	INTRODUCTION	62
4.2	DEMOGRAPHICS	62
4.3	RELIABILITY OF QUESTIONNAIRE	66
4.4	VALIDITY	67

4.4.1	FACTOR LOADINGS	68
4.4.2	AVERAGE VARIANCE EXTRACTED (AVE) AND DISCRIMINANT VALIDITY	75
4.5	CUSTOMER EXPECTATION	87
4.5.1	SERVICE QUALITY EVALUATION.....	87
4.5.2	CUSTOMER INSIGHTS	88
4.5.3	DESCRIPTIVE STATISTICS	89
4.5.4	NORMALITY TEST.....	98
4.6	CORRELATION ANALYSES.....	98
4.7	REGRESSION ANALYSES	100
4.7.1	RELIABILITY AND H1	100
4.7.2	RESPONSIVENESS AND H2.....	101
4.7.3	EASE OF USE AND H3.....	102
4.7.4	ENJOYMENT AND H4	103
4.7.5	PRIVACY AND SECURITY AND H5.....	103
4.7.6	TRANSPARENCY ON PRICE AND H6.....	104
4.8	IMPORTANT VARIABLE	105
4.9	CONCLUSION	106
 CHAPTER 5 – PRESENTATION OF QUALITATIVE RESULTS.		108
5.1	INTRODUCTION	108
5.2	DEMOGRAPHICS	108
5.3	THEMES	109
5.4	ANALYSES OF THEMES.....	111
5.4.1	COMPETITION AND EQUALITY IN THE TELECOMMUNICATIONS SECTOR	111
5.4.2	CONSUMER WELFARE	115
5.4.3	SUSTAINABILITY	120
5.4.4	INNOVATION	124
5.4.5	REGULATORY ASPECTS	130
5.4.6	UNEXPECTED FINDING	135
5.5	CONVERGENCE OF QUALITATIVE AND QUANTITATIVE DATA	135
5.5.1	CONVERGENCE WITH QUANTITATIVE DATA	136
5.6	SUMMARY	137

CHAPTER 6 – CONCLUSION, LIMITATIONS AND RECOMMENDATIONS.....140

6.1	INTRODUCTION	140
6.2	CONCLUSION ON RESEARCH QUESTION	140
6.2.1	CONCLUSION REGARDING RESEARCH ON THE MAIN RQ1	140
6.2.2	CONCLUSION REGARDING RQ2.....	141
6.2.3	CONCLUSION REGARDING RESEARCH ON THE MAIN RQ3	142
6.2.4	CONCLUSION REGARDING RESEARCH ON THE MAIN RQ4	144
6.3	LIMITATIONS	145
6.4	RECOMMENDATIONS	146
6.5	AREAS OF FUTURE RESEARCH.....	146
6.5.1	QUALITY FOR GROUP 2 AND GROUP 3 OTTs.....	146
6.5.2	DEVELOP FRAMEWORK FOR MEASURING QUALITY OF SERVICE	146
6.5.3	PRIVACY IN DATA COLLECTION IN GUARANTEEING OTT SERVICE QUALITY	147
	REFERENCES	148
	APPENDIX A: ETHICS CLEARANCE	164
	APPENDIX B: QUANTITATIVE SURVEY	165
	APPENDIX C: QUALITATIVE INTERVIEW	171
	APPENDIX D: CONSENT FORM	174
	APPENDIX E: PARTICIPANT INFORMATION SHEET (PIS).....	178

LIST OF TABLES

Table 1: Top applications for 2022 on IOS and Android in South Africa as adapted from My Broadband.....	4
Table 2: Regulatory and legislative protection as adapted from ICASA.....	7
Table 3: Newly regulated QoS parameters as sourced from Amendment of the ICASA EUSSC.....	8
Table 4: E-Service quality dimensions	34
Table 5: Deductive approach for the e-ServQual model used.....	44
Table 6: Likert scale options.....	47
Table 7: Sample size calculation.....	48
Table 8: Respondents who agreed to partake in the study	50
Table 9: Declined responses to partake in the qualitative survey.....	51
Table 10: Proposed E-Service quality survey	52
Table 11: Interview questionnaire to explore regulation in the public interest ..	53
Table 12: Quality assurance measures for qualitative and quantitative studies	58
Table 13: Gender of participants.....	63
Table 14: Racial distribution of respondents	64
Table 15: Distribution by age of respondents to the survey	65
Table 16: Preferred OTT as per survey respondents	65
Table 17: Preferred OTT table in percentage.....	66
Table 18: Calculation of Cronbach Alpha of questionnaire	66

Table 19: Cronbach Alpha calculations	67
Table 20: KMO and Bartlett's test	68
Table 21: KMO and Bartlett's test for reliability	68
Table 22: Component matrix for reliability	69
Table 23: KMO and Bartlett test for responsiveness	69
Table 24: Component matrix for responsiveness	70
Table 25: KMO and Bartlett test for Ease of Use	70
Table 26: Component matrix for Ease of Use	71
Table 27: Rotated component matrix for Ease of Use.....	71
Table 28: KMO and Bartlett for Enjoyment.....	72
Table 29: Component matrix for Enjoyment.....	72
Table 30: Rotated component matrix for Enjoyment	73
Table 31: KMO and Bartlett test for Privacy and Security	73
Table 32: Component matrix for Privacy and Security	74
Table 33: KMO and Bartlett's test for Transparency on Price	74
Table 34: Component matrix for Transparency on Price.....	75
Table 35: Correlation matrix for the Reliability factors.....	76
Table 36: Correlation matrix for the Responsiveness factors.....	77
Table 37: Correlation matrix for Ease of Use factors.....	79
Table 38: Correlation matrix for Enjoyment.....	81

Table 39: Correlation matrix for Privacy and Security	84
Table 40: Correlation matrix for Transparency on Price	86
Table 41 Service quality analyses	87
Table 42: Results on Reliability	90
Table 43: Results of Responsiveness	91
Table 44: Summary on Ease of Use	93
Table 45: Summary of Enjoyment	95
Table 46: Summary of Privacy and Security	96
Table 47: Summary of Transparency on Price	97
Table 48: Normality tests	98
Table 49: Correlation analyses.....	99
Table 50: Significance test	99
Table 51: Regression analyses with Reliability as the independent variable .	100
Table 52: Regression analyses with Responsiveness as the independent variable	101
Table 53: Regression analyses with Ease of Use as the Independent variable	102
Table 54: Regression analyses with Enjoyment as the independent variable	103
Table 55: Regression analyses with Privacy and Security as the independent variable	104
Table 56: Regression analyses with Transparency on Price as the independent variable	105

Table 57: Standardised Beta values	106
Table 58: Demographic details of respondents	108
Table 59: Competition and equity.....	110
Table 60: Consumer welfare	110
Table 61: Sustainability	110
Table 62: Innovation.....	110
Table 63: Regulatory aspects.....	110
Table 64: Summary of OTT service quality Indicators as given by experts	136
Table 65: Difference between qualitative and quantitative responses.....	137

LIST OF FIGURES

Figure 1: Prediction of move to data only MNOs by 2025	15
Figure 2: OTT sitting over network provider	16
Figure 3: Conceptual framework utilising e-ServQual and Public Interest Regulation Theory.....	37
Figure 4: Snapshot of Twitter post for snowball sampling	49
Figure 5: Results of the statements from customers	88

LIST OF ACRONYMS

2G	Second Generation of Mobile Telecommunications Technology
4G	Fourth Generation of Mobile Telecommunications Technology
5G	Fifth Generation of Mobile Telecommunications Technology
AVE	Average Variance Extracted
BEREC	Body of European Regulators for Electronic Communications
DCDT	Department of Communications and Digital Technologies
ECA	Electronic Communications Act of 2005
ECNS	Electronic Communications Network Services
ECS	Electronic Communications Service
EFA	Exploratory Factor Analyses
EJ	Enjoyment
EUSSC	End-User and Subscriber Service Charter
EU	Ease of Use
IBA	Independent Broadcasting Authority
ICASA	Independent Communications Authority of South Africa
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
ISP	Internet Service Provider
ITU	International Telecommunication Union

KMO	Kaiser-Meyer-Olkin
KPI	Key Performance Indicator
MNO	Mobile Network Operator
MOS	Mean Opinion Score
OECD	Organisation for Economic Co-operation and Development
OTT	Over-the-Top
PMG	Parliamentary Monitoring Group
POPIA	Protection of Personal Information Act
PPCCDT	Parliamentary Portfolio Committee on Communications and Digital Technologies
PS	Privacy and Security
QoE	Quality of Experience
QoS	Quality of Service
RB	Reliability
RICA	Regulation of Interception of Communications and Provision of Communication
RQ	Research Question
RS	Responsiveness
SATRA	South African Telecommunications Regulatory Authority
ServPerf	Service Performance
ServQual	Service Quality

SMS	Short Message Service
Stats SA	Statistics South Africa
TR	Transparency on Price
UCLA	University of California, Los Angeles
UN	United Nations
USAASA	Universal Service and Access Agency of South Africa

CHAPTER 1 – INTRODUCTION

1.1 Statement of purpose

The purpose of the study was to investigate the need for quality-of-service (QoS) standards around Over-the-Top (OTT) service providers that offer similar services to Mobile Network Operators (MNOs). There is increased reliance of consumers on services provided by OTTs, which has created an ecosystem where basic communication services were taking place without any oversight from regulatory bodies, leaving OTT service providers to self-govern (Park, 2017). South Africans enjoy quality communications provided by traditional MNOs as there were defined minimum standards that had to be adhered to as part of licence agreements with the Independent Communication Authority of South Africa (ICASA, 2019).

1.2 Background of the study

1.2.1 Telecommunications in South Africa

In 1993, South Africa issued its first two cellular licenses to expand telecommunications access (Vodacom, 2004). By then, 1% of the rural population had telephone access compared to 98% in suburbs. Mobile services aimed to bridge this gap (Lewis, 2013). The introduction of prepaid services in 1996, a global first, lowered entry barriers and further accelerated access to communications in South Africa (Vodafone, 2005).

1.2.2 The rise of OTT providers

The first smartphone was launched by IBM in 1993, but the true revolution gained momentum with the launch of the iPhone in 2007 and later Android-based devices (Križanović, 2020; World Economic Forum [WEF], 2018). The true power of these devices was that their capability was only limited by the imagination of application developers (D'Juan, 2018). These applications were known as Over-the-Top (OTT) applications and started the platform ecosystem on mobile

devices. Some of these OTT platforms offer services that were offered by MNOs or Electronic Communications Service (ECS). WhatsApp, Viber, and Facebook Messenger are examples of OTT services offering users the ability to send texts and make voice calls like MNOs (Muhammad & Valliappan, 2019). Voice, data, and text messaging (SMS) services provided by MNOs must comply with minimum service levels or face the risk of being penalised by national regulatory bodies (International Telecommunication Union [ITU], 2017).

1.2.3 Regulatory environment

1.2.3.1 Quality of Service Regulation

The following are areas that were usually covered by regulators in telecommunications QoS regulatory frameworks (ITU, 2017a), irrespective of the service being offered.

- i. Speed (How quickly service is accessed. Time to setup a call, time to send SMS).
- ii. Service accuracy (e.g. Quality of Speech, Call Setup Success Rate, Bill Accuracy).
- iii. Service availability (e.g. coverage, service availability).
- iv. Service reliability (e.g. dropped call ratio, number of billing complaints).
- v. Security around offering (e.g. Fraud Mitigation).
- vi. Ease of operations (e.g. Cancellation process, Ease of getting software updates).
- vii. Agility (e.g. Ease of moving to different package).

There is currently no set regulation governing OTT quality of service in South Africa. OTT services are best effort services but need to meet minimum technical service standards to satisfy user experience. Technical elements of QoS in OTT would need to be evaluated along service accessibility, service retainability and service integrity (Elhaddouj & Amiroune, 2018). This linked to points (i) to (iv) listed above. Point (v) would be important for OTT services as they rely on the internet to provide services. The aim of cybersecurity was to protect computer-

based systems, applications, devices, data, financial assets and people against loss (Lindemulder & Kosinski, 2024). It was estimated that global spend on cybersecurity would exceed USD 1.75 trillion for the period between 2021 to 2025 (Morgan, 2024). Points (vi) and (vii) would be beneficial as it would cater for elements around the actual user experience and implications of choosing certain options within the OTT platforms.

1.2.3.2 Regulatory Oversight in South Africa

In South Africa, the regulatory role fell in the domain of the Independent Communications Authority of South Africa (ICASA). The mandate of regulating the postal, telecommunications and broadcasting services rested with ICASA. This was done to safeguard the interests of the South African public. ICASA's mandate is summarised below (ICASA, 2005a).

- Ensure access to quality affordable communication services to all citizens.
- Licensing of broadcast and telecommunications service providers.
- Enforcement of rules around provisioning of electronic communications.
- Regulatory Compliance.
- Custodian of consumer rights from unjust business practices and inferior quality of service.
- Mediation in disputes between licence holders.
- Spectrum management.

The above suggests that with the new digital platforms that had gained popularity, ICASA needed to cater for OTT providers in the regulatory framework of the industry. There were major barriers to entry for MNOs that the OTT providers had exploited and thus avoided any subsequent regulation governing MNOs. These are listed below.

- They do not require spectrum. Spectrum is the set of frequencies required to transmit electromagnetic waves necessary for traditional communication services (ICASA, 2022a).

- They do not need licensing by the regulator (Parliamentary Monitoring Group [PMG], 2016a).

ICASA would need to find a balance between enabling innovation within the sector while at the same time creating a fair operating environment.

1.2.3.3 Types of OTTs Available in South Africa

Table 1 depicts popular applications on IOS and Android devices in South Africa for 2022. Popular applications can be grouped into three categories listed below.

Group-1 – Those that offer similar services as ECS providers and disrupt their business models, e.g. WhatsApp.

Group-2 – Those that offer services that ECS providers want as they promote usage and help to increase revenue, e.g. YouTube.

Group -3 – Those that offer services that do not generate significant traffic for mobile operators but are critical as they manage sensitive user information, e.g. Capitec.

This study focused more on the first group of OTT providers.

Table 1: Top applications for 2022 on IOS and Android in South Africa as adapted from My Broadband

Rank	Android	OTT Group	iOS	OTT Group
1	TikTok	Group 2	Lenasa AI	Group 2
2	Capitec	Group 3	TikTok	Group 2
3	WhatsApp	Group 1	WhatsApp	Group 1
4	TikTok Lite	Group 2	CapCut Video Editor	Group 2
5	Shein	Group 3	Instagram	Group 2
6	Facebook Lite	Group 1	Facebook	Group 2
7	Load Shedding Notifier	Group 2	Capitec	Group 3
8	Bolt	Group 3	EskomSePush	Group 2
9	Opera Mini	Group 2	YouTube	Group 2
10	Spotify	Group 2	Google	Group 2

1.2.4 Why OTTs are gaining popularity

Internet availability to homes in South Africa was measured at 77.5% (Statistics South Africa [Stats SA], 2021a). Stats SA (2021a) highlights that people usually gained access to the internet outside of their homes as only 10.4% reported to have access to the internet at home. Respondents reported that they relied on their mobile devices to access the internet. This suggests that the latest 4G and 5G devices were being used to achieve this as the experience on 2G devices would be frustrating due to the lower data rates (Institute of Electrical and Electronics Engineers [IEEE], 2019).

Most internet users (95%) in South Africa between the ages of 16 to 64 years made use of WhatsApp, with Facebook messenger coming second at just above 86% (Kemp, 2022). The advantage that these platforms had over traditional communications was their capability to perform traditional voice and text messaging services at a fraction of the cost (Thompson, 2022). This enticed the South African consumers to adopt these OTT services due to the relative cost to communicate being cheaper on OTTs. Globally, it has been shown that more WhatsApp messages are sent versus traditional text messages (Stegner, 2023). Ayyagari (2022) shows that there were 100 billion WhatsApp text messages sent daily versus 18 billion SMS text messages that were sent via traditional mobile telephony. A year after voice calls were enabled over WhatsApp, there were 100 million calls being made on the platform daily across the globe (Mugerwa, 2016). It could therefore be argued that WhatsApp, for example, could be viewed as an MNO and thus required an ECS licence as it provided the same services as a traditional MNO, with the advantage of operating outside the regulatory framework governing traditional service providers (Body of European Regulators for Electronic Communications [BEREC], 2016). This could be achieved with a modification of the regulations to cover OTT providers.

Quality of Service (QoS) traditional services that are currently being monitored needed to be considered as there was increased popularity of OTTs.

1.2.5 Asymmetry in regulation

The ICASA Act 13 of 2000 provides legislative authority that ICASA was an independent regulator for the South African communications sector (Republic of South Africa [RSA], 2000). The Electronic Communications Act (ECA) of 2005 was additional legislation that regulates the delivery of electronic communications services in South Africa (ICASA, 2005b). There were 18 key legislation and regulations that required compliance from holders of ECNS and ECS licensees. Even though some of the legal requirements applied to both MNOs and OTT providers, the mobile operators had a higher compliance threshold as they were monitored as part of their license requirements in the form of reporting and regulatory monitoring (Shanapinda, 2019).

Table 2 provides a view of the legislative and regulatory environment with which MNO service providers must comply. The regulations provide the minimum requirements and standards that the service providers need to adhere to. The End-user and Subscriber Service Charter (EUSSC), which was listed eighth under regulations in Table 2, sets out the minimum service quality standards that must be adhered to when providing telecommunications services. The charter is applicable to all licenced service providers of electronic communications (ICASA, 2016). QoS falls under section 9 of the charter.

Table 2: Regulatory and legislative protection as adapted from ICASA

	Legislation
1	Independent Communications Authority of South Africa Act, 2000 'ICASA Act' (Act No. 13 of 2000), as amended
2	Electronic Communications Act, 2005 'ECA' (Act No. 36 of 2005), as amended.
	Regulation
1	ICASA General Licence Fees Regulations, 2013
2	Universal Service and Access Fund Regulations, 2011
3	Compliance Procedure Manual Regulations, 2011 (CPMR)
4	Regulations on Standard Terms and Conditions for Individual Licences, 2010
5	Regulations on Standard Terms and Conditions for Class Licences, 2010
6	Processes and Procedures Regulations for Individual Licences, 2010
7	Processes and Procedures Regulations for Class Licences, 2010
8	End User and Subscriber Service Charter Regulations, 2016
9	Interconnection Regulations, 2010
10	Electronic Communications Facilities Leasing Regulations, 2010
11	Regulations on Code on People with Disabilities Applicable to All Licensees, 2007
12	Code of Conduct for ECS-ECNS Licensees, 2007
13	Regulations in terms of Section 4 read with Section 73 of ECA in respect of E-Rate 2009
14	Numbering Plan Regulations, 2016
15	Call Termination Regulations, 2014
16	Information and Communications Technology (ICT) COVID-19 National Disaster Management Regulations, Government Gazette Number 43207, 2020.
17	Regulation of Interception of Communications and Provision of Communication
18	Protection of Personal Information Act

Source: ICASA (2021)

Only licenced service providers needed to comply with legislative and regulatory frameworks. Currently OTT providers are not licenced and do not need to comply with the set regulation, despite there being services that are common to those provided by MNO service providers. Voice calling and text messaging are examples of such services. QoS is an area in regulation where asymmetry exists between OTT and MNO service providers, where mobile operators are required to submit bi-annual reports. QoS campaigns are conducted by the regulators and they produce campaign reports on the state of quality of service in various towns in South Africa (ICASA, n.d.). In April 2023, a fourth amendment to the EUSC came into effect (ICASA, 2023). A set of new QoS minimum standards around voice and data services came into effect. Table 3 highlights the changes around voice services. The proposed changes had revised voice call targets for call setup (Average Call Setup Success Ratio and Average Call Setup Time), call retention (Average Dropped Call Ratio) and voice call quality (Average Speech Quality Mean Opinion Score). There were changes suggested for SMS delivery success (Average SMS End-to-End Delivery Success Rate and Average SMS End-to-End

Delivery Time). The proposed changes that are summarised in Table 3 would only apply to licenced operators.

Table 3: Newly regulated QoS parameters as sourced from Amendment of the ICASA EUSSC

Parameter	Threshold
Average Call Setup Success Rate	$\geq 98\%$
Average Call Setup Time	≤ 9 seconds
Average Call Drop Ratio	$\geq 3\%$
Average Speech Quality (MOS)	≥ 3
Average SMS End to End delivery Success Rate	$\geq 98\%$
SMS End-to-End Delivery Time	≤ 10 Seconds

Source: ICASA (2023)

One could conclude from the new regulations that ICASA still finds it important to have minimum standards around quality for the foreseeable future as these proposed changes were initially proposed in April 2022 and were adopted in consultation with the MNOs (ICASA, 2023). Vodacom, Telkom, Cell C and MTN all had the opportunity to respond to these proposed changes, but nothing from the OTT providers, despite there being regional offices for Meta (Owner of WhatsApp and Facebook) in South Africa (ICASA, 2023). Telkom highlighted the unfairness of being held responsible for some of the services being provided by OTT service providers over their network due to parts of it being outside their control (Telkom, 2022). The proposed changes that are highlighted in Table 3 applied only to licence holders but did not apply to OTT providers like WhatsApp that provide similar services (ICASA, 2023). This asymmetry in regulation needed to be addressed. It was established from Table 1 that there was a group of applications that offer similar services to the ECS providers. It made sense that either one of the following scenarios would occur in the future:

- Gradually there would be service substitution by the OTT providers on services offered by mobile operators, thereby relegating them to just carrying traffic offered by OTT providers (BEREC, 2016).

- Service providers might offer a superior service or obtain regulatory protection from national regulators such that the OTT providers naturally fade out. Regimes in Qatar and the United Arab Emirates have banned OTT applications in their countries, but users would circumvent these by using virtual private network services (BEREC, 2016; Sablah, 2024).
- Innovation that changes the landscape offering diverse ways to communicate. There is current talk of offering mobile cellular coverage using satellite technology by companies such as Starlink (Kleinman, 2023; Starlink, 2023).

No matter the direction, ICASA needed to ensure that consumers have access to quality communications and therefore needed to always ensure that the QoS framework continuously evolved to ensure that the South African public remain protected as per mandate (ICASA, 2005b).

1.3 Research problem

OTT services had disrupted the telecommunications industry in South Africa. It had already been shown that WhatsApp had replaced SMS as the preferred platform for messaging (Ayyagari, 2022). OTT services, such as WhatsApp, Skype, and Facebook Messenger allow users to make calls, send messages, and stream media content over the internet, without the need for traditional voice or data plans. Globally, five times more WhatsApp texts are sent daily versus SMS (Ayyagari, 2022). The undeniable cost benefit brought about by OTT services was visible to everyone. The services had assisted to bring down costs to communicate compared to traditional service offerings. QoS was defined as the total of characteristics of a telecommunication offering that display its ability to fulfil stated and tacit needs of the user of the offering. In today's environment, the user can include non-human users (ITU, 2017b). The QoS of OTT services had been the subject of debate amongst standards bodies and national regulators. They had been able to operate outside the bounds of traditional regulation without being assessed on the service quality, both in South Africa and globally (Masemola, 2019). WhatsApp, as an example of an OTT with a large footprint,

has over two billion users globally. Current predictions estimate that this figure will grow to 24.5 million users in South Africa by 2028 (Degenhard, 2023). This would equate to about 37% of the population. The population of South Africa is currently at 60.6 million and is predicated to grow by 7% in 2027 (Stats SA, 2022).

MNOs were seeing more of their traditional services, such as traditional voice and SMS, being replaced by services provided by OTT service providers like WhatsApp and Facebook (PMG, 2016b). The uptake in OTT penetration was initially slow due to the high data prices in South Africa. There has been a decline in data prices, fuelled by ICASA and social movements for lower mobile data pricing (ICASA, 2022c). This made it attractive for consumers to use more of the services as the cost to communicate over an OTT became more favourable than over traditional mobile operators. The two dominant mobile operators in South Africa, Vodacom and MTN, argued to parliament that the creation of a level playing field was required between the OTT service providers and mobile operators from a regulatory perspective (PMG, 2016a). Local MNOs needed to contend with regulations around universal service and access regulations, price, tax, and QoS, which was the focus of this study.

The QoS of traditional ECS was governed by the End-user Subscriber Service Charter of 2016, subsection nine (ICASA, 2016). The innovation brought by OTT services had demonstrated the power of digital platforms in converting the business model of mobile operators to being a pipeline for third party applications to create services that meet the consumer demands. This would necessitate looking at the service offering by OTT services in the interest of consumers. The service quality offered by OTT applications was normally attributed to inferior performance from the internet service providers (ISPs) when questioned, which is not always the case and needs to be assessed further. An example would be to use information that was readily available on the internet on sites such as DOWNDetector that highlights significant issues on Facebook and WhatsApp whenever they occurred (DOWNDetector, 2023). Another example would be the global WhatsApp outage of October 2022, where users could not send text messages for two hours. It would be incorrect to attribute this failure to the MNOs

(Singh, 2022). This is information that can be used to improve and monitor service levels. The aim was to investigate if there is an opportunity to assimilate QoS in OTT service providers into the EUSSC.

1.4 Research questions

The study aimed to address the following research questions related to Group-1 OTT. These are OTTs that offer similar services as ECS providers and disrupt their business models. An example of a Group-1 OTT would be WhatsApp.

- i. What are the fundamental quality indicators related to quality-of-service of OTT providers as perceived by regulators and consumers?
- ii. What is the primary quality indicator that consumers consider as the most significant in relation to the quality of OTT services?
- iii. What are the challenges and opportunities of regulating quality-of-service in OTT?
- iv. What are the regulatory implications of incorporating OTT services within the current QoS framework of the End User Subscriber Service Charter (EUSSC)?

1.5 Rationale

1.5.1 Technology adoption, adaption and assimilation

There was a time difference when new technology was introduced into a market and became adopted by individuals, adapted by business, and later when it was assimilated into laws and charters by regulatory bodies (Armstrong & Lee, 2021). Armstrong and Lee (2021) not only highlight the exponential nature at which digital platforms were adopted, but also argued the need for organisations to limit the time between technology being available and being adopted by consumers to remain competitive. Armstrong and Lee (2021) highlight that law makers and governing bodies were usually last to assimilate the modern technology into regulation. The time taken to have new technology adapted, adopted, and

assimilated needed to be kept to a minimum as the digital space changes exponentially.

1.5.2 Time for ICASA to assimilate OTT into regulation

The South African voice and SMS market finds itself in this predicament where OTT players were able to introduce offerings into the market that eroded the traditional MNOs' business models around these services. Mobile communications were estimated to generate R162 billion in revenue and needed to ensure that these revenues stay within our borders, while at the same time ensuring that innovation does not leave us behind (Stats SA, 2021b).

Despite the plea from local MNO service providers to include greater regulatory compliance for OTT service providers, the multinational OTT service providers argued that the mobile operators benefitted from the increased data that were being derived from the subscribers that they attracted on their platforms. They highlighted that the current regulation might not be appropriate for the platform ecosystem that was currently in existence (PMG, 2016a). The End-user and Subscriber Service Charter Regulations, 2016, published in Government Gazette No. 39898 (Notice No. 189) were created to set minimum standards around service and to be the voice of consumers (ICASA, 2016). There was, however, a gap in the regulation as OTTs do not operate within this framework while they provided similar services that were currently regulated. This study aimed to look at the current ecosystem around QoS in the EUSSC and investigated if there were opportunities to include OTTs in the framework.

1.6 Delimitations of the study

- i. Popular OTTs in South Africa can be grouped into three classes as was previously highlighted. The focus of this study was on OTT providers that offer services that compete with the mobile service providers.
- ii. This study focused more on QoS and experience as covered by the EUSSC from a regulatory perspective.
- iii. The study focused on OTT services operating in South Africa

1.7 Definition of terms

Electronic Communications Network Services (ECNS): a physical network deployed and operated to carry electronic communications. This may be made up of optic fibre, copper based or even the communicating radio equipment. Having an ECNS licence does not allow the holder to provide services in South Africa but may carry services of another provider that has an ECS licence to operate electronic communications (ICASA, 2005b).

Electronic Communications Service (ECS): ICASA (2005) defined this as any service that was provided over an electronic communications service network. A licence holder would be allowed to provide electronic services over its own or another ECNS licence holder's network (ICASA, 2005b). There were discussions around modifying the definition to include platform services to this definition as they can offer similar services that ECS providers supply (BEREC, 2016).

Independent Communications Authority of South Africa (ICASA): Regulatory body for communications in South Africa.

Mobile Network Operator (MNO): Providers of mobile cellular services.

Platform: A web-based technology that allows the development, deployment and management of solutions and services (Rouse, 2017)

Quality of Experience (QoE): The level of happiness or annoyance of the consumer of a service or application (ITU, 2017b). This is experience as perceived by the user.

Quality of Service (QoS): Quality of Service (QoS) can be seen as total of characteristics of a telecommunications offering that display its ability to fulfil stated and tacit needs of the user of the offering. In today's environment, the user can include non-human users (ITU, 2017b).

Over the Top (OTT): Content, a service or an application that is provided to the end-user over the public Internet (BEREC, 2016).

Spectrum: The range of frequencies allocated for transmission of a particular electronic service (ICASA, 2022a).

1.8 Assumptions

The following assumptions applied to the study.

- i. The mobile network operators operated throughout South Africa only.
- ii. ICASA was the sole regulator of electronic communications in South Africa.
- iii. OTT services were seen as those operating within South Africa and therefore evaluated in the South African context.

1.9 Chapter outline

The research follows the following chapter guidelines.

Chapter 1: Introduction

Chapter 2: Literature Review and Theoretical Framework

Chapter 3: Research Methodology

Chapter 4: Presentation of Quantitative Results

Chapter 5: Presentation of Qualitative Results

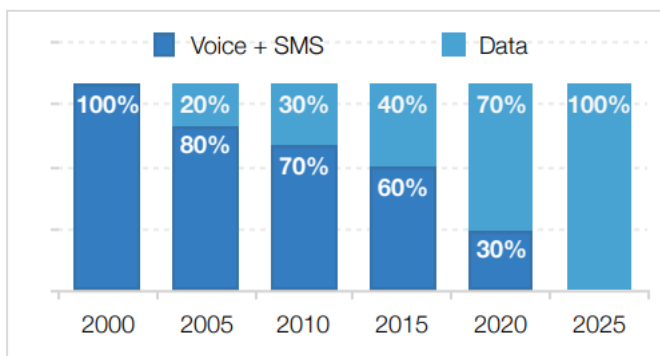
Chapter 6: Conclusion, Limitations and Recommendations

CHAPTER 2 – LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

The mobile communications sector was moving towards an environment where MNOs would only be able to charge for bandwidth and data consumption (Stork & Esselaar, 2019). Stork and Esselaar (2019) predicted that by 2025, MNO traffic in Africa would be data only, as is highlighted in Figure 1.

Figure 1: Prediction of move to data only MNOs by 2025



Source: From Stork et al. (2020)

OTT players would absorb the voice and SMS market. It made sense that there would always be a need for traditional voice services, especially when in need of emergency service. ICASA would need to look at ways of protecting consumers, regardless of the channel being used to communicate. The asymmetric QoS regulation between OTT providers and MNOs meant that currently there was no quality control on services done via OTT. It was for this reason that the researcher aimed to investigate the current telecommunications landscape on QoS and to identify opportunities and challenges to include OTT service providers in QoS regulation.

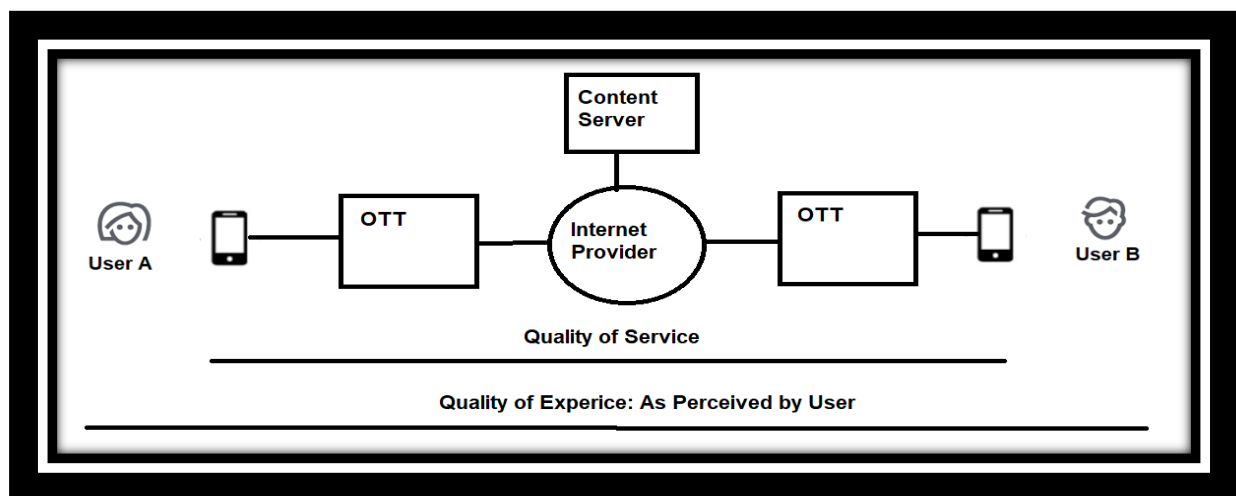
2.2 Definition of topic or background discussion

This section discusses key concepts around how OTT and MNOs relate, QoS and how QoS fits into the current regulatory framework in South Africa.

2.2.1 How OTT and MNOs relate

OTT content was defined as a service or an application that was provided to the end-user over the public internet (Sridhar, 2019). This meant that anything provided over the public internet was an OTT service (BEREC, 2016). The internet, which is provided by various network providers, whether fixed or mobile, is the basic requirement on which an OTT provider exists (BEREC, 2016). Figure 2 depicts how the OTT leverages on the internet service providers to provide a service.

Figure 2: OTT sitting over network provider



Source: Adapted from Robinson & Okeleke (2020)

2.2.2 Regulatory Framework for Telecommunications

The Department of Communications and Digital Technology (DCDT) is responsible for policy direction and implementation around communications and digital technology (DCDT, 2023). The department has a constitutional mandate of ensuring that all South Africans have access to quality communications and digital technology at an affordable price (DCDT, 2023). The department plays an

oversight role for the work of regulatory bodies such as ICASA and the Universal Service and Access Agency of South Africa (USAASA) (Ellipsis, 2012). ICASA is the communications regulator in South Africa. Oversight of the DCDT is done by Parliamentary Portfolio Committee on Communications and Digital Technologies (PPCCDT). It has powers to conduct inquiries and subpoena documents (Ellipsis, 2012; Parliament, n.d.). Globally, the ITU performs the role of standardisation in telecommunications networks for the development of uniform technical standards. This is to ensure interoperability between networks and technologies. South Africa is a signatory of the ITU and is represented by the DCDT at the ITU level (ITU, 2023).

In summary, the ITU sets out guidelines for regulatory frameworks that national governments (via the DCDT) use in directing policy. ICASA, as the country's independent regulator, sets regulation around these policies in their regulatory frameworks. The DCDT is accountable to parliament via the PPCCDT. The right to communicate is a constitutional right, therefore all regulations are protected by the Constitution in South Africa.

2.3 Important indicators around Quality-of-Service in relation to OTT providers

2.3.1 Quality as defined from a regulatory perspective

The registration and granting of electronic communications licences in South Africa is performed by ICASA under the ECA of 2005 (Ellipsis, 2012). In the service licensing framework in South Africa, there are two main categories of service licences available under the ECA:

- Electronic Communications Network Service (ECNS) licences: Allow the licensee to build and maintain a network of their own (Ellipsis, 2012).
- Electronic Communications Service (ECS) licences: Allow the licensee to provide services to consumers over its own or leased network (BEREC, 2016).

Only services that were licensed were subjected to conforming to the subsequent regulatory framework provided by the ECA of 2005 and any spin-off regulation that emanated from this. QoS was part of section 9 of the EUSSC and only covered for ECS and ECNS services (ICASA, 2016).

2.3.2 *Quality from a consumer perspective*

The ability of an organisation to provide a service of the highest quality is one of the cornerstones for any company seeking market leadership and to deliver shareholder value (Shava, 2021). Organisations need to ensure that they can deliver according to the needs of the customer, if they want to deliver value (O'Grady, 2023). Quality is defined as fitness for use (Juran & Gryna, 1993). One of the cornerstones in quality management is to focus on customers as they are the ones using the products (Slack, 2013). A quality service or product is one where the difference between the expected product and the one delivered by the organisation is identical, which will ultimately determine the perceived quality by the customer and customer satisfaction (Malik, 2012). This relationship is captured in the formula below.

- $\text{Service Perception} - \text{Service Expectation} = \text{Perceived Service Quality}$
→ Customer satisfaction

It is important to note that there is a difference between customer satisfaction and service quality. Customer satisfaction refers to a customer's overall assessment of how well a service meets or exceeds their expectations. It is a measure of the degree of satisfaction that customers feel because of the service they believe they received from a supplier (Malik, 2012). Higher levels of customer satisfaction result when the actual service quality meets or exceeds customer expectations.

One of the most popular models to determine the gap between customer expectation versus the actual service received was initially proposed in the form of the Service Quality (ServQual) Model or Gap model (Parasuraman et al., 1988). The model gives a framework that measures service quality across five dimensions which the authors developed by checking the difference between the

perceived quality and expected quality. The model is discussed in detail in section 2.6.1.1. The adaptability of the ServQual model allowed the researcher to further modify the framework for services delivered by e-commerce shops via digital platforms (Zeithaml et al., 2005). These authors had identified 11x dimensions that needed to be explored when evaluating ServQual on online platforms and called it e-Service Quality (e-ServQual). This is further elaboration on in section 2.6.1.1.

2.3.3 Identifying the most important dimension

Shava (2021) investigated user satisfaction using the service quality model of users of mobile network services in South Africa, on a sample of 1451 customers. The dimensions used to measure quality were tangibility, reliability, responsiveness, empathy, and assurance on customer satisfaction. It was established that assurance and tangibility had the biggest impact on customer satisfaction in mobile networks. Ngwenya (2017) performed similar work on a sample size of 128 customers. Kumar (2018) highlights ServQual in the telecommunications sector using a qualitative study in the Indian market. Two additional dimensions were added, namely network quality and competitive advantage. Network quality was judged to be the most important amongst customers. This highlighted adaptability of the ServQual model to satisfy their specific needs and not just to use the original five proposed dimensions. With the current study focusing on OTTs offering similar services as MNOs, it would be worthwhile to perform a similar comparison taking the OTT into account. For an OTT to operate, offer reliable voice and text services, the following would be minimum requirements (Lagharia & Laghari, 2021). An OTT would need to allow users to set up, maintain and terminate services reliably and within a reasonable timeframe.

There were other social dimensions that have resulted in the popularity of OTT services, such as their relative affordability when considering that the average cost of data has been on the decline in South Africa, and the general expansion of broadband coverage, which are unique to the South African market.

2.4 Opportunities and challenges of incorporating OTT into regulatory framework

2.4.1 Opportunity: Regulatory framework

A qualitative study was done to find an approach to include OTT providers into regulation in Turkey (Bilbil, 2018). Bilbil (2018) argues that there was a need for the regulation of OTT services to ensure a level playing field for all stakeholders in the communications sector. Another crucial factor was to protect consumers and provide access to quality communications services. Bilbil (2018) further argues that the existing regulatory framework for telecommunications services was inadequate for regulating OTT services as it only catered for fixed and mobile service providers in Turkey, as is also the case in South Africa. The paper proposes a methodology that considers the unique characteristics of OTT services and the regulatory challenges they pose. Bilbil (2018) suggests that since the OTT sector is still developing, regulation needs to be investigated from three perspectives, as listed below.

- Types of services they provide (e.g. Voice, Streaming).
- Relationship between MNOs and OTTs (e.g. MNOs offering flat-rated deals for certain OTT services).
- Area of regulation (e.g. QoS, QoE).

QoS was part of the third group on this list and was the focus of this study.

Regulatory frameworks of sectors take place in one of the forms listed below (Ma, 2018).

- i. Self-regulation: When sector or profession regulates itself through standards and codes of conduct.
- ii. Ex-ante regulation: When the government intervenes before an event occurs to prevent negative externalities.
- iii. Ex-post regulation: When the government intervenes after an event has occurred to correct any negative externalities.

- iv. No regulation: When there are no rules or laws governing a particular industry or profession.

An ex-ante regulatory framework was not suitable for sectors that were evolving exponentially or to regulate low-risk general-purpose technologies (Narayanan & Lee-Makiyama, 2020). Narayanan and Lee-Makiyama (2020) argue that an ex-ante regulation does not promote innovation outputs in an economy. This would impact a sector's ability to remain competitive in the global economy. OTTs were part of the digital technology that leveraged off the improving broadband coverage in South Africa and falling data prices to disrupt the MNOs in the country (National Planning Commission [NPC], 2020).

The current telecommunications environment in South Africa has seen the traditional business models of mobile operators under pressure (PMG, 2016a). The MNOs have realised that they need to adapt their business models and embrace the "new normal" where OTTs are an integral part of the telecommunications landscape in South Africa (Shanapinda, 2019). It has resulted in all operators launching their own platforms (e.g. in the form of mobile money offerings) or collaborating with OTT providers (e.g. flat-rated WhatsApp bundles) (Stork & Esselaar, 2019). Cell-C was the first to embrace MNOs and showed market share increase in the 2015/16 financial years to 23%, but these gains were reversed when Vodacom and MTN followed suite and embraced the OTTs (NPC, 2020). The current environment has an element of self-regulation around the OTT service provisioning with the MNOs having an additional requirement to adhere to their licence obligation (Masemola, 2019).

The current ICASA EUSSC, as amended in 2023, section 9 that focuses on QoS, has 22 parameters that have been predefined for MNO providers to adhere to and are measured according to their adherence to these. This was an example ex ante regulation (ICASA, 2016). The above suggests that there needs to be a move to an ex-post regulatory framework to incorporate OTTs if there is a need to promote innovation, while at the same time ensuring that the role of ICASA to ensure access to quality communications remains (ICASA, 2005; Narayanan &

Lee-Makiyama, 2020). This has led to some researchers proposing the idea that QoS by the ISPs be given based on consumer requirements (Ahmad et al., 2016). Ahmad et al. (2016) argue that there should be an interface between the OTTs and ISPs for greater collaboration and visibility of the QoS requirements of users. The concern with this is that the voice of the consumer will be drowned out as there is a risk that two independent businesses (an MNO and an OTT) will consolidate and have greater control of the environment, limiting regulatory frameworks on OTT. There is the risk of quality being dedicated to those that pay the most during times of high load where the MNO (or ISP) would want to monetise greater use of their network. This would be against regulating to ensure that everyone in South Africa has access to quality communications and ensuring that a balance is maintained between business and consumers (ICASA, 2005a).

2.4.2 Opportunity: Shared responsibility for QoS

There are growing voices globally within the regulation of QoS in the telecommunications sector to move away from the ex-ante to ex post regulatory frameworks (Robinson & Okeleke, 2020). Robinson and Okeleke (2020) advocate for more empowerment of the end-user by moving to a framework that measures more end-to-end experience (QoE, as shown in Figure 5), using feedback from the consumer in the form of survey feedback or covertly utilising probes on the devices of users to obtain experience information from the user. Regulatory regimes in Ghana, Kenya and Europe had moved or were in the process of incorporating end-user feedback in their quality service regulation (ITU, 2017c).

2.4.3 Challenge: OTT dependence on the Internet

The OTT market is one that is widespread, changed dynamically, and is assisted by the increase in smartphone adoption. There are extraordinarily few barriers to entry from a legal perspective outside the in-house network architecture required to operate on the public internet as compared to launching an MNO. Difficulty in incorporating OTT services in the current QoS framework of the EUSSC was due to the lack of uniformity in the delivery of these services. The EUSSC is an ex-

ante type of regulatory framework and was established for traditional modes of communications (Narayanan & Lee-Makiyama, 2020).

OTT services require an internet connection, which is outside the control of the OTT providers. It would be unfair to expect the OTT providers to provide consistent quality while the internet is experiencing network-related issues. This may result in variations in the quality of service, which can impact on the user experience. The regulation of OTT services presents a challenge to their incorporation into the current QoS framework of the EUSC. OTT services are not subject to the same regulatory framework as traditional telecommunications services, which could lead to a lack of consistency in service delivery (Voice call on a traditional MNO vs a WhatsApp call). The regulation of OTT services is complex and requires a coordinated effort between regulators and service providers to ensure a level playing field (Zhang, 2020).

Robinson and Okeleke (2020) propose for current the QoS framework to move to an approach that captures feedback from the user in an ex-post type of regulatory framework which would allow for feedback from the user to gauge the experience provided. The current EUSC charter has a requirement in section 10 for monitoring of the network 24 hours, seven days a week by the various MNO providers (ICASA, 2016). The same information can be incorporated with the information received from the users to investigate where responsibility lies on the provisioning of service. This data must be provided to regulatory bodies to monitor compliance.

2.4.4 Challenge: No uniform definition of OTT

There has been debate around the current definition of ECS providers. Masemola (2019) argues the need for a proper definition of the OTT in the South African regulatory system as there is no universally defined term in our regulatory framework. The same argument was made by BEREC that national regulators need to expand on the definition of an ECS to include OTTs, as they offer similar services as traditional MNOs without the need to obtain a regulatory licence (BEREC, 2016). Doing this would facilitate regulatory frameworks around OTTs.

The ECA of 2005 provided for the establishment of regulatory minimum standards end-user subscriber and service charter under Chapter 12, section 69(3). Section 69(4) gives powers that the charter may set different standards for different services provided (Ellepsis, 2012; ICASA, 2005b). This was part of ICASA's mandate to protect consumers. This gave rise to the End-User Subscriber and Service Charter (EUSSC) which sets out the minimum levels of service to which the ECS and ECNS licensees need to conform. QoS falls in subsection 9 of the charter, which was the focus of this study. Figure 2 highlights that one cannot get the complete end-to-end QoS without including OTTs in the measurements. Currently the EUSSC, as amended in 2023, only caters for the regulation of MNOs and no incorporation of the OTTs in the regulation, displaying one of the key areas highlighted in the research of asymmetry in this area, as was previously highlighted in section 1.2.5.

2.5 Similar works

2.5.1 Regulatory opinion

Bilbil (2018) undertook a qualitative study of OTT services to determine the feasibility of including OTT services in the regulatory framework in Turkey. The study observed the similarities and differences between OTT services and those provided by mobile operators to determine the challenges and opportunities around incorporating OTT service in regulation. The author highlights the lack of a universal definition of OTT services, inadequate regulatory frameworks that are more suited to MNOs, the dependence on the internet to provide services, and the current ex-ante regulatory approach as current challenges. Bilbil (2018) highlights that there are opportunities to create a level playing field and protect consumer rights to quality communication without stifling innovation within the industry. The author concludes by highlighting a multidimensional view for studying OTT focusing on the services they offer, the relationship between OTTs and MNOs and area of regulation. Nandhiasa and Haryadi (2015) used a qualitative approach to investigate global trends around OTT and investigated

regulation from around the world and to apply in the Indonesian market. The authors highlighted.

- A lack of clear definitions of what an OTT is. You cannot regulate what you cannot define.
- Increased competition brought about by OTT providers has eroded profit margins of the traditional MNOs. Suggested the need to incorporate OTT in regulation.
- The need for regulation to protect consumer rights to quality communication.
- The need to be careful as to not stifle innovation within the sector by overregulating the industry.
- The need to get all stakeholders (government, OTT providers, MNOs, and consumer groups) to formulate a balanced regulatory framework that incorporates the OTT.

Jayakar and Park (2014) compared regulatory frameworks from China, South Korea, and the European Union to identify commonalities and differences. The researchers advocate for a balanced regulatory approach that considers both the interests of traditional telecommunication operators and the innovative nature of OTT services. The authors recognise the importance of fostering competition, innovation, and consumer protection while addressing potential challenges associated with OTT services, which include market eroding of traditional business models of the MNOs, new monopolies formed due to the network effect of digital technologies, and a lack of investments in upkeep of infrastructure of the ISP. Stork et al. (2020) used a quantitative approach by surveying telecommunications, regulatory and OTT stakeholders and highlighted that OTT and MNOs should be treated as different because they operate using different *modus operandi*. For example, MNOs need spectrum, do not need an internet connection, and are usually confined to the country in which they are licensed. OTTs currently do not need licensing, have global reach, and do not need spectrum to offer service. The authors highlight the innovation brought about by the OTT service providers which resulted in the reduced costs to communicate

that were brought about by the OTT providers at the detriment of revenues of MNOs. Stork et al. (2020) recommend that a balance in the ecosystem must be achieved in the regulation of OTTs without reversing the obvious benefits that consumers have gained, as one of the aims of regulation is to protect consumers.

The above highlights that there is a general appreciation for the positives that OTTs have brought about in reducing the cost to communicate provided by the OTT providers. Studies show that there is a need to bring the OTTs into the regulatory framework to ensure that consumer rights are still being upheld without stifling the innovation brought about by the OTTs.

2.5.2 Service quality evaluation

Over and above the studies already referred to in section 2.3.2, Langhari et al. (2017) undertook a Mean Opinion Score (MOS) view but focused on the video and picture compression that takes place when these file formats are transferred via social platforms and asked users for an opinion on the perceived quality of the retrieved image and videos. The findings showed that Twitter provided the worst experience as perceived by users due to the greater compression they apply to images and videos. Tumblr and Facebook fared identically. Langharia et al. (2021) used a survey approach where students were asked to rate the quality of service of the voice call being experienced over Google+ Hangout, WeChat, and Facebook. WeChat was found to have the best experience using a broadband internet connection, with the highest user satisfaction level. Hangout was found to be the best when using 3G on the MNO internet for video compared to Facebook and WeChat. The study focused on the Pakistan market and utilised user feedback to rate the perceived call clarity using the MOS method (ex-post). This study highlighted that consumer feedback data can be used to evaluate the performance of individual OTT providers where it would be challenging to evaluate using the traditional ex-ante regulatory frameworks that national regulatory bodies use. From the above it was concluded that the ServQaul model would be beneficial as a basis for investigating QoS for our context.

2.5.3 Implications of Using Consumer Feedback

Using data from consumers would result in a more robust regulatory environment giving regulators almost real time consumer feedback on the state of service being provided. The Organisation for Economic Co-operation and Development (OECD) (2022) highlight that the increased use of data in feedback would allow for continuous improvement in regulation. This would enable ICASA to identify the real state of quality in a particular service and ensure relevant regulatory measures are taken. Cases where poor service offerings are identified could be used to update standards in the EUSSC and Consumer Protection Acts around OTT services once legislated. There would be responsibility on regulators and OTT providers to ensure that consumer data is obtained with full consent of consumers. Relevant laws around protection of consumer information needs to be tightened to include OTT such as the Protection of Personal Information Act (POPIA).

2.6 Analytical framework

This section discusses the theoretical framework and the analytical framework.

2.6.1 Theoretical Framework

The theoretical framework of the study was underpinned by the Theory of Service Quality (ServQual) and Theory of Public Interest.

2.6.1.1 Theory of Service Quality

The theory of service quality (ServQual) was a tool that measured the gap between what consumers expected to receive from a particular service offering versus the actual service that was received as perceived by the customer (Parasuraman et al., 1988). Parasuraman et al. (1988) were able to define service quality using five dimensions, namely:

- Tangibles: Physical facilities, equipment, and physical appearance of employees.

- Reliability: Ability to perform the promised service dependably and accurately.
- Responsiveness: Willingness to assist customers and provide prompt assistance.
- Assurance: Knowledge and courtesy of employees.
- Empathy: Caring, individualised attention the firm provides its customers.

The dimensions of ServQual can change depending on the industry in question by determining the important dimensions (Kumar, 2018). Kumar (2018) was able to show justification for adding two additional dimensions that were required for evaluation of the telecommunications sector. This highlights the adaptability of this model in determining quality across a wide spectrum of services. The ServQual model was later adapted to measure the quality of service provided by electronic platforms (Zeithaml et al., 2000). This was done to address the requirements for service quality outside traditional methods of delivery where customers use the internet as a medium. Zeithaml et al. (2000) were able to identify 11x dimensions that can be used to evaluate e-ServQual, namely:

- Reliability: Proper technical operation of the site.
- Responsiveness: Quick response and the ability to get help if there is a problem or question.
- Access: Ability to get on the site quickly and to reach the company when needed.
- Flexibility: Choice of ways to use.
- Ease of navigation: Easy to navigate platform.
- Efficiency: Uncluttered user interface requiring uncomplicated actions to get results.
- Assurance/trust: Confidence the customer feels in dealing with the site and is due to the reputation of the site and the products or services it sells, as well as clear and truthful information presented.
- Security/privacy: Personal information is safe and protected.
- Price knowledge: Fair and open pricing.

- Site aesthetics: Appearance of the site.
- Customisation/personalisation: Customisation to suit individual preferences.

This model has been applied to e-retail services and online banking and a modified version for the OTT service delivery would not require too much modification as they are services that require the internet for delivery. The researcher gravitated toward the ServQual and e-ServQual models because they offer perspectives between what the consumer expectation is versus the actual received service quality. Other models, such as the Service Performance (ServPerf) models only measure the received service quality along several dimension (Rasyida et al., 2016).

The Service Performance model (ServPerf) model is an approach to determining service quality that measures current performance of the service. No focus is placed on the expectation of the customer to measure the gap with the current performance (Cronin & Taylor, 1992). The model measures service quality along the dimensions Reliability, Responsiveness, Assurance, Empathy and Tangibles. The model is attractive to researchers due to its simplicity where focus is on the perceived quality of service that is being offered by the service provider and measures the core dimensions of interest in the provisioning of service. The drawback with the model was the neglect of expected service quality, which was of particular interest for the researcher to provide an input into what customers expect from existing OTT service providers. Like the ServQual model, it suffers from susceptibility to biases of the users (Haqiqat, 2017).

Expectancy-Disconfirmation Model (EDM) is an approach that states that user satisfaction is influenced by the comparison between prior expectations and perceived performance the model is like service quality but does not have fixed dimensions (Oliver, 1980). The advantages of EDM are that it is simple and can be used to identify gaps in service quality. The disadvantages are that, like the ServQual model, it is susceptible to biases (Yüksel & Yüksel, 2001). It also has not been tested in an environment where service is delivered in an online

environment. ServiceQual has been tested in this environment(e-ServQual), hence the gravitation to this model.

The Kano Model classifies customer preferences into different categories based on their impact on customer delight. It proposes that product features can be classified into five categories (Kano, 1984). These are:

- Basic: These are features that must be there like mirrors on a car.
- Excitement: Result in an unequal uptick delight of customer as you continue to add invest in these features. Customers will not miss these features if they aren't included in your products. Including them will however improve the overall quality of your product.
- Performance: These features result in linear increase product satisfaction.
- Indifferent: These are features that customers don't care about.
- Dissatisfaction: Features that will cause customers grief.

The Kano Model works well for product development environment where teams need to identify essential features to add in their products. It primarily focusses on product features and not the overall service quality of a product. It might not be able to accurately measure the multidimensional nature of service provisioning in OTT (ProductPlan, 2024). Rotar et al. (2017) were able to show how the Kano model could be used to identify potential areas of improvement in products offered by an organisation. The study highlighted how the model works well in environments where product differentiation is the main goal. This is important in business where organisations are competing to gain an advantage with the customer, which is different from our application of determining the current state of service quality in OTT to help in determining regulatory policy and protect consumers.

Service Quality has been tested in several environments including online service delivery(e-ServQual). It is well positioned to be used to measure the multidimensional nature of service provisioning in OTT services. Models such as EDM, Kano and ServPerf have not been tested in online environments and it

would be better to utilise a model that would closely allow the researcher to test OTT services. It was primarily for this reason that e-ServQual was chosen.

2.6.1.2 Theory of Public Interest Regulation

John Stuart Mill was one of the first advocates that regulation should be done in the interest of the public (Stanford Encyclopedia of Philosophy, 2022). He argued that the government should intervene in the economy to ensure that markets were competitive and that consumers were protected from monopolies. The theory relies on two arguments (Shleifer, 2005).

- Regulation seeks to protect the public at large. If markets are left to self-regulate, markets often fail due to monopolies forming or external factors.
- Proposes that regulation is a tool that government can use to correct these market failures.

The theory can be used to evaluate proposed policy along economic, cultural, environmental, religious, and technological lines to determine the best policy direction in the interest of the public. The theory is an evolving research field with the fundamental objective to evaluate proposed dimensions. Part of ICASA's mandate is to provide quality communications for all South Africans, regardless of background (ICASA, 2005a). As a result, authorities are forced to intervene in markets when the activities of OTT applications have a negative impact on the government's aims of improving the social welfare of its population. Masemola (2019) opines that regulatory establishments that had been captured by the business sector or powerful individuals, such as politicians, primarily pursue their own objectives instead of societal interests. This theory is important because an important mandate of regulators is to be independent and to be the voice of the voiceless (ICASA, 2005b). It has been discussed that OTTs have disrupted the existing MNOs' business models and reduced the cost to communicate for the public at large. It is thus proposed that the regulatory position around them needs to be investigated around the following dimensions.

- Consumer Welfare.

- Market Competition.
- Sustainability.
- Equity.
- Innovation.

An additional dimension, called Current Regulation, was added to discuss the current existing regulation around the sector to investigate the impact on consumers in our study.

Regulatory Capture, Principal-Agent and Public Choice Theory were other theories that were considered. Public Choice Theory suggests that individuals in authority, such as politicians and bureaucrats, act to fulfil self-interest when making decisions regarding public policy and regulation. It posits that regulatory actions are influenced by the preferences and incentives of those in power, rather than the public interest (Buchanan & Tollison, 1984). Regulatory Capture Theory contends that regulatory agencies, which are intended to regulate industries in the public interest, can become captured by the industries they are supposed to oversee. Regulations may therefore serve the interests of the regulated industries rather than the broader public interest (Stigler, 1971). This capture can occur through various means, such as lobbying, revolving doors between regulatory agencies and industry, and the influence of industry stakeholders on regulatory decision-making. Principal-Agent Theory examines relationship where one party, the principal, delegates authority or decision-making power to another party, the agent, to act on their behalf. In the context of regulation, this theory is often used to analyse the relationship between governments, who are the principals, and regulatory agencies, the agents. It highlights issues such as information asymmetry, moral hazard, and agency costs, which can lead to regulatory actions that may not always align with the public interest (Ross, 1973).

The researcher leaned more to Theory of Public Interest Regulation due to its balanced evaluation of key pillars while keeping the consumer at its core. In South Africa, proposed changes to laws must be tabled before parliament and undergo public participation before they are adopted into law (Parliament, 2024). There is

no obligation from parliamentarians to adopt feedback from the public participation process and therefore the biggest voice in law making in the country lies with the politicians as parliament has the final say on whether a proposed bill becomes enacted into law. An example would be the process undertaken to update the EUSSC whereby new quality of service standards were obtained. Participation was skewed in favour of business and politicians where only three members of the public participated in the discussions (ICASA, 2022c). 84 percent of countries in Europe and Central Asia, and 76 percent in East Asia and the Pacific solicit feedback from the groups that will be tasked with complying with the new regulations (Worldbank, 2016). Approaches in Ghana, Kenya and Europe had moved or were in the process of incorporating end-user feedback in their quality service regulation. If a similar approach was followed by South Africa, it would assist in amplifying the voice of the customer on matters around quality (ITU, 2017c).

2.6.2 Conceptual framework

From the literature covered, the researcher proposed that the original 11 dimensions as given by Zeithaml et al. (2000) on e-ServQual could be adjusted for the case of OTT providers. This is summarised in Table 4. The researcher combined the dimensions responsiveness with access for an OTT as both address the ability to get hold of the OTT service provider. The original dimensions were developed for the case of online shopping where the user would need access to the online seller. Similar work was done around privacy and security, enjoyment, and ease of use to group dimensions that address to similar subjects and to make it easier for analyses and investigation purposes. Due to the online nature of OTT, the tangibles dimension does not feature in the model. The researcher developed the following hypotheses:

H1: Higher levels of reliability will result in higher levels of OTT service quality.

H2: Higher levels of responsiveness will result in higher levels of OTT service quality.

H3: Higher levels of ease of use will result in higher levels of OTT service quality.

H4: Higher levels of enjoyment will result in higher levels of OTT service quality.

H5: Higher levels of privacy and security will result in higher levels of OTT service quality.

H6: Higher levels of price knowledge will result in higher levels of OTT service quality.

Table 4: E-Service quality dimensions

Revised Dimension	Description	Original Dimension	Measure
Reliability	Measuring the in-platform experience of the actual services being used	Reliability	Clarity of Calls Service Availability Delay in Text transmission Service Accessibility when required
Responsiveness	Ability to get assistance from OTT provider. Issues around OTT platform support. Includes update on user queries Inability to transact, platform enquiries	Responsiveness Access	Query resolution time Availability to log query resolution rate
Ease of Use	Measures the platform environment experience. Are consumers able to find features with minimum ease	Flexibility Ease of navigation Efficiency	No limitations Features found with minimum strokes
Enjoyment	Look and feel of the user interface. Ability to customise	Customisation/personalisation Site aesthetics	Ability to change appearance. Status updates Ability to change appearance.

Privacy and Security	Deals with issues around protection of personal information and minimising risk of cyber threats	Assurance/trust Security/privacy	Data protection Prior consent to use data. Encryption of services Authentication
Price knowledge	Open pricing policy available. Cost of consumer data	Price knowledge	Visible pricing Openness with user data worth

Source: Zeithaml et al. (2000)

Popular OTTs, like WhatsApp and Microsoft Teams, prompt users at the end of calls about the user experience. This would be an obvious measure to use to gauge the Responsiveness dimension. The survey could be extended to include questions around experience and general delight (Ease of Use, Price Knowledge and Enjoyment) without increasing the survey to over five questions and ensuring that users do not suffer from survey fatigue. An alternative to measure reliability would be to allow regulators to get access to OTT traffic where actual service disruptions are detected and can be used to verify the customer feedback surveys. Privacy and Security would require regular reporting on the occurrence of breaches in cybersecurity experienced by OTT providers and submitted as part of a quarterly report with mitigations implemented to avoid future occurrences.

2.6.2.1 Challenges in Hypothesis Testing

Adequate Sample

A sample in research is a subset of a population which is studied to draw conclusion of the population (Pannell, 2023). The sample in this study needed to cater for the diversity in the South African OTT user ecosystem to be able to draw meaningful conclusions about the population at large. The initial challenge in the study was ensuring that enough samples were gathered to be statistically significant. The sample, furthermore, needed to represent the right racial and gender dynamics to allow for meaningful conclusions to be drawn about the greater population. Discussion on this was done in section 3.4 of the research.

Subjectivity in Responses

Testing the relationship between the identified dimensions and service is subjective in nature. It can be difficult to quantify and measure consistently across different individuals (Griffin et al., 1994). Additionally, the user response to questions posed can be influenced by various external factors that may not be directly controlled or accounted for in the study, such as mood or personal experiences (Parasuraman et al., 1988). The researcher ensured that the questionnaire was tested before administering to wider audience and that an adequate sample size was used limit the effect of biases. These were discussed further in Chapter 3 of this document.

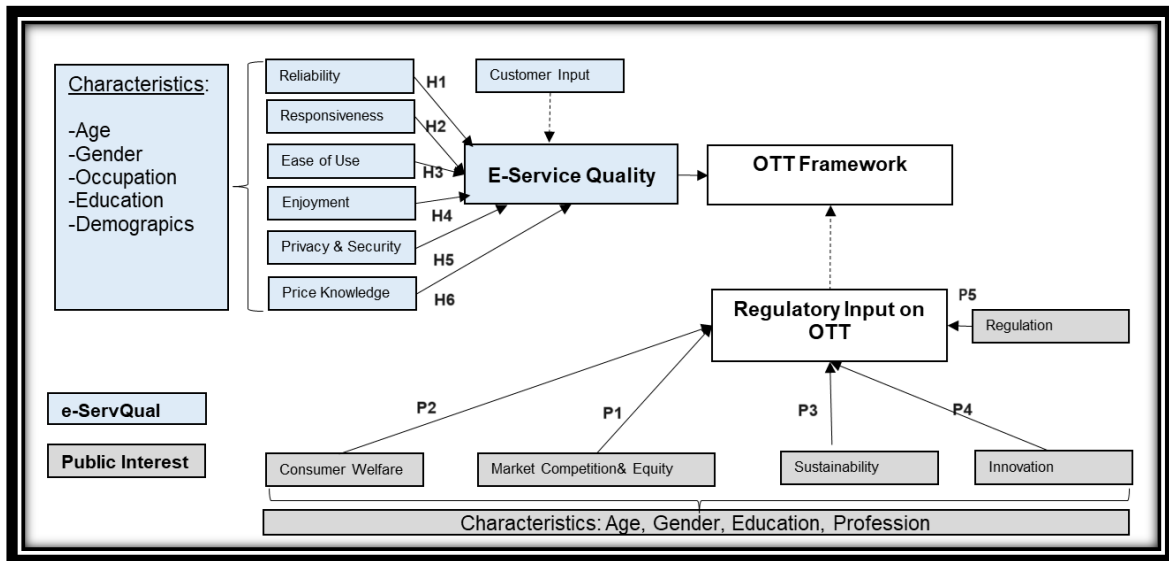
Type I and Type II Errors in Decision Making

Type I errors occur when a researcher incorrectly rejects the null hypothesis that is true (Banerjee et al., 2009). It is the mistake of concluding that there is an effect or a difference when there is none. A Type II error occurs when a researcher fails to reject a null hypothesis that is false (Banerjee et al., 2009). It is the mistake of not detecting an effect or difference when one exists. Using appropriate and diverse sample sizes, correct significance level and performing adequate power analyses (beta analyses) in the study (Bhandari, 2023) These were further explored in Chapter 4 when the results of the qualitative analyses were analysed.

Conceptual Framework

The conceptual framework highlights the approach that was taken in answering the research questions and is summarised in Figure 3.

Figure 3: Conceptual framework utilising e-ServQual and Public Interest Regulation Theory



A quantitative study was performed on consumers to determine the current perception of service quality in the OTT environment to evaluate the level of service quality according to consumers. This partly addressed Research Questions (RQ) 1 and 2. The regulatory aspects of RQ 1, RQ 3 and RQ 4 were covered in an interview style survey of regulatory experts to get a deep understanding of the importance of incorporating OTT in the current regulatory framework along several dimensions, namely sustainability, consumer welfare, sustainability, equity, innovation, and current regulation. The following propositions were used to explore the indicators.

Proposition (P1): Inclusion of OTT services within the existing QoS framework may lead to increased competition and equality among OTT service providers and traditional MNOs, potentially resulting in a more level playing field for all market players.

Proposition (P2): Implementing efficient and cost-effective regulatory mechanisms for monitoring and enforcing QoS standards in OTT services can enhance consumer benefits by promoting affordability, accessibility, and transparency in service offerings.

Proposition (P3): Developing symmetric regulatory mechanisms for monitoring and enforcing QoS standards in OTT services can improve the long-term sustainability of MNOs' traditional business.

Proposition (P4): Reducing regulatory burden of OTTs and MNOs can improve the innovation capability of MNOs and OTTs.

Proposition (P5): Strengthening regulatory oversight and enforcement mechanisms to address non-compliance with QoS standards by OTT service providers and MNOs is essential for maintaining consumer trust and confidence in the regulatory framework.

The interview questionnaire and customer survey are discussed in Chapter 3 of the study. These are expanded on in the subsequent chapters but provide a view of how the researcher intended to solve the research problems by linking them to the hypotheses, and the research method employed to answer the questions.

2.7 Conclusion

This chapter explored various literature from local and global scholars on best approaches to answer the four research questions from Chapter 1.

- i. What are the fundamental quality indicators related to quality-of-service of OTT providers as perceived by regulators and consumers?
- ii. What is the primary quality indicator that consumers consider as the most significant in relation to the quality of Over-the-Top (OTT) services?
- iii. What are the challenges and opportunities of regulating Quality of Service in OTT?
- iv. What are the regulatory implications of incorporating Over-the-Top (OTT) services within the current Quality of Service (QoS) framework of the End User Subscriber Service Charter?

There was limited research in South Africa on the OTT QoS, and the researcher had to supplement the theory with studies done by global scholars. This aided in

the formulation of a conceptual framework that assisted in formulating a framework to incorporate OTTs in QoS regulation for the scenario where the MNOs and OTTs services. The research adopted a mixed methods approach where the researcher investigated the service quality perception of OTTs from a customer perspective using the ServQual model and a regulatory view using the theory of public interest.

CHAPTER 3 – RESEARCH METHODOLOGY

The role of a telecommunications regulator is to create and sustain a telecommunications environment that is conducive to provide services (Intvarn et al., 2000). One of the concerns raised around OTT has centred on the disparity in QoS regulation between OTT providers and MNOs. Parliament and ICASA had not yet enshrined regulation into the South African EUSSC around OTT (Shanapinda, 2019). This study intended to find out how South African customers' overall service experiences were impacted by this disparity in QoS and how the current regulatory framework could be amended to incorporate OTT into the QoS regulatory framework. Using the concepts of e-service quality (e-ServQual) and regulation in the public interest, this study examined the dimensions of both the frameworks that were pertinent to the QoS asymmetry between OTT providers and MNOs from a regulatory and customer perspective, and its impact on consumer satisfaction. This section on research methodology provides an overview of the research design, data collection methods, sampling strategy, and data analysis techniques that were used to achieve the research objectives and contribute to the existing body of knowledge on the subject. The research methodology was crucial to demonstrate the steps that were undertaken to solve a problem (Nayak, 2018).

3.1 Research approach

3.1.1 Chosen approach

Quantitative methods revolve around the collection, analysis, interpretation, and documentation of data. One feature of quantitative research is that the research results can be represented using numbers. The quantitative method is concerned with establishing the effect that one event has on another or causality (Creswell, 2009). The researcher needed to use specific statistical methods to identify a relevant population and sample size. This is discussed further in section 3.4.

A qualitative research approach is concerned with purposeful sampling, utilising of open-ended data and the individual interpretation of the findings that are all

components of qualitative procedures (Creswell, 2009). Through interviews and observation, qualitative research attempts to comprehend a phenomenon in its natural environment. Qualitative methods seek to answer the “what”, “how”, and “why” of phenomena, which is different to what quantitative approaches seek to answer, such as “how many” or “how much” (Berk et al., 2015). The aim in this study was to answer the following research questions (RQs):

RQ1: What are the fundamental quality indicators related to quality-of-service of OTT providers as perceived by regulators and consumers?

RQ2: What is the primary quality indicator that consumers consider as the most significant in relation to the quality of Over-the-Top (OTT) services?

RQ3: What are the challenges and opportunities of regulating Quality of Service in OTT?

RQ4: What are the regulatory implications of incorporating Over-the-Top (OTT) services within the current Quality of Service (QoS) framework of the End User Subscriber Service Charter?

RQ1 has a regulatory and consumer component. The researcher's aim was to determine how much each of the e-ServQual parameters contributed to the overall service quality that a consumer receives by comparing the Expected (E) vs Received (R) service quality. RQ2 goes further to determine which one of the service quality parameters consumers consider as the most important. These two questions were explored using a 5-point Likert scale in a survey type environment. This required a quantitative research approach. RQ1, RQ3 and RQ4 revolve around the regulatory aspect where the researcher tried to get a deeper understanding of how OTTs could be incorporated into the current QoS framework and understand what quality looked like, using their existing knowledge and applying it to an OTT. This required a qualitative approach. A mixed-methods approach was proposed for this study, combining the strengths of both the quantitative and qualitative methods. By integrating quantitative data on e-service quality and qualitative insights from the theory of public regulation,

a comprehensive understanding of the QoS as perceived by consumers could be combined with the insights from the themes that emanated from the regulatory interviews. This helped to provide input into correcting the asymmetry that currently exists in regulation between OTTs and MNOs.

3.1.2 *Why mixed methods*

The three main stakeholders that are primarily affected by the proposed regulation of OTT services are the government (and by extension regulatory bodies), business, and the consumers. It was established that regulation is always better when society participates in developing them (OECD, 2021). Citizens and business can provide valuable insights based on their day-to-day experiences. It makes sense that including all stakeholders in the regulatory process would promote democratic processes that form the bedrock of the South African society and promote trust in the government. ICASA would normally propose amendments and new regulations around telecommunications and invite comments from society. An example would be where the regulator proposed amendments to the End-user and Subscriber Service Charter Regulations of 2016. A total of 12 responses were received where all the MNOs in Vodacom, Cell C, MTN and Telkom submitted representation. Only three members of the public submitted representation (ICASA, 2022b). Using mixed-methods would provide a greater voice of the consumer on what they consider as important and creating a balance with the voice of business and represent major players in the South African telecommunications ecosystem.

3.1.3 *Type of mixed methods proposed*

Convergent Mixed Methods is a form of mixed-methods design whereby the results of the quantitative survey and qualitative interview converge to give a comprehensive analysis of the problem of interest (Creswell & Creswell, 2009). The researcher collected both the quantitative and qualitative data at the same time. Results from both sets of data were integrated into the interpretation of the overall results. Contradicting findings were further analysed to determine causes

of the divergence or misalignment. The advantages of utilising convergent mixed methods were summarised below.

- Complete view and understanding of what consumers and business understand as important quality indicators.
- Compare and cross-reference the findings from the different methods. Differences can be investigated further to understand the underlying differences. It would strengthen arguments where the data from both sets of data agree on what the important quality indicators are.
- Comprehensive recommendations can be derived from both the views of the major stakeholders and provide a sound footing for future studies.
- A convergent approach allowed for quicker results when compared to exploratory sequential mixed methods as the quantitative and qualitative results are obtained at the same time. This was an unintended advantage of this method as the research report is due within a year of commencement.

3.1.4 Paradigm of Study

A research paradigm can be defined as the beliefs and assumptions that provide the structure for the study in question. These can be characteristics of your discipline or personal beliefs (Ulz, 2023). The three most common research paradigms are listed below.

- Positivism: Philosophy that relies on observation and reason for the purpose of understanding human behaviour or that sees human beings as phenomenon which can be studied scientifically (UKZN, 2024).
- Interpretivism: This means that a concerted effort is made to understand the viewpoint of the research observer or researcher (Guba & Lincoln, 1989).
- Pragmatism: Pragmatism is characterized by its eclectic approach, meaning it doesn't strictly adhere to a single set of methods or principles. Instead, it incorporates elements from various paradigms (e.g., positivism,

interpretivism) as needed to address specific research questions (UKZN, 2024). The study contained both quantitative and qualitative elements and therefore would fall under the pragmatism paradigm.

3.2 Research design

This section examines how a mix of deductive and inductive research methods was used to gain an understanding of a proposed research topic. Inductive reasoning aids in providing insights into a particular case that has the potential to contribute to the development of theories and models. Deductive reasoning assists in testing existing theories or hypotheses. The merits of these approaches are investigated next.

3.2.1 Deductive approach

A deductive approach begins from theory and develops hypotheses from this theory. The aim was to design a research strategy that would test these hypotheses (Wilson, 2010). Our proposed theory to explore service quality provided by OTT was the e-ServQual model. Six (6) hypotheses were developed, and the approach is summarised in Table 5.

Table 5: Deductive approach for the e-ServQual Model

Research Question	Theory	Dimension	Hypothesis	Test Tool
RQ1 and RQ2	e-Service Quality	Reliability	H1	Survey
		Responsiveness	H2	
		Ease of Use	H3	
		Enjoyment	H4	
		Privacy & Security	H5	
		Price Knowledge	H6	

3.2.2 Inductive approach

An inductive approach is usually associated with qualitative analyses (Creswell, 2009). Inductive research explores a detailed view of the area of interest and seeks patterns from this exploratory view. It was from this, that theories emerged. In our qualitative view of the problem, the researcher explored several dimensions that affect the telecommunications market. Our approach was in the form of interviews of professionals in the regulatory environment. From their responses the researcher looked for patterns and themes that provided input into a framework for service quality (refer to Figure 3 in Chapter 2).

3.2.3 Research strategy

The research had elements of exploratory, relational, and descriptive research approaches. An exploratory design was used to better understand the topic or phenomenon under investigation (Sacred Heart University [SHU], 2020). This phase typically involves methods, such as interviews, observations, or focus groups, to explore different perspectives and identify patterns. The researcher investigated the impact of dimensions that were proposed and identified fundamental quality indicators related to the quality-of-service of OTT providers, the primary quality indicators considered by consumers, challenges, and opportunities of regulating QoS in OTT, and the regulatory implications of incorporating OTT services within the current QoS framework. Insights were collected from consumers to allow for the discovery of other important aspects outside of our proposed dimensions.

Correlational research design was used to investigate relationships between variables (Bhandari, 2023). The researcher studied the relationships between quality indicators, Reliability, Responsiveness, Ease of Use, Enjoyment, Transparency on Price and Privacy and Security, and the relationship they have on overall service quality in OTT services. By collecting data from consumers, the study identified and explored the relationships between these variables.

Descriptive research aims to describe a population accurately and systematically. It was useful in answering *what*, *where*, *when* and *how* questions, but not *why* questions. The study aimed to describe fundamental quality indicators related to OTT services as perceived by regulators and consumers, the primary quality indicator considered by consumers (McCombes, 2022). Further to this, the researcher wanted to find out how what impact the study would have on the existing QoS framework if OTTs were incorporated.

3.2.4 Units of analysis

The units of analysis were general consumers who use OTT services. Our primary focus was the public who use OTT services. For the regulatory analyses, professionals from government and regulatory agencies, telecommunications sector and OTT providers that compete with MNOs were targeted. The researcher did not disclose names of organisations to ensure anonymity.

3.3 Data collection methods

3.3.1 Quantitative aspect

The quantitative data collection was conducted through an online survey. The survey was set up to measure the responses of consumers of OTT platforms with reasonable knowledge of technology. Surveys are effective ways of collecting data because:

- i. Online Surveys are cheap ways to collect data.
- ii. They can reach vast numbers of people which was crucial for this study.
- iii. They can employ statistical methods which can be used to identify patterns and relationships between variables.
- iv. They provide a structured way for researchers to measure opinions, feelings, and beliefs (Ponto, 2015).

The survey employed a five-point Likert scale to quantify the consumer responses. The five-point Likert scale is easy to use and understand, offers enough variability in responses to allow for statistical analyses, has credibility in

academia and has enough steps to reduce bias in response (SurveyMonkey, 2024). The participants of the survey were asked for their opinion on various statements on a scale ranging from 1 to 5, where 1 and 2 represented disagreement with the statement being proposed, and 4 and 5 meant you agree. The difference was in the intensity of the agreement or disagreement. A rating of 3 meant that you are on the fence and are neutral. This is represented in Table 6.

Table 6: Likert scale options

Rating (1-5)				
1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)

The aim of the survey was to investigate the primary quality indicators that users perceive as the most important. Our audience was primarily any consumer who used OTT platforms that offer services that compete with MNOs. The surveys were self-administered which made it a cost-effective method for the researcher.

3.3.2 Qualitative aspect

For the qualitative phase, interviews were conducted with eight regulatory professionals from the government and regulatory institutions, telecommunications sector, and OTTs. The interviews were conducted according to the preference of the interviewee, whether online, in person or via a questionnaire. The interviews explored the participants' experiences, opinions, and perceptions related to the asymmetry in QoS regulation and its impact on service experience. The interviews provided in-depth insights and allowed the exploration of regulation in the public interest along the set dimensions to develop proposed policy around OTT QoS regulations.

3.4 Population and sample

Population refers to the entire group of individuals that the researcher aimed to research (Banerjee & Chaudhury, 2010). It was the larger group about which the

study aimed to generalise. The target population was a smaller subset of the target population which the researcher has identified due to certain traits that they possess. The sample was a subset of the target population on which the researcher decided to administer the research. The sample population should be a representative representation of the target population to enable the results to be applied to the wider population.

3.4.1 Quantitative study: e-Service Quality

The sample for this survey was a subset of all the people who use OTT services that would be large enough to ensure that it delivered results that were statistically significant. The target population for this study was the South African consumers who utilise any Group 1 OTT services. South Africa has a population of around 60 million people (Stats SA, 2022). WhatsApp is the biggest OTT in the Group 1 basket of OTTs, with 23 million users in South Africa (Degenhard, 2023). This was our target population. Our sample size was determined to be at least 385 to get error margin of 5%, as is depicted in Table 7.

Table 7: Sample size calculation

Target Population	Sample size	Margin of error	Confidence level
23 million	385	5%	95

All attempts were made to obtain a sample that reflects the demographics of the country in terms of gender, population dynamics and racial aspects for quality assurance purposes and for generalisation. Due to the non-probabilistic approach undertaken, the researcher was already on the backfoot regarding this aspect. A non-probabilistic sampling approach was selected for the quantitative section. This was an approach where individuals were randomly selected and there was no guarantee of participation for all individuals (McCombes, 2019). This approach was popular due to the ease of use and the cost effectiveness. Our approach was to target friends, family, and colleagues. This was a form of convenience sampling. Snowballing is a technique where participants were

recruited via others (McCombes, 2019). Social media was one such technique. It was decided to employ the use of social media platform X, with the help of an influencer friend, as there were 134 participants by 14 November 2023. There were 588 responses at the end of November 2023. This helped to increase the numbers well above the 385-sample target. Figure 6 shows a snapshot of the social media post that was used. The post had 8,900 views and 26 reposts.

Figure 4: Snapshot of X post for snowball sampling



Source: X (formerly Twitter)

3.4.2 Qualitative study: Public Regulation Theory

Our target sample was selected using purposive non-probabilistic sampling. In this section, colleagues and personal LinkedIn networks were used to identify participants by means of convenience sampling. Our aim was to gain substantial amounts of insights from the interviews that were going to be conducted. It was therefore recommended that all participants have at least a specialist level of expertise in the regulatory sector (5 years work experience). The researcher therefore identified eight interview participants comprising a mix of regulatory

(three staff members) and telecommunications regulatory experts (five staff members). The final details of the respondents are listed in Table 8. Details that could identify the participants were removed as was agreed in the ethics application.

Table 8: Respondents who agreed to partake in the study

Respondent	Gender	Age	Industry	Title	Years Experience
R1	Female	33	Regulatory	Manager	9
R2	Female	35	Regulatory	Engineer	10
R3	Male	41	Regulatory	Engineer	15
R4	Male	43	Telecommunications	Senior Manager	21
R5	Male	40	Telecommunications	Manager	17
R6	Female	35	Telecommunications	Manager	8
R7	Male	39	Telecommunications	Manager	16
R8	Female	40	Telecommunications	Manager	18

R1, R2 and R3 all work at the same regulatory agency in South Africa. R4 and R6 work for the same MNO in South Africa in Technical and Commercial regulations. R5 works for an MNO that operates across the continent, including South Africa. R7 and R8 work in the technical division of an MNO in South Africa.

The researcher had tried to incorporate individuals from the OTT environment but struggled to get favourable responses from possible participants to partake in the study due to fear of compromising their existing employers. The initial target was to interview 13 experts. Table 9 summarises the respondents who were targeted to partake in the study but refused. D1 and D2 specifically declined because the entire team could not participate at a visit to their offices, which removed a major source of information around OTT. This could have added much needed diversity to our study. Kingstone et al. (2017) highlight that it is difficult to determine a sample size in advance for exploratory, inductive research. Sim et al. (2018) highlight that determining sample size at the beginning of a study may be practical and nice to have but argue that the decision on whether an adequate sample size was achieved rests with the data. There must be enough data, such that the aims of the study are met, and meaningful conclusions can be made.

Table 9: Declined responses to partake in the qualitative survey

Respondent	Gender	Age	Industry	Title	Years Experience	Approach	Reason for Decline
D1	M	Unknown	OTT	Senior Manager	15	E-mail, Visit to Office	Fear of job compromise
D2	M	Unknown	OTT	Head Regulatory	9	E-mail, Visit to Office	Fear of job compromise
D3	M	43	Telecommunication	Senior Engineer	19	E-mail	Subject matter outside expertise
D4	M	39	Telecommunication	Senior Manager	18	E-mail	NO response
D5	M	Unknown	Telecommunication	Group Executive	Unknown	E-mail	No response
D6	M	Unknown	Regulatory	Board Member	25	LinkedIn	Too busy, asked for time

Note: M= Male

3.5 The research instruments

The research instrument consisted of a structured online survey questionnaire for the quantitative phase. There was an option to complete a physical copy should anyone request to do so. No one requested this. The questionnaire used a five-point Likert scale to measure the e-service quality dimensions. The proposed survey is highlighted in Table 10. The questionnaire followed the following sequence:

- Introduction and explanation of the purpose of the questionnaire.
- Guidelines to answer survey.
- Ask to populate age, gender, race. Respondents were allowed to decline answering any of the biographic questions.
- Survey as per Table 10 measuring the dimensions of e-ServQual.

Table 10: Proposed E-Service quality survey

Theory	Dimension	Hypothesis	Survey Question
E-Service Quality	Reliability	H1	The OTT application I use rarely experiences downtime. Downtime refers to periods where consumers are unable to transact on the platform.
			The OTT application I use consistently delivers messages and calls without disruptions.
			The OTT application I use is dependable in terms of its performance.
	Responsiveness	H2	The OTT application I use promptly responds to queries via online platforms
			The customer support of the OTT application I use is quick in addressing my queries or concerns.
			The OTT application I use provides timely updates and notifications on downtime
			The OTT application I use is easily accessible on multiple devices (e.g., smartphone, tablet, computer).
			The OTT application I use allows me to connect with other users without any barriers
	Ease of Use	H3	The OTT application I use offers a wide range of features to suit my communication needs.
			I can customize the settings of the OTT application according to my preferences.
			The OTT application I use provides options for adjusting privacy and notification settings.
			The OTT application I use allows me to send and receive messages and calls without delays.
			The loading time of the OTT application is minimal, ensuring smooth usage.
	Enjoyment	H4	The OTT application efficiently manages my contacts and conversation
			The design and visual appeal of the OTT application are pleasing to the eye.
			The OTT application uses graphics and colors that enhance the user experience.
			The overall look and feel of the OTT application are visually attractive.
			The OTT application I use offers options for personalizing my profile and settings.
			I can customize the appearance and theme of the OTT application.
			The OTT application provides features that cater to my individual preferences.
	Privacy&Security	H5	It is easy for me to navigate through different sections and features of the OTT application.
			I can quickly find the necessary functions and options within the OTT application.
			The overall layout and organization of the OTT application's interface are user-friendly
			The OTT application I use implements strong security measures to safeguard my data.
	Price Knowledge	H6	I have control over my privacy settings within the OTT application.
			The OTT application provides options for encryption and secure communication.
			I feel confident about the security and privacy of my data when using the OTT application.
			I trust the OTT application ensures the confidentiality of my messages and calls.
	Customer input		I trust the OTT application to protect my personal information from unauthorized access
			The pricing structure and plans of the OTT application are transparent and easy to understand.
			I am aware of the costs associated with using the OTT application.
			The OTT application provides clear information about any additional charges or fees
			Is there any other requirement that you consider important? How do you rate this?

Source: Adapted from Zeithaml et al. (2005)

The full survey can be found in Appendix B. For the qualitative phase, an interview guide was developed to facilitate the interviews, allowing for open-ended exploration of participants' viewpoints and experiences around various market conditions related to the presence of OTT in the telecommunications industry and ended with the theory of regulation in the public interest. The interview could be administered physically, virtually on a platform of the interviewee's choice or in written form. The questionnaire followed the sequence below:

- Introduction and explanation of the purpose of the questionnaire.
- Ask to populate age, gender, job title. Participants were allowed to decline answering any of the personal questions.
- Guidelines to answer interview.

- Interview as per Table 11 to develop themes. Full interview can be found in Appendix C.

Table 11: Interview questionnaire to explore regulation in the public interest

Dimension	Research Question
Consumer Welfare	1. How do you perceive the quality of service provided by Over-the-Top (OTT) Providers? 2. In your opinion, how does the asymmetry in Quality of Service (QoS) regulation impact your overall service experience as a consumer on OTT? 3. What are the specific aspects of consumer welfare that you consider important in the context of OTT services?
Market Competition	1. How do you perceive the level of competition between OTT Providers and Mobile Network Operators in the market? 2. Do you believe that the asymmetry in QoS regulation affects the competitive landscape between these entities? If so, how? 3. Are there any specific market dynamics or practices that you believe should be regulated to ensure fair competition?
Sustainability	1. From your perspective, how does the asymmetry in QoS regulation impact the long-term sustainability of both OTT Providers and Mobile Network Operators? 2. Are there any potential risks or challenges associated with the current regulatory asymmetry that may affect the sustainability of these entities? 3. What measures or regulations do you believe would promote sustainable practices in the industry?
Equity	1. In your view, does the asymmetry in QoS regulation contribute to any disparities or inequities between OTT Providers and Mobile Network Operators? 2. Are there specific aspects of the service experience or access to services that you believe are influenced by this regulatory asymmetry? 3. How do you think the regulatory framework can address equity concerns and ensure a level playing field for both entities?
Innovation	1. How do you perceive the impact of the asymmetry in QoS regulation on the innovation capabilities of OTT Providers and Mobile Network Operators? 2. Are there any specific areas of innovation that you believe are influenced by this regulatory asymmetry? 3. What regulatory measures or policies do you think would promote innovation while maintaining a balance between OTT Providers and Mobile Network Operators?
Regulatory	1. How do you believe OTT can be effectively incorporated into the current Quality of Service (QoS) framework? 2. From your perspective, is it feasible for the current framework to accommodate both OTT and MNO (Mobile Network Operators)? 3. What potential impact, if any, do you think the shift from self-regulation to ex-post or ex-ante regulation in OTT would have on monitoring capabilities? 4. Do you have any additional comments or insights regarding the current End-User Subscriber Service Charter (EUSSC) and its relationship with OTT services?

The combined output gave a thematic view of the required QoS by customers and the regulatory input about incorporating these findings into regulation.

Online platforms provided the widest reach and enabled greater flexibility. The researcher, however, catered for scenarios where individuals required physical interaction to complete the interview. Two participants opted for this method.

3.6 Procedure for data collection

The survey was set up on the Qualtrics platform. This platform allowed for participants to complete the survey provided they had the link for the survey. Participants of the quantitative e-ServQual survey were invited to complete the survey via e-mail or on other social media platforms. The survey was self-administered. Participants had a specified period in which to complete the survey. The survey was open from August 2023 until December 2023. The platform allowed for the data to be downloaded in a format that could be used in the data

analyses platforms. For our study, the researcher used SPSS statistical analyses software.

The interviews on the qualitative study of the theory of public regulation were scheduled with selected participants via e-mail, where the researcher introduced themselves and asked for the participant's consent to partake in study. The subsequent information sheets were shared with the participants via e-mail. The virtual interviews were conducted via Microsoft Teams. Two of the participants asked for in-person interviews, which were conducted at the office premises of the participants. The virtual Microsoft Teams sessions were recorded on the platform. A mobile phone was used where physical sessions were chosen. Notes were taken using Microsoft Word on a laptop. The interviews were converted to text using Otter software and combined in Microsoft Word, where the initial themes were established. The coding and themes were done using Excel by taking the notes done from the combined interviews and arranging them in Excel. Common codes that emerged were grouped under common umbrella themes. The themes were made easier by the fact that the questions were addressing certain aspects of the theory of public regulation. Despite the process being inductive, the study could be said to have an element of deductiveness as the respondents were asked questions related to certain dimensions.

3.7 Data analysis strategies and interpretation

It was required that the researcher investigate the different datasets independently using different data analyses techniques, as the mixed-methods approach would require us to interpret the quantitative and qualitative data independently and tie the overall data together to derive recommendations on ways to improve customer satisfaction.

3.7.1 Quantitative data analysis strategies

3.7.1.1 Descriptive analyses

Descriptive data analysis involves the statistical process of describing, aggregating, and presenting the constructs of interest or the relationships between these constructs (Bhandari, 2020). This method aided in providing a holistic view of how users perceived the current service quality across the six proposed e-ServQual dimensions. The mean, denoting the arithmetic average, provides a central tendency measure, while variance captures the dispersion of data points around the mean. Kurtosis quantifies the peakiness or flatness of the distribution. The standard error of Kurtosis offers insights into the reliability of the Kurtosis estimate. Skewness evaluates the asymmetry of the distribution, and its standard error delineates the precision of the skewness estimate.

3.7.1.2 Reliability testing – Cronbach Alpha

The Cronbach Alpha is measure of internal consistency. It assessed the reliability of a scale or instrument used in the research. It is computed based on the interrelatedness of items within the scale. The Cronbach Alpha value measures the extent to which the items measure the same underlying construct. The Cronbach Alpha value ranges between 0 and 1. A higher Cronbach Alpha value suggests greater internal consistency and reliability of the scale (University of California, Los Angeles [UCLA], 2021). An Alpha value of 0.7 and above is targeted in research.

3.7.1.3 Inferential analyses

Inferential analyses are useful when researchers evaluate hypotheses and want to use an existing study sample to draw conclusions about the greater population group (Bhandari, 2020). These analyses involve applying statistical tests and techniques, such as hypothesis testing, regression analysis, analysis of variance, chi-square tests, t-tests, and correlation analysis among other tests the research uses to evaluate the hypotheses of the e-ServQual model. Analyses and interpretation of the themes within each dimension in relation to the research

questions were explored to determine the connections and implications of the themes.

3.7.2 *Qualitative methods*

3.7.2.1 Thematic methods

Thematic analysis is a qualitative research method used to identify and analyse patterns, themes, and meanings within a dataset. It involves the identification, organisation, and interpretation of themes or patterns that emerge from the data. This allows researchers to gain insights into the research topic or question and develop patterns, themes, and meaning from the data (Caulfield, 2022). This was used to investigate the themes that arose from the constructs that were developed around the theory of public regulation in our interview section. Themes were developed around each dimension after data were coded. The process of developing themes was iterative to ensure that the researcher did not miss any sub-themes within the data. Themes were renamed and analysed for reporting.

3.7.3 *Mixed methods*

3.7.3.1 Triangulation

Triangulation helps to derive further insights on what could be deduced further by combining the data from two or more research method approaches (Moran-Ellis et al., 2006). Integration involves the process of establishing specific relationships between two or more research methods whereby the different research methods retain their paradigmatic nature but are meshed with the goal of unearthing more findings about the findings (Moran-Ellis et al., 2006). The study involved finding out what consumers think of the OTT quality of service and merge that with the findings from the regulatory perspective to derive further insights by triangulation. Triangulation, for example, can be used to cross-reference similar constructs by determining what the regulator thinks quality should look like in the case of our study and mesh the findings with the consumer perspective. The integration of both quantitative and qualitative findings would enable a comprehensive interpretation of the research outcomes (Moran-Ellis et al., 2006).

3.8 Limitations and challenges of the study

The following aspects were identified as limitations and challenges of the study.

- i. Self-reported data may be subject to bias in the responses. The survey and interviews were evaluated to identify any potential biases that emerged. All efforts have been made to maintain respondent anonymity so that respondents and interviewees could respond without fear of prejudice.
- ii. Generalisation of the study can only be done in the South African context. This is not a problem, as currently the regulatory landscape of each country is different and therefore each country would need to develop a country-specific context. There is no global regulator, but more standards bodies like the ITU that offer guidelines on best practices. It remains for each country to establish their own legislative process.
- iii. Protection of user information. All data will be stored on a password-protected platform. Interview feedback will be on a laptop to which only the researcher has access. The laptop is governed by regular cybersecurity protocols such as regular password change, anti-virus software and two-factor authentication, amongst others. Research results will be published by the university without revealing the personal information of respondents.
- iv. Respondents not reaching a target set for the sample. The survey will be extended to individuals who fit the profile to meet the sample requirements.

3.9 Quality assurance

Due to the mixed-methods approach being adopted for this study, the research covered all quality assurance dimensions as highlighted in Table 12 and as are discussed further on.

Table 12: Quality assurance measures for qualitative and quantitative studies

Quantitative	Qualitative
External validity	Transferability
Reliability	Dependability
Internal validity	Credibility
Objectivity	Confirmability

3.9.1 External and Internal Validity

External validity in a quantitative study refers to the ability to generalise the results of the study to the population at large (Patino & Ferreira, 2018). For a study to have external validity, it requires internal validity. Internal validity requires that the sample is such that it reflects a true proportion of the population. To increase the study internal validity, the researcher aimed to:

1. Try as far as possible to represent the demographics of South Africa, i.e. majority youth, 50:50 gender split, majority Black (Stats SA, 2022).
2. Ensure that there is a fair representation of OTT platforms. WhatsApp is by far the biggest OTT provider and therefore a fair proportion of responses from that platform was expected.
3. Our target population was limited to users that use OTT. This ensured broad qualifying criteria.

3.9.1 Transferability

Transferability involves the extent to which the results from the study can be used and applied beyond the bounds of the current study (Coghlan & Brydon-Miller, 2014). It is the equivalent of external validity in quantitative methods. To ensure increased levels of transferability, the following should be considered:

1. Diverse demographic group. The researcher aimed as far as possible to include fair gender representation.
2. The researcher ensured that they gained perspectives not only from the regulatory angle, but also other telecommunications experts and professionals who are part of the ecosystem.
3. Ensure that the interview is conducted in an environment that was of the choice of the user.
4. Ensure that the identities or any information that could compromise the identity of the participants were kept confidential.
5. Non-leading questions were prepared for the interviews.

The above ensured that the users provided answers to questions according to their truth without any fear or discomfort.

3.9.2 Reliability

Reliability in a quantitative study measures the consistency of responses. A user should be able to return the same answer to a question every time the same question is asked (Heale & Twycross, 2015). To ensure reliability:

1. Survey questions were assessed before administering to a larger sample size.
2. Language was as clear as possible. Used language that the average person understands. Where there was ambiguity, the researcher took time to ensure that concepts were defined before proceeding with the question.
3. Utilised the Cronbach Alpha calculation to test the reliability of our survey. The Cronbach Alpha is a measure of internal consistency. It assesses the reliability of a scale or instrument used in the research. It was computed based on the interrelatedness of items within the scale. The Cronbach Alpha value measures the extent to which the items measure the same underlying construct. The Cronbach Alpha value ranges between 0 and 1. A higher Cronbach Alpha value suggests greater internal consistency and reliability of the scale. An Alpha value of 0,7 and above is targeted in research (UCLA, 2021).

3.9.3 Dependability

Dependability in qualitative research is the extent to which the research can be reproduced with the same findings if done by a different researcher (Quantilope, 2022). In our study, the level of rigour was increased by:

1. Using a diverse sample of interviewees from differing regulatory divisions, industries, in government and telecommunications. All interviewees were specialist level and above with a minimum of 5 years' experience.
2. The study interviewed eight regulatory experts.
3. Test interviews were performed to ensure that biases are removed.
4. Creating an environment that did not reveal the identities of the respondents to ensure that they answered truthfully.
5. Recording of interviews was done to be able to refer to later so that we did not lose messages over time.

3.9.4 Credibility

Credibility refers to the trustworthiness and believability of the research results generated through the research process (Stahl & King, 2020). To improve credibility, the following were implemented.

1. Ensured that perspective was gained, not only from the regulatory angle, but also other telecommunications experts and professionals who are part of the ecosystem and triangulated the responses.
2. Endeavoured to spend time on all the questions on the survey.
3. Assistance of fellow postgraduate students to proofread analyses to ensure validity.

3.9.5 Objectivity

Objectivity in quantitative research involves the attempts to remove bias from the answers (Resnik, 2001). The researcher:

1. Ensured that respondent identities are protected.

2. Ensured that questions were not leading.
3. Assured respondents that their identities were only known to the researcher.

3.9.6 Conformability

Conformability in qualitative studies refers to the likelihood of agreement between two or more independent parties regarding the data's veracity, relevance, or significance (Elo et al., 2001).

1. The researcher endeavoured to spend time on all the questions on the survey.
2. The researcher used the assistance of fellow postgraduate students to proofread analyses to ensure validity.
3. The researcher ensured that interviews were recorded for future reference.

3.10 Ethical considerations

This was a study with minimal risk as per the ethics guide. Both the survey and interviews did not intend to cause damage or present extreme viewpoints that could result in negative outcomes. Prior to the actual interviews with the experts, signed consent forms were obtained. All data collected remain confidential. Only the researcher has access to the data. Only results were published in the research report. Participants were informed that participation was voluntary, and that they had the right to withdraw at any time. No data collection took place before the approval of the University Ethics Committee.

CHAPTER 4 – PRESENTATION OF QUANTITATIVE RESULTS

4.1 Introduction

This chapter summarises the results from the quantitative survey that was administered. The main aim of the survey was to help investigate RQ1 and RQ2.

RQ1: What are the fundamental quality indicators related to quality-of-service of OTT providers as perceived by regulators and consumers?

RQ2: What is the primary quality indicator that consumers consider as the most significant in relation to the quality of Over-The-Top (OTT) services?

Statistical tests, such as validity, correlation, regression and hypothesis testing, were done on the results of the quantitative survey in this chapter.

4.2 Demographics

Table 13 summarises the gender of the survey participants. The survey was administered to 588 respondents. A total of 460 were complete. Seven surveys were terminated as the participants opted against continuing from the initial consent questions, while 121 were incomplete. A total of 128 surveys were therefore discarded in total.

Table 13: Gender of participants

Gender		Frequency	Percent	Valid Percent
Valid	Male	211	43.3	45.9
	Female	211	43.3	45.9
	Trans	7	1.4	1.5
	Prefer not to say	31	6.3	6.7
	Total	460	94.5	100
Incomplete Surveys	System	128	5.5	
Total		588	100	

Table 13 shows an equal split between male and female, with a 45.9% valid percent. Smaller samples were attributed to those who preferred not to say and Trans at 6.7% and 1.5% respectively. South Africa has 51,1% (30,8 million) of its population as female and 48,9% (29,4 million) as male (Stats SA, 2023). Before the data were cleaned, where the incomplete data were removed, there were 246 male respondents versus 264 females. Cleaning the data allowed for a 50:50 gender split.

Table 14 highlights the racial distribution of the respondents.

Table 14: Racial distribution of respondents

Race		Frequency	Percent	Valid Percent
Valid	Black	311	63.8	67.6
	White	49	10	10.7
	Coloured	37	8	8
	Indian/ Asian	28	7.6	6
	Other	4	0.8	0.87
	Prefer not to say	31	6.4	6.8
	Total	460	94.5	100
Incomplete Surveys	System	128	5.5	

Most of the respondents were Black, with 67.6% of the valid respondents. This was, however, below the national average. Census information of 2022 confirmed that the Black race was the dominant population group at 81.4% of the population, followed by coloureds at 8.2%, whites at 7.3% and Indians/Asians at 2.7% (Stats SA, 2023). The researcher, however, believes that the data can be used as it still shows a strong dominance of the Black race and the representation of the other races being in the single digits. There was an over-representation in the Asian at more than double the national average at 6% of respondents and whites at 10,7% of valid respondents. There were 6,8% of respondents who preferred not to disclose their race, which could have ensured that figures closer to the census numbers were achieved. Table 15 highlights the distribution of the respondents by age. Table 15 highlight that 50,9% of the respondents, or the majority, were youth or below the age of 35 years in line with a developing country (United Nations[UN], 2015).

Table 15: Distribution by age of respondents to the survey

Age		Frequency	Percent	Valid Percent
Valid	18-24	75	15.4	16.3
	25-34	159	32.6	34.6
	35-44	147	30.2	32
	45-60	47	9.7	10.2
	60>	13	2.7	2.8
	Prefer not to say	19	3.9	4.1
	Total	460	94.5	100
Incomplete	System	27	0.2	

WhatsApp was by far the most used OTT, with 85% of users preferring it for written and video communication. A total of 82% of respondents preferred WhatsApp for voice calls. Telegram was the next most popular application, with preference of 10% for voice, 10% for written and 8% for video communications. The results are highlighted in Tables 16 and 17.

Table 16: Preferred OTT as per survey respondents

OTT	Written	Voice	Video
WhatsApp	390	378	390
Telegram	44	45	37
Viber	10	10	12
Signal	11	17	12
Other	5	10	9
Total	460	460	460

Table 17: Preferred OTT in percentage

OTT	Written	Voice	Video
WhatsApp	85%	82%	85%
Telegram	10%	10%	8%
Viber	2%	2%	3%
Signal	2%	4%	3%
Other	1%	2%	2%
Total	100%	100%	100%

Data had pegged WhatsApp as the overwhelming market leader in the OTT providers, in line with our survey sample. The difference was that they had pegged it at 95% of users in South Africa (Kemp, 2022).

4.3 Reliability of questionnaire

The Cronbach Alpha of the questionnaire was calculated and tabulated in Table 18. This was done to determine the internal reliability of the questionnaire. The overall Cronbach Alpha of 0,88 was obtained, which confirmed reliability of our survey.

Table 18: Calculation of Cronbach Alpha of questionnaire

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.880	.887	6

Table 19 represents the Cronbach Alpha calculations for the individual dimensions.

Table 19: Cronbach Alpha calculations

Expected	Reliability	Responsiveness	Ease of Use	Enjoyment	Privacy and Security	Transparency on Price
No. of Components	4.00	5.00	6.00	9.00	6.00	3.00
Alpha	0.84	0.87	0.78	0.92	0.92	0.91
Perceived						
No. of Components	4.00	5.00	6.00	9.00	6.00	3.00
Alpha	0.77	0.76	0.87	0.91	0.91	0.90

Service quality comprised several dimensions. The Cronbach Alpha of the individual dimensions was calculated for the expected and perceived results of the questionnaire. This aided to ensure that none of the dimensions had issues with reliability. A higher Cronbach Alpha value suggests greater internal consistency and reliability of the scale (University of California, Los Angeles [UCLA], 2021). An Alpha value of 0.7 and above is targeted in research. The Cronbach Alpha values were all above 0.7 for the six variables that were defined. The questionnaire can therefore be considered as reliable.

4.4 Validity

The study used exploratory factor analyses (EFA) to test for validity of the study. This was done to investigate the discriminant and convergent validity. The discriminant validity was used to measure the extent to which a measurement instrument was able to distinguish between different variables that were theoretically distinct (Cummings, 2004). Convergent validity assessed the degree to which different measurement instruments that are theoretically expected to measure the same variable produced results that converge (Cummings, 2004). The researcher began by evaluating the adequacy of the sample to conduct EFA by utilising the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Test of Sphericity (Bartlett Test).

Table 20: KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.85
Bartlett's Test of Sphericity	Approx. Chi-Square	1502.87
	Df	15
	Sig.	.00

The results of the KMO were 0.85 and significance was a value less than 0.001 as is shown in Table 20. A KMO value greater than 0.5 and a significance level for the Bartlett's test below 0.05 mean that there was substantial correlation in the data (Nijs, 2019). This justifies the use of EFA as there are relationships between the variables.

4.4.1 Factor loadings

Each variable was assessed to determine suitability for factor analysis and to determine the suitability of the factors for measuring the variables.

4.4.1.1 Reliability (RB)

The KMO measure, as represented in Table 21, indicates that the data were suitable for factor analysis (KMO = 0.817), and Bartlett's test of sphericity is significant, supporting the factorability of the correlation matrix. The factor loadings as presented in Table 22 measuring the variable in reliability (RB1, RB2, RB3, RB4) have high factor loadings ranging from 0.803 to 0.838 on the single extracted component, indicating that they contributed significantly to measuring the construct of reliability.

Table 21: KMO and Bartlett's test for reliability

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.817
Bartlett's Test of Sphericity	Approx. Chi-Square	690.216
	Df	6
	Sig.	<.001

Table 22: Component matrix for reliability

Component Matrix ^a	
	Component
	1
RB1	.824
RB2	.838
RB3	.803
RB4	.817
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	

4.4.1.2 Responsiveness (RS)

The KMO in Table 23 indicates a measure of 0.817, indicating the data's suitability for factor analysis, and Bartlett's test is significant, supporting factorability. Factor Loadings as presented in Table 24 utilised to measure the variable responsiveness (RS1, RS2, RS3, RS4, RS5) exhibited strong loadings ranging from 0.750 to 0.853 on the single component extracted, indicating their importance in measuring responsiveness. All the question items have the same intent in measuring this variable.

Table 23: KMO and Bartlett test for responsiveness

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.817
Bartlett's Test of Sphericity	Approx. Chi-Square	1140.234
	Df	10
	Sig.	<.001

Table 24: Component matrix for responsiveness

Component Matrix ^a	
	Component
	1
RS1	.849
RS2	.853
RS3	.800
RS4	.750
RS5	.791
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	

4.4.1.3 Ease of Use (EU)

The KMO measure was 0.780, as was summarised in Table 25. This indicates fair sampling adequacy, and that the Bartlett's test was significant. Two components were extracted from the factor loadings from Table 26. In the initial component matrix (before rotation in Table 26), all the question items indicated meaningful loadings, suggesting their contribution to measuring the variable EU and that all items were intentional and consistent in measuring this variable. After rotation (Table 27), the question items loaded strongly on either component 1 or 2, providing insight into the underlying structure of the construct, even though EU5 loaded negatively with a loading of -0.048 in component 1, it had a strong loading of 0.888 under component 2, therefore the question item was kept as one of the items measuring the variable EU.

Table 25: KMO and Bartlett test for Ease of Use

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.780
Bartlett's Test of Sphericity	Approx. Chi-Square	868.848
	Df	15
	Sig.	<.001

Table 26: Component matrix for Ease of Use

Component Matrix^a		
	Component	
	1	2
EU1	.791	.231
EU2	.752	.244
EU3	.741	-.345
EU4	.659	-.547
EU5	.546	.702
EU6	.753	-.178
Extraction Method: Principal Component Analysis.		
a. 2 components extracted.		

Table 27: Rotated component matrix for Ease of Use

Rotated Component Matrix^a		
	Component	
	1	2
EU1	.446	.693
EU2	.408	.677
EU3	.785	.225
EU4	.856	.019
EU5	-.048	.888
EU6	.685	.359
Extraction Method: Principal Component Analysis.		
Rotation Method: Varimax with Kaiser Normalization.		
a. Rotation converged in 3 iterations.		

4.4.1.4 Enjoyment

The KMO measure in Table 28 was 0.907, indicating excellent sampling adequacy and Bartlett's test is significant. Two components were initially extracted from the factor loadings in Table 29. In the initial matrix, all items had substantial loadings on both components, indicating their relevance to measuring the variable enjoyment. After rotation (Table 30), the items predominantly loaded

on component 1, indicating a clearer structure, and even though the last three items loaded low, these items were kept.

Table 28: KMO and Bartlett for Enjoyment

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.907
Bartlett's Test of Sphericity	Approx. Chi-Square	2882.254
	Df	36
	Sig.	<.001

Table 29: Component matrix for Enjoyment

Component Matrix ^a		
	Component	
	1	2
EJ1	.804	-.333
EJ2	.786	-.380
EJ3	.805	-.326
EJ4	.782	-.243
EJ5	.822	-.154
EJ6	.759	.025
EJ7	.751	.509
EJ8	.757	.513
EJ9	.771	.462
Extraction Method: Principal Component Analysis.		
a. 2 components extracted.		

Table 30: Rotated component matrix for Enjoyment

Rotated Component Matrix^a		
	Component	
	1	2
EJ1	.835	.248
EJ2	.850	.200
EJ3	.830	.254
EJ4	.761	.303
EJ5	.736	.398
EJ6	.574	.497
EJ7	.263	.868
EJ8	.265	.875
EJ9	.308	.844
Extraction Method: Principal Component Analysis.		
Rotation Method: Varimax with Kaiser Normalization.		
a. Rotation converged in 3 iterations.		

4.4.1.5 Privacy and Security (PS)

The KMO measure was 0.921, indicating excellent sampling adequacy, and Bartlett's test is significant (Table 31). The factor loading for all the question items utilised to measure the variable privacy and security exhibited strong loadings on the single component extracted, indicating their importance in measuring privacy and security (Table 32).

Table 31: KMO and Bartlett test for Privacy and Security

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.921
Bartlett's Test of Sphericity	Approx. Chi-Square	1926.898
	Df	15
	Sig.	<.001

Table 32: Component matrix for Privacy and Security

Component Matrix ^a	
	Component
	1
PS1	.840
PS2	.854
PS3	.871
PS4	.871
PS5	.852
PS6	.834
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	

4.4.1.6 Transparency on Price (TR)

The KMO measure was 0.756, indicating fair sampling adequacy, and Bartlett's test is significant. For factor loadings of all question items, the variable had high loadings on the single component extracted, suggesting their relevance to measuring transparency on price, meaning that all items were kept.

Table 33: KMO and Bartlett's test for Transparency on Price

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.756
Bartlett's Test of Sphericity	Approx. Chi-Square	962.959
	Df	3
	Sig.	<.001

Table 34: Component matrix for Transparency on Price

Component Matrix ^a	
	Component
	1
TR1	.914
TR2	.933
TR3	.924
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	

The above sections (4.4.1.1 to 4.4.1.6) demonstrated the relationship between the question items that were utilised and underlying variables (reliability, responsiveness, ease of use, enjoyment, transparency of price, and privacy and security). The loadings above 0.4, indicated items that are good indicators of the variables, while loadings below 0.4 suggested poor indicators. These findings supported the validity of the measurement model and provided insights into the reliability and structure of the variables under investigation.

4.4.2 Average Variance Extracted (AVE) and Discriminant Validity

The average variance extracted (AVE) is a way for researchers to determine the extent of variations in items that can be explained by the construct (Analyses INN, 2020). An AVE of at least 0.50 was recommended to ensure that the selected variables explain variances instead of errors. Discriminant Validity is an analysis to determine the correlation between items. The goal was to obtain weak correlation with other constructs except for the ones to which it is theoretically associated (Analyses INN, 2020). Further analyses of the above concepts on each of the variables were done in sections 4.4.2.1 to 4.4.2.6.

4.4.2.1 Reliability

The correlation matrix is depicted in Table 35. The correlation between the factors was utilised to calculate the AVE.

Table 35: Correlation matrix for the Reliability factors

		RB1	RB2	RB3	RB4
Correlation	RB1	1.000	.601	.548	.553
	RB2	.601	1.000	.554	.586
	RB3	.548	.554	1.000	.544
	RB4	.553	.586	.544	1.000
Sig. (1-tailed)	RB1		<.001	<.001	<.001
	RB2	.000		.000	.000
	RB3	.000	.000		.000
	RB4	.000	.000	.000	

Compute AVE:

- $RB: AVE = (0.824^2 + 0.838^2 + 0.803^2 + 0.817^2) / 4$
 $AVE \approx 0,673$

Compare AVE with threshold:

- $AVE \approx 0.673$ which is above the threshold of 0.5.

Discriminant Validity:

- Square root of $AVE \approx \sqrt{0.673} \approx 0.820$

Comparing with correlations:

- Correlation between RB1 and other items: RB2 (0.601), RB3 (0.548), RB4 (0.553)
- Correlation between RB2 and other items: RB1 (0.601), RB3 (0.554), RB4 (0.586)
- Correlation between RB3 and other items: RB1 (0.548), RB2 (0.554), RB4 (0.544)
- Correlation between RB4 and other items: RB1 (0.553), RB2 (0.586), RB3 (0.544)

- Square Root of AVE (RB): 0.820

Since the square root of AVE (0.820) is greater than the correlation between RB1 and RB3 (0.548), RB1 and RB4 (0.553), RB2 and RB3 (0.554), *RB2 and RB4* (0.586). RB3 and RB4 (0.544), discriminant validity is supported for the variable RB/ responsiveness.

4.4.2.2 Responsiveness

The correlation matrix is depicted in Table 36 for responsiveness. The correlation between the factors was utilised to calculate the AVE.

Table 36: Correlation matrix for the Responsiveness factors

Correlation Matrix						
		RS1	RS2	RS3	RS4	RS5
Correlation	RS1	1.000	.775	.620	.473	.532
	RS2	.775	1.000	.596	.521	.526
	RS3	.620	.596	1.000	.470	.548
	RS4	.473	.521	.470	1.000	.613
	RS5	.532	.526	.548	.613	1.000
Sig. (1-tailed)	RS1		<.001	<.001	<.001	<.001
	RS2	.000		.000	.000	.000
	RS3	.000	.000		.000	.000
	RS4	.000	.000	.000		.000
	RS5	.000	.000	.000	.000	

Compute AVE:

- RS: $AVE = (0.849^2 + 0.853^2 + 0.800^2 + 0.750 + 0.791^2)/5$

$$AVE \approx 0.655$$

Compare AVE with threshold:

- $AVE \approx 0.655$, which is above the threshold of 0.5.

Discriminant Validity:

- Square root of AVE $\approx \sqrt{0.655} \approx 0.809$

Comparing with correlations:

- Correlation between RS1 and other items: RS2 (0.775), RS3 (0.620), RS4 (0.473), RS5 (0.532)
- Correlation between RS2 and other items: RS1 (0.775), RS3 (0.596), RS4 (0.521), RS5 (0.526)
- Correlation between RS3 and other items: RS1 (0.620), RS2 (0.596), RS4 (0.470), RS5 (0.548)
- Correlation between RS4 and other items: RS1 (0.473), RS2 (0.521), RS3 (0.470), RS5 (0.613)
- Correlation between RS5 and other items: RS1 (0.532), RS2 (0.526), RS3 (0.548), RS4 (0.613)
- Square Root of AVE (RS): 0.809

Since the square root of AVE (0.809) is greater than all correlations between RS and other items, discriminant validity is supported for variable RS.

4.4.2.3 Ease of Use (EU)

The correlation matrix is depicted in Table 37 for EU. The correlation between the factors was utilised to calculate the AVE.

Table 37: Correlation matrix for Ease of Use factors

Correlation Matrix							
		EU1	EU2	EU3	EU4	EU5	EU6
Correlation	EU1	1.000	.547	.439	.407	.477	.460
	EU2	.547	1.000	.512	.270	.409	.424
	EU3	.439	.512	1.000	.509	.165	.467
	EU4	.407	.270	.509	1.000	.107	.508
	EU5	.477	.409	.165	.107	1.000	.312
	EU6	.460	.424	.467	.508	.312	1.000
Sig. (1-tailed)	EU1		<.001	<.001	<.001	<.001	<.001
	EU2	.000		.000	.000	.000	.000
	EU3	.000	.000		.000	.000	.000
	EU4	.000	.000	.000		.011	.000
	EU5	.000	.000	.000	.011		.000
	EU6	.000	.000	.000	.000	.000	

Compute AVE:

- EU: $AVE = (0.791^2 + 0.752^2 + 0.741^2 + 0.659^2 + 0.546^2 + 0.753^2) / 6$

$AVE \approx 0.507$

Compare AVE with threshold:

- $AVE \approx 0.507$, which is above the threshold of 0.5.

Discriminant Validity:

- Square root of AVE $\approx \sqrt{0.507} \approx 0.712$

Comparing with correlations:

- Correlation between EU1 and other items: EU2 (0.547), EU3 (0.439), EU4 (0.407), EU5 (0.477), EU6 (0.460)
- Correlation between EU2 and other items: EU1 (0.547), EU3 (0.512), EU4 (0.270), EU5 (0.409), EU6 (0.424)
- Correlation between EU3 and other items: EU1 (0.439), EU2 (0.512), EU4 (0.509), EU5 (0.165), EU6 (0.467)
- Correlation between EU4 and other items: EU1 (0.407), EU2 (0.270), EU3 (0.509), EU5 (0.107), EU6 (0.508)
- Correlation between EU5 and other items: EU1 (0.477), EU2 (0.409), EU3 (0.165), EU4 (0.107), EU6 (0.312)
- Correlation between EU6 and other items: EU1 (0.460), EU2 (0.424), EU3 (0.467), EU4 (0.508), EU5 (0.312)
- Square Root of AVE (EU): 0.712

Since the square root of AVE (0.712) is greater than all correlations between EU and other items, discriminant validity is supported for EU.

4.4.2.4 Enjoyment

The correlation matrix is depicted in Table 38 for enjoyment. The correlation between the factors was utilised to calculate the AVE.

Table 38: Correlation matrix for Enjoyment

Correlation Matrix										
		EJ1	EJ2	EJ3	EJ4	EJ5	EJ6	EJ7	EJ8	EJ9
Correlation	EJ1	1.000	.778	.710	.592	.648	.495	.467	.464	.481
	EJ2	.778	1.000	.714	.585	.608	.519	.431	.428	.448
	EJ3	.710	.714	1.000	.645	.629	.544	.435	.464	.497
	EJ4	.592	.585	.645	1.000	.693	.604	.431	.451	.490
	EJ5	.648	.608	.629	.693	1.000	.612	.526	.511	.535
	EJ6	.495	.519	.544	.604	.612	1.000	.549	.527	.508
	EJ7	.467	.431	.435	.431	.526	.549	1.000	.753	.733
	EJ8	.464	.428	.464	.451	.511	.527	.753	1.000	.763
	EJ9	.481	.448	.497	.490	.535	.508	.733	.763	1.000
Sig. (1-tailed)	EJ1		<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
	EJ2	.000		.000	.000	.000	.000	.000	.000	.000
	EJ3	.000	.000		.000	.000	.000	.000	.000	.000
	EJ4	.000	.000	.000		.000	.000	.000	.000	.000
	EJ5	.000	.000	.000	.000		.000	.000	.000	.000
	EJ6	.000	.000	.000	.000	.000		.000	.000	.000
	EJ7	.000	.000	.000	.000	.000	.000		.000	.000
	EJ8	.000	.000	.000	.000	.000	.000	.000		.000
	EJ9	.000	.000	.000	.000	.000	.000	.000	.000	

Compute AVE:

- EJ: AVE = $(0.804^2 + 0.786^2 + 0.805^2 + 0.782^2 + 0.822^2 + 0.759^2 + 0.751^2 + 0.757^2 + 0.771^2)/9$

$$\text{AVE} \approx 0.612$$

Compare AVE with threshold:

- $\text{AVE} \approx 0.612$, which is above the threshold of 0.5.

Discriminant Validity:

- Square root of AVE $\approx \sqrt{0.612} \approx 0.782$

Comparing with correlations:

- Correlation between EJ1 and other items: EJ2 (0.778), EJ3 (0.710), EJ4 (0.592), EJ5 (0.648), EJ6 (0.495), EJ7 (0.467), EJ8 (0.464), EJ9 (0.481)
- Correlation between EJ2 and other items: EJ1 (0.778), EJ3 (0.714), EJ4 (0.585), EJ5 (0.608), EJ6 (0.519), EJ7 (0.431), EJ8 (0.428), EJ9 (0.448)
- Correlation between EJ3 and other items: EJ1 (0.710), EJ2 (0.714), EJ4 (0.645), EJ5 (0.629), EJ6 (0.544), EJ7 (0.435), EJ8 (0.464), EJ9 (0.497)
- Correlation between EJ4 and other items: EJ1 (0.592), EJ2 (0.585), EJ3 (0.645), EJ5 (0.693), EJ6 (0.604), EJ7 (0.431), EJ8 (0.451), EJ9 (0.490)
- Correlation between EJ5 and other items: EJ1 (0.648), EJ2 (0.608), EJ3 (0.629), EJ4 (0.693), EJ6 (0.612), EJ7 (0.526), EJ8 (0.511), EJ9 (0.535)
- Correlation between EJ6 and other items: EJ1 (0.495), EJ2 (0.519), EJ3 (0.544), EJ4 (0.604), EJ5 (0.612), EJ7 (0.549), EJ8 (0.527), EJ9 (0.508)
- Correlation between EJ7 and other items: EJ1 (0.467), EJ2 (0.431), EJ3 (0.435), EJ4 (0.431), EJ5 (0.526), EJ6 (0.549), EJ8 (0.753), EJ9 (0.733)

- Correlation between EJ8 and other items: EJ1 (0.464), EJ2 (0.428), EJ3 (0.464), EJ4 (0.451), EJ5 (0.511), EJ6 (0.527), EJ7 (0.753), EJ9 (0.763)
- Correlation between EJ9 and other items: EJ1 (0.481), EJ2 (0.448), EJ3 (0.497), EJ4 (0.490), EJ5 (0.535), EJ6 (0.508), EJ7 (0.733), EJ8 (0.763)

Since the square root of AVE (0.782) is greater than all the correlations between EJ and other items, discriminant validity is supported for EJ.

4.4.2.5 Privacy and Security (PS)

The correlation matrix is depicted in Table 39 for PS. The correlation between the factors was utilised to calculate the AVE.

Table 39: Correlation matrix for Privacy and Security

Correlation Matrix							
		PS1	PS2	PS3	PS4	PS5	PS6
Correlation	PS1	1.000	.663	.655	.705	.615	.668
	PS2	.663	1.000	.699	.689	.704	.618
	PS3	.655	.699	1.000	.712	.722	.664
	PS4	.705	.689	.712	1.000	.670	.680
	PS5	.615	.704	.722	.670	1.000	.651
	PS6	.668	.618	.664	.680	.651	1.000
Sig. (1-tailed)	PS1		<.001	<.001	<.001	<.001	<.001
	PS2	.000		.000	.000	.000	.000
	PS3	.000	.000		.000	.000	.000
	PS4	.000	.000	.000		.000	.000
	PS5	.000	.000	.000	.000		.000
	PS6	.000	.000	.000	.000	.000	

Compute AVE:

- PS: $AVE = (0.840^2 + 0.854^2 + 0.871^2 + 0.871^2 + 0.852^2 + 0.834^2) / 6$

$AVE \approx 0.729$

Compare AVE with threshold:

- $AVE \approx 0.729$, which is above the threshold of 0.5.

Discriminant Validity:

- Square root of $AVE \approx \sqrt{0.729} \approx 0.854$

Comparing with correlations:

- Correlation between PS1 and other items: PS2 (0.663), PS3 (0.655), PS4 (0.705), PS5 (0.615), PS6 (0.668)
- Correlation between PS2 and other items: PS1 (0.663), PS3 (0.699), PS4 (0.689), PS5 (0.704), PS6 (0.618)
- Correlation between PS3 and other items: PS1 (0.655), PS2 (0.699), PS4 (0.712), PS5 (0.722), PS6 (0.664)
- Correlation between PS4 and other items: PS1 (0.705), PS2 (0.689), PS3 (0.712), PS5 (0.670), PS6 (0.680)
- Correlation between PS5 and other items: PS1 (0.615), PS2 (0.704), PS3 (0.722), PS4 (0.670), PS6 (0.651)
- Correlation between PS6 and other items: PS1 (0.668), PS2 (0.618), PS3 (0.664), PS4 (0.680), PS5 (0.651)

Since the square root of AVE (0.854) is greater than the correlation between PS1 and PS5 (0.615), PS2 and PS6 (0.618), PS3 and PS6 (0.664), PS4 and PS5 (0.670), PS4 and PS6 (0.680), PS5 and PS6 (0.651), discriminant validity is supported.

4.4.2.6 Transparency on Price (TP)

The correlation matrix is depicted in Table 40 for TP. The correlation between the factors was utilised to calculate the AVE.

Table 40: Correlation matrix for Transparency on Price

Correlation Matrix				
		TR1	TR2	TR3
Correlation	TR1	1.000	.779	.756
	TR2	.779	1.000	.805
	TR3	.756	.805	1.000
Sig. (1-tailed)	TR1		<.001	<.001
	TR2	.000		.000
	TR3	.000	.000	

Compute AVE:

- TR: $AVE = (0.914^2 + 0.933^2 + 0.924^2) / 3$

$$AVE \approx 0.853$$

Compare AVE with threshold:

- $AVE \approx 0.853$, which is above the threshold of 0.5.

Discriminant Validity:

- Square root of AVE $\approx \sqrt{0.853} \approx 0.924$

Comparing with correlations

- Correlation between TR1 and other items: TR2 (0.779), TR3 (0.756)
- Correlation between TR2 and other items: TR1 (0.779), TR3 (0.805)
- Correlation between TR3 and other items: TR1 (0.756), TR2 (0.805)

Since the square root of AVE (0.924) is greater than the correlation between TR1 and TR3 (0.756), discriminant validity is supported.

4.5 Customer expectation

A summary of the results from the dimensions of the service quality survey is shown below for Reliability, Responsiveness, Ease of Use, Enjoyment, Privacy and security, Transparency on Price, and insights from the statements that customers had given.

4.5.1 Service quality evaluation

Service Quality was evaluated using the results of the perceived [P] service quality versus the expected service [E]. Results are summarised in Table 41.

Table 41 Service quality analyses

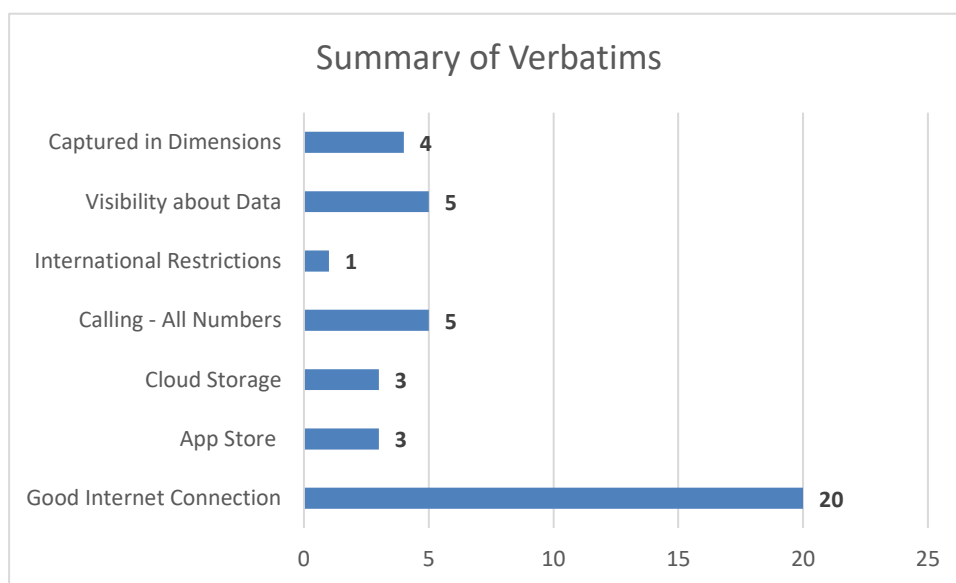
Service Quality	Reliability	Responsiveness	Ease of Use	Enjoyment	Privacy and Security	Transparency on Price
No. of Components	4	5	6	9	6	3
Average Score [E]	4.45	4.38	4.40	4.42	4.66	4.52
Average Score [P]	3.78	3.79	4.23	4.15	3.72	4.08
P-E	-0.67	-0.59	-0.17	-0.27	-0.95	-0.43

The above suggests that the respondents expected the most from privacy, followed by transparency on price and reliability. The biggest gap between perceived and expected service quality was in privacy and security. This highlights the increased concern around IP-based applications which was not a big concern around MNOs. The researcher drilled down into the individual results from the survey to get further insights from the survey responses. Using the results of the expected service responses, it would allow us to determine consumer expectations around OTT service offerings.

4.5.2 Customer Insights

There was a section in the survey that was left open for customers to add any additional insights into what customers perceived as most important. There were 41 (8.9%) respondents who gave insights about what other factors needed to be incorporated when determining what consumers perceived as important. The statements were entered on an Excel spreadsheet and combined into an umbrella theme. The results are summarised in Figure 5.

Figure 5: Results of the statements from customers



The differences in responses, although small, highlight that customers appreciate the importance of the internet in provisioning of OTT services (48.8%). Most people wrote one-word answers but the following is from an individual who elaborated a bit more.

“Mostly just network issues although I am aware they mainly caused by loadshedding.” – P143

There is no OTT without the internet (BEREC, 2016). Zhang (2019) highlights that the regulation of OTT needs to be a coordinated effort between regulators, internet service providers (ISP) and OTT themselves due to this requirement. It is for this reason that Robinson and Okeleke (2020) advocate a move to an ex-

post regulatory framework where feedback from the user was captured. This point further emerged in the qualitative section of the research. Although privacy and security were covered in the dimensions, five of the respondents felt the need to reiterate the concerns around security of their data. The following are some of the comments from the study where more context was added.

“End-to-end encryption, ability to personalise app according to my needs and not have my data passed onto third parties.” - P9

“Knowing who besides myself and the people I contact are seeing my messages/info sent between myself and my contacts. I need to know how much accessibility to data people have to the info I send and receive from contacts essentially. Is it full private or not. Do governments have access to this data. etc.”
- P140

This suggests that a special approach was required where protection of user information is investigated in-depth.

The ability to call all numbers was another factor that was raised as important. Five of the respondents listed this as important. With the service substitution that has taken place with OTT replacing SMS, it makes sense to ensure that there are no limitations on number calling. Currently WhatsApp, which is the most popular OTT in South Africa, cannot call emergency services. These points were elaborated further in Chapter 5, where more in-depth interviews were conducted. It is, however, interesting to note that some commonality is already being displayed, although the sample is small.

4.5.3 Descriptive statistics

4.5.3.1 Reliability

Table 42 summarises the results on reliability.

Table 42: Results on Reliability

KPI	RB	RB1	RB2	RB3	RB4
Mean	4.45	4.47	4.54	4.22	4.57
Median	4.75	5	5	4	5
Standard Deviation	0.73	0.92	0.88	0.98	0.78
Sample Variance	0.53	0.85	0.78	0.96	0.61
Skewness	-1.87	-1.98	-2.24	-1.37	-2.36
Error of Skewness	0.11	0.11	0.11	0.11	0.11
Kurtosis	3.86	3.60	4.79	1.37	6.48
Error of Kurtosis	0.23	0.22	0.22	0.22	0.22
Minimum	1	1	1	1	1
Maximum	5	5	5	5	5
Incomplete Survey	128	128	128	128	128
Count (N)	460	460	460	460	460

The median value was higher than the mean value for all the indicators. It was not surprising that there is an expectation from consumers that OTTs must always be available, deliver messages without delay, allow users to make and receive calls and deliver dependable performance, as was captured by questions RB1 to RB4. The resulting skewness reinforces that there is an expectation from OTT users to provide a reliable service, as negative value suggests the distribution is skewed to the left. The standard error of skewness suggests that skewness values can be trusted for all the indicators as they are all much smaller than the actual Skewness values. The positive Kurtosis in all the results suggests strong consensus or a lack of variability in the responses. This means that they follow a Leptokurtic distribution with a sharper peak and heavier tails (Turney, 2022).

The Standard Error of Kurtosis of value just above 0.2 for all the dimensions suggests that the Kurtosis values can be trusted as they are significantly smaller than the actual Kurtosis values.

4.5.3.2 Responsiveness

Table 43 summarises the survey results around responsiveness of OTT. Responses to RS1 suggest that users agree that companies behind excellent

OTT applications respond to queries logged. The mean and median scores are relatively high, indicating a positive perception. The standard deviation (1) suggests a moderate level of variability. Respondents to RS3 expressed a positive perception that customer support of excellent OTT applications addresses queries raised in a timely manner. The mean of 4.4 and median of 5 are high, and the standard deviation (0.99) suggests a moderate level of variability. Respondents to RS4 expressed a positive perception that customer support of excellent OTT applications addresses queries raised in a timely manner. The mean and median scores are high, and the standard deviation (0.94) suggests a moderate level of variability. There is a strong agreement among respondents that excellent OTT applications allow communications without limitations. The mean and median scores are high, and the standard deviation (0.8) indicates a moderate level of variability. Respondents generally agree that excellent OTT applications update and notify customers proactively about any downtime represented by RS2. The mean and median scores are relatively high, and the standard deviation (0.92) suggests a moderate level of variability.

Table 43: Results of Responsiveness

KPI	RS	RS1	RS2	RS3	RS4	RS5
Mean	4.38	4.23	4.28	4.40	4.50	4.50
Median	4.60	5	5	5	5	5
Standard Deviation	0.54	1.00	0.92	0.99	0.80	0.81
Sample Variance	0.73	0.99	0.84	0.98	0.63	0.66
Skewness	-1.49	-1.34	-1.35	-1.76	-1.97	-2.11
Error of Skewness	0.11	0.11	0.11	0.11	0.11	0.11
Kurtosis	2.23	1.26	1.51	2.34	4.28	5.12
Error of Kurtosis	0.23	0.22	0.22	0.22	0.22	0.22
Minimum	1.2	1	1	1	1	1
Maximum	5	5	5	5	5	5
Incomplete Survey	128	128	128	128	128	128
Count (N)	460	460	460	460	460	460

Negative skewness indicates that the distributions are skewed to the left. The resulting skewness reinforces that there is an expectation from OTT users for OTT providers to respond to consumer queries. The standard error of skewness of just over 0.1 suggests that skewness values can be trusted for all the indicators as they are all much smaller than the actual Skewness values. The positive Kurtosis in all the results suggests strong consensus or a lack of variability in the responses. This means that they follow a Leptokurtic distribution with a sharper peak and heavier tails (Turney, 2022). The Standard Error of Kurtosis of value just above 0.2 for all the dimensions suggests that the Kurtosis values can be trusted as they are significantly smaller than the actual Kurtosis values. Positive Kurtosis values suggest relatively heavy tails and more extreme values than a normal distribution.

4.5.3.3 Ease to Use

Table 44 summarises the descriptive statistics on Ease of Use. The mean values of EU1 to EU6 were all above 4. This suggests that there is an agreement from users around OTT providers being able to:

- i. Provide a wide range of features to suit their communication needs.
- ii. Ability to customise their interfaces to suit their needs.
- iii. Easily accessible privacy information.
- iv. Small Loading Times.
- v. Uncomplicated ways to send messages and receive calls.
- vi. Easy contact management.

The median values are relatively close to the mean values and the standard deviation values were all below 1, therefore suggesting little variability in responses.

Table 44: Summary on Ease of Use

KPI	EU	EU1	EU2	EU3	EU4	EU5	EU6
Mean	4.40	4.37	4.28	4.51	4.66	4.00	4.57
Median	4.5	4	4	5	5	4	5
Standard Deviation	0.57	0.78	0.84	0.76	0.62	1.15	0.67
Sample Variance	0.32	0.60	0.71	0.58	0.39	1.32	0.45
Skewness	-1.53	-1.63	-1.43	-2.05	-2.26	-0.97	-1.94
Error of Skewness	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Kurtosis	5.19	3.95	2.50	5.40	6.66	-0.03	5.06
Error of Kurtosis	0.23	0.22	0.22	0.22	0.22	0.22	0.22
Minimum	1.17	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5
Incomplete Survey	128	128	128	128	128	128	128
Count (N)	460	460	460	460	460	460	460

The Skewness values were all negative, with the most negative values being in questions EU3, EU4 and EU6. This skewness indicates that the distributions are skewed to the left and suggests that there are more values on the upper end. This implies that there is positive sentiment that OTT must do the following as per EU1 to EU6:

- i. Provide a wide range of features to suit their communication needs.
- ii. Ability to customise their interfaces to suit their needs.
- iii. Easily accessible privacy information.
- iv. Small Loading Times.
- v. Uncomplicated ways to send messages and receive calls.
- vi. Easy contact management.

The positive Kurtosis in all the results except in EU4 suggests strong consensus or a lack of variability in the responses. This means that they follow a Leptokurtic distribution with a sharper peak and heavier tails (Turney, 2022). EU4 was closer to a normal distribution, with the Kurtosis value of -0.03, which is closer to 0. This

would suggest that the responses are spread across the options of the survey. The low values for the Standard Error of Kurtosis and Skewness suggest that the Kurtosis and Skewness values can be trusted.

4.5.3.4 Enjoyment

Questions EJ1 to EJ9 were used to measure Enjoyment. The mean values and median values were all above 4, with the difference between the mean and median values all being below 1. This suggests that there is agreement that:

- i. Excellent OTT applications allow for easy profile personalisation and settings change.
- ii. Excellent OTT applications allow for easy customisation of the theme and appearance.
- iii. Excellent OTT applications allow for features that cater for individual preferences.
- iv. Excellent OTT applications allow for easy navigation of the various sections and features.
- v. Excellent OTT applications are easy to navigate to find functions and options.
- vi. Excellent OTT applications have a layout and interface that are user-friendly.

Table 45: Summary of Enjoyment

KPI	EJ	EJ1	EJ2	EJ3	EJ4	EJ5	EJ6	EJ7	EJ8	EJ9
Mean	4.42	4.29	4.28	4.30	4.40	4.35	4.41	4.58	4.58	4.61
Median	4.44	4	4	4	5	4	5	5	5	5
Standard Deviation	0.58	0.75	0.76	0.75	0.71	0.76	0.76	0.73	0.73	0.70
Sample Variance	0.33	0.56	0.58	0.57	0.50	0.58	0.58	0.53	0.54	0.48
Skewness	-1.76	-1.07	-1.08	-1.21	-1.31	-1.33	-1.49	-2.05	-2.12	-1.99
Error of Skewness	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Kurtosis	5.06	1.40	1.58	2.43	2.79	2.65	2.96	4.77	5.37	4.39
Error of Kurtosis	0.23	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Minimum	1.11	1	1	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5	5	5	5
Incomplete Survey	128	128	128	128	128	128	128	128	128	128
Count (N)	460	460	460	460	460	460	460	460	460	460

All the skewness values are negative, indicating that the distributions are skewed to the left. This implies that there is positive sentiment around all the responses, implying that OTTs need to provide an enjoyable service. The positive Kurtosis suggests that there is consensus or a lack of variability in the responses. The standard error of deviation and variance values below 1 suggest that there is little variability in the responses. There is a strong consensus that excellent OTT applications must have aspects related to the ease of personalisation, customisation, and navigation in OTT applications to be considered excellent.

4.5.3.5 Privacy and Security

Table 46 summarises the attributes measuring Privacy and Security. The mean value for all the survey questions were all above 4.5. The median value was 5 for all the questions. This suggests that the respondents believe:

- i. Excellent OTT applications use robust security measures to safeguard my data.
- ii. Excellent OTT applications allow users to have control over privacy settings within the application.

- iii. Excellent OTT applications have options for encrypted and secure communications.
- iv. Excellent OTT applications ensure user information is always encrypted and secure.
- v. Excellent OTT applications ensure that calls and messages are delivered confidentially.
- vi. Excellent OTT applications protect personal information of users from unauthorised access.

The standard deviation and variance values suggest that the survey responses were close to a common value.

Table 46: Summary of Privacy and Security

KPI	PS	PS1	PS2	PS3	PS4	PS5	PS6
Mean	4.66	4.57	4.67	4.70	4.67	4.69	4.64
Median	5	5	5	5	5	5	5
Standard Deviation	0.61	0.83	0.68	0.67	0.70	0.65	0.76
Sample Variance	0.37	0.69	0.46	0.44	0.49	0.42	0.57
Skewness	-2.83	-2.37	-2.61	-2.76	-2.80	-2.74	-2.64
Error of Skewness	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Kurtosis	10.68	5.86	8.29	8.74	9.43	9.53	7.74
Error of Kurtosis	0.23	0.22	0.22	0.22	0.22	0.22	0.22
Minimum	1	1	1	1	1	1	1
Maximum	5	5	5	5	5	5	5
Incomplete Survey	128	128	128	128	128	128	128
Count (N)	460	460	460	460	460	460	460

The negative skewness values below -2 suggests that the distribution is skewed to the left. This suggests that there is a lot of positivity around privacy and security. The Kurtosis values are all above 5.8, with only PS1 below 6. The high Kurtosis suggests that there is consensus or a lack of variability in the responses. It is evident that across all aspects of privacy and security, respondents exhibit a strong consensus and overwhelmingly positive perceptions. The high mean and median scores, coupled with low standard deviations, indicate a high level of agreement among respondents. The negative skewness points to a

concentration of higher ratings, while positive Kurtosis suggests the presence of some extremely positive evaluations.

4.5.3.6 Transparency on Price

Table 47 shows the survey responses that measured Transparency on Price attributes. The mean values were all above 4.4 for all the questions (TR1 to TR3). The median values were all 5. This meant that the respondents placed high importance on the fact that:

- i. Excellent OTT applications have a transparent pricing structure.
- ii. Excellent OTT applications make users aware of the costs associated with using the OTT applications.
- iii. Excellent OTT applications provide clear information about any additional charges or fees.

The variance and standard deviation values were all below 1. This meant that the responses were clustered close to a common value. There is a strong consensus that excellent OTT applications provide clear information about additional charges or fees.

Table 47: Summary of Transparency on Price

KPI	TR	TR1	TR2	TR3
Mean	4.51	4.48	4.49	4.57
Median	5	5	5	5
Standard Deviation	0.87	0.96	0.95	0.91
Sample Variance	0.75	0.91	0.90	0.83
Skewness	-2.22	-2.11	-2.17	-2.39
Error of Skewness	0.11	0.11	0.11	0.11
Kurtosis	4.67	4.02	4.36	5.27
Error of Kurtosis	0.23	0.22	0.22	0.22
Minimum	1	1	1	1
Maximum	5	5	5	5
Incomplete Survey	128	128	128	128
Count (N)	460	460	460	460

The negative skewness values, which were all below -2, suggest that the distribution was skewed to the left. This suggests that there is a lot of positivity around the attributes measuring price transparency. The Kurtosis values are all above 4. The high Kurtosis suggests that there is consensus or a lack of variability in the responses. For the aspects related to transparency on price, respondents expressed a strong consensus and predominantly positive perceptions. Findings highlight that users perceive excellent OTT applications as those that provide transparent pricing information.

4.5.4 Normality test

The normality test was done to determine if both tests follow a normal distribution and results summarised in Table 48.

Table 48: Normality tests

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
RB	0.23	460	<.001	0.76	460	<.001
RS	0.20	460	<.001	0.81	460	<.001
EU	0.15	460	<.001	0.86	460	<.001
EJ	0.19	460	<.001	0.84	460	<.001
PS	0.30	460	<.001	0.62	460	<.001
TR	0.32	460	<.001	0.63	460	<.001

In both cases, the sig. value (p-value) was less than the chosen significance level of 0.05. This implies that there is enough support to reject the null hypothesis for normality. All the variables do not follow a normal distribution.

4.6 Correlation analyses

The correlation was done to assist in identifying the relationship between the variables. The results are summarised in Table 49.

Table 49: Correlation analyses

	Reliability	Responsiveness	Ease of Use	Enjoyment	Privacy and Security	Transparency on Price	Average e-Service Qual
Reliability	1.00	0.71	0.55	0.43	0.57	0.55	0.81
Responsiveness	0.71	1.00	0.60	0.55	0.61	0.64	0.87
Ease of Use	0.55	0.60	1.00	0.69	0.56	0.42	0.77
Enjoyment	0.43	0.55	0.69	1.00	0.56	0.42	0.73
Privacy and Security	0.57	0.61	0.56	0.56	1.00	0.64	0.81
Transparency on Price	0.55	0.64	0.42	0.42	0.64	1.00	0.80
Average e-Service Qual	0.81	0.87	0.77	0.73	0.81	0.80	1.00

The results in Table 50 suggest that there is a strong correlation between the independent variables (Reliability, Responsiveness, Ease of Use, Enjoyment, Privacy and Security, and Transparency on Price) and the dependent variable e-Service Quality. All the correlation values are 0.73 and above. Correlation This suggests that there is a relationship between all the independent variables and e-Service Quality of OTT.

Table 50: Significance test

	R	N	T Stat.	Df	P
Reliability	0.81	460	29.24	485	<.001
Responsiveness	0.87	460	37.13	485	<.001
Ease of Use	0.77	460	25.6	485	<.001
Enjoyment	0.73	460	23	485	<.001
Privacy and Security	0.81	460	29.97	485	<.001
Transparency on Price	0.8	460	28.45	485	<.001

4.7 Regression analyses

The regression analyses were done for the independent variables (Reliability, Responsiveness, Ease of Use, Enjoyment, Privacy and Security, and Transparency on Price) of e-Service Quality against the dependent variable (e-Service Quality) in the next section. This was done to assist in testing the hypotheses in our study.

4.7.1 Reliability and H1

Table 51 summarises the regression statistics using reliability as the independent variable and e-Service Quality as the dependent variable.

Table 51: Regression analyses with Reliability as the independent variable

Model Summary	<i>R</i>	<i>R</i> ²	<i>Adjusted R</i> ²	<i>Std. Error</i>	<i>Observations</i>
	0.81	0.65	0.65	0.32	460
ANOVA	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	88.84	88.84	855.001	<.001
Residual	458	47.59	0.10		
Total	459	136.43			
Coefficients	<i>Beta</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	
Intercept	1.79	0.09	19.31	<.001	
Reliability	0.60	0.02	29.24	<.001	

The first hypothesis was:

H1: Higher levels of reliability will result in higher levels of e-service quality.

The null hypothesis would be:

H0: There is no relationship between reliability and e-service quality.

The R^2 value of 0.65 suggests a 65% variance in service quality. It can therefore be said that the 65% of the variability in e-service quality can be attributed to reliability. The coefficient value of 0.6 means that there is a positive relationship between reliability and e-service quality. The p-value was less than 0.001, which

was smaller than our significance level that was used of 0.05. This suggests a very high confidence level of 99.9%. This means that there is evidence to reject the null hypothesis (H0: There is no relationship between reliability and e-service quality) in favour of H1.

4.7.2 Responsiveness and H2

Table 52 summarises the regression statistics using responsiveness as the independent variable. The hypothesis around responsiveness stated:

H2: Higher levels of responsiveness will result in higher levels of OTT service quality.

The null hypothesis would be:

H0: There is no relationship between responsiveness and e-service quality.

Table 52: Regression analyses with Responsiveness as the independent variable

Model Summary	R	R²	Adjusted R²	Std. Error	Observations
	0.87	0.75	0.75	0.27	460
ANOVA	Df	SS	MS	F	Significance F
Regression	1	102.41	102.41	1378.75	<.001
Residual	458	34.02	0.07		
Total	459	136.43			
Coefficients	Beta	Standard Error	t Stat	P-value	
Intercept	1.64	0.08	21.28	<.001	
Responsiveness	0.65	0.02	37.13	<.001	

The R² value of 0.75 suggests 75% of the variance in e-service quality. It can therefore be said that the 75% of the variability in e-service quality can be attributed to responsiveness. The coefficient value of 0.65 means that there is a positive relationship between responsiveness and e-service quality. The p-value was less than 0.001, which was smaller than our significance level that was used of 0.05. This suggests a very high confidence level of greater than 99.99%. This

means that there is evidence to reject the null hypothesis (H0: There is no relationship between responsiveness and e-service quality) in favour of H2.

4.7.3 Ease of Use and H3

Table 53 summarises the regression statistics using ease of use as the independent variable. The hypothesis around Ease of Use states:

H3: Higher levels of ease of use will result in higher levels of OTT e-service quality.

The null hypothesis would be:

H0: There is no relationship between Ease of Use and e-service quality.

Table 53: Regression analyses with Ease of Use as the Independent variable

Model Summary	R	R²	Adjusted R²	Std. Error	Observations
	0.77	0.59	0.59	0.35	460
ANOVA	Df	SS	MS	F	Significance F
Regression	1	80.32	80.32	655.57	<.001
Residual	458	56.11	0.12		
Total	459	136.43			
Coefficients	Beta	Standard Error	t Stat	P-value	
Intercept	1.22	0.13	9.53	<.001	
Ease of Use	0.74	0.03	25.60	<.001	

The R² value of 0.59 suggests 59% of the variance in e-service quality. It can therefore be said that the 59% of the variability in e-service quality can be attributed to Ease of Use. The coefficient value of 0.74 means that there is a positive relationship between ease of use and e-service quality. The p-value was less than 0.001, which was smaller than our significance level that was used of 0.05. This suggests a very high confidence level of greater than 99.99%. This means that there is evidence to reject the null hypothesis (H0: There is no relationship between Ease of Use and e-service quality) in favour of H3.

4.7.4 Enjoyment and H4

Table 54 summarises the regression statistics using enjoyment as the independent variable. The hypothesis around enjoyment states:

H4: Higher levels of enjoyment will result in higher levels of OTT e-service quality.

The null hypothesis would be:

H0: There is no relationship between enjoyment and e-service quality.

Table 54: Regression analyses with Enjoyment as the independent variable

Model Summary	<i>R</i>	<i>R</i> ²	<i>Adjusted R</i> ²	<i>Std. Error</i>	<i>Observations</i>
	0.73	0.54	0.54	0.37	460
ANOVA	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	73.13	73.13	529.10	<.001
Residual	458	63.30	0.14		
Total	459	136.43			
Coefficients	<i>Beta</i>	<i>Std. Error</i>	<i>t Stat</i>	<i>P-value</i>	
Intercept	1.41	0.13	10.56	<.001	
Enjoyment	0.69	0.03	23.00	<.001	

The R^2 value of 0.54 suggests 54% of the variance in e-service quality. It can therefore be said that 54% of the variability service quality can be attributed to enjoyment. The coefficient value of 0.69 means that there is a positive relationship between enjoyment and e-service quality. The p-value was less than 0.001, which was smaller than our significance level that was used of 0.05. This suggests a very high confidence level of greater than 99.99%. This means that there is evidence to reject the null hypothesis (H0: There is no relationship between Enjoyment and e-service quality) in favour of H4.

4.7.5 Privacy and Security and H5

Table 55 summarises the regression statistics using Privacy and Security as the independent variable. The hypothesis around Privacy and Security states:

H5: Higher levels of Privacy and Security will result in higher levels of OTT e-service quality.

The null hypothesis would be:

H0: There is no relationship between Privacy and Security and e-service quality.

Table 55: Regression analyses with Privacy and Security as the independent variable

	<i>R</i>	<i>R</i> ²	<i>Adjusted R</i> ²	<i>Std. Error</i>	<i>Observations</i>
	0.81	0.66	0.66	0.32	460
ANOVA	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	90.36	90.36	898.25	<.001
Residual	458	46.07	0.10		
Total	459	136.43			
Coefficients	<i>Beta</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	
Intercept	1.08	0.11	9.46	<.001	
Privacy and Security	0.73	0.02	29.97	<.001	

The R^2 value of 0.66 suggests 66% of the variance in e-service quality. It can therefore be said that the 66% of the variability service quality can be attributed to Privacy and Security. The coefficient value of 0.73 means that there is a positive relationship between Privacy and Security and e-service quality. The p-value was less than 0.001, which was smaller than our significance level that was used of 0.05. This suggests a very high confidence level of greater than 99.99%. This means that there is evidence to reject the null hypothesis (H0: There is no relationship between Privacy and Security and e-service quality) in favour of H5.

4.7.6 Transparency on Price and H6

Table 56 summarises the regression statistics using Transparency on Price as the independent variable. The hypothesis around Transparency on Price states:

H6: Higher levels of Transparency on Price will result in higher levels of OTT e-service quality.

The null hypothesis would be:

H0: There is no relationship between Transparency on Price and e-service quality.

Table 56: Regression analyses with Transparency on Price as the independent variable

	<i>R</i>	<i>R</i> ²	<i>Adjusted R</i> ²	<i>Std. Error</i>	<i>Observations</i>
	0.80	0.64	0.64	0.33	460
ANOVA	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	87.13	87.13	809.33	<.001
Residual	458	49.31	0.11		
Total	459	136.43			
Coefficients	<i>Beta</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	
Intercept	2.21	0.08	27.21	<.001	
Transparency on Price	0.50	0.02	28.45	<.001	

The R^2 value of 0.64 suggests 64% of the variance in e-service quality. It can therefore be said that the 64% of the variability service quality can be attributed to Transparency on Price. The coefficient value of 0.50 means that there is a positive relationship between Transparency on Price and e-service quality. The p-value was less than 0.001, which was smaller than our significance level that was used of 0.05. This suggests a very high confidence level of greater than 99,99%. This means that there is evidence to reject the null hypothesis (H0: There is no relationship between Transparency on Price and e-service quality) in favour of H6.

4.8 Important variable

4.8.1 Beta Test

The standardised Beta values were calculated by standardising the individual variable responses and performing the multivariable regression analyses. These

were summarised in Table 57. Table 57 further summarises the results of the hypothesis testing. The researcher can conclude that transparency on price was the most important variable with the highest Beta value of 0.27, followed by reliability and responsiveness jointly at 0.22. Privacy and security followed with a Beta of 0.19. Ease of Use and enjoyment are the least important based on the Beta values of 0.18 and 0.17 respectively.

Table 57: Standardised Beta values

Variable	Hypothesis	Verdict	Standardised Beta
Reliability (RB)	H1	Accepted	0.22
Responsiveness (RS)	H2	Accepted	0.22
Ease of Use (EU)	H3	Accepted	0.17
Enjoyment (EJ)	H4	Accepted	0.18
Privacy and Security (PS)	H5	Accepted	0.19
Transparency on Price (TP)	H6	Accepted	0.27

4.8.2 Implications for OTT Service Quality

The above highlights that regulators would need to ensure that Transparency on Price, Reliability and Responsiveness receive the greatest attention, when incorporating the voice of the customer in service quality regulations that OTT providers would need to adhere to. It would be important, however, to ensure that expert opinion is incorporated into the overall regulatory picture to ensure that there are no issues that might be ignored by consumers which could have a detrimental effect. One dimension that would play an important role would be Privacy and Security. It would need the expert eye to add more controls around this. It was estimated that global spending on cybersecurity would exceed USD 1.75 trillion for the period between 2021 to 2025 as criminals exploit unsuspecting consumers due to the increased focus on this. Despite the sample not fully representing exactly the demographics, researcher believes that the results can be used to represent the broader population as there was a majority black and 50:50 gender split. The merging of the consumer and regulatory expert opinion is discussed further in section 5.5.

4.9 Conclusion

The survey results from the respondents were analysed. There was a reasonable gender split from the respondents of 50:50 male to female ratio after removal of incomplete data. There was an under-representation of the national South African population averages but the results correctly had a predominantly majority Black population, just over 14% below the national average of 81%. The Cronbach Alpha was used to check the reliability of our questionnaire. It was indeed confirmed as reliable. The rest of the calculations centred around factor analyses, correlation and regression analyses, which allowed the researcher to determine the relationship between the variables. The researcher was able to ascertain that all the independent variables (Reliability, Responsiveness, Ease of Use, Enjoyment, Privacy and Security, and Transparency on Price) had a positive impact on e-Service Quality of OTT applications. The regression analyses helped to determine the variability of e-Service Quality as the independent variables were changed. They all had a strong influence on the overall service quality from the R^2 values. The standardised Beta values were calculated to help in ranking the independent variable that had the most impact on the dependent variable. Transparency on price was identified as the dimension. The researcher was thus able to accept all the hypotheses (H1 to H6) as summarised in Table 57. It was concluded that Reliability, Responsiveness, Ease of Use, Enjoyment, Privacy and Security, and Transparency on Price are all required by consumers to ensure adequate OTT e-Service Quality and that Transparency on Price was the most important independent variable, followed by Reliability and Responsiveness. This was important in answering in RQ1 and RQ2 listed as:

RQ1: What are the fundamental quality indicators related to quality-of-service of OTT providers as perceived by regulators and consumers?

RQ2: What is the primary quality indicator that consumers consider as the most significant in relation to the quality of Over-the-Top (OTT) services?

Chapter 5 concludes on the results of the qualitative section, giving us the regulatory opinion about the research study.

CHAPTER 5 – PRESENTATION OF QUALITATIVE RESULTS

5.1 Introduction

Chapter 4 discussed the results from the interviews or qualitative component of our research. The qualitative aspect was used to get specialist opinions on the intricacies introduced by OTT providers and the possible regulatory approaches that could be used in OTT. These were used to answer RQ3 and RQ4.

RQ3: What are the challenges and opportunities of regulating Quality of Service in OTT?

RQ4: What are the regulatory implications of incorporating Over-the-Top (OTT) services within the current Quality of Service (QoS) framework of the End User Subscriber Service Charter?

5.2 Demographics

Table 58 summarises the profiles of participants. As was highlighted in the ethics agreement, the personal identities and company detail of the participants were kept anonymous.

Table 58: Demographic details of respondents

Respondent	Gender	Age	Industry	Title	Years Experience
R1	Female	33	Regulatory	Manager	9
R2	Female	35	Regulatory	Engineer	10
R3	Male	41	Regulatory	Engineer	15
R4	Male	43	Telecommunications	Senior Manager	21
R5	Male	40	Telecommunications	Manager	17
R6	Female	35	Telecommunications	Manager	8
R7	Male	39	Telecommunications	Manager	16
R8	Female	40	Telecommunications	Manager	18

The participants comprised four females and four males. The ages ranged from 33 years up to 43 years. Three of the participants were employed with the National Regulatory bodies. The remainder of the participants were employed in the telecommunications sector. The participants all had more than eight years of experience. One participant had 21 years of telecommunications experience.

5.3 Themes

The purpose of the qualitative portion of the study was to investigate QoS standards for OTT service providers that offer similar services to MNOs. The interviews aimed to obtain experts opinion on how to address the following objectives:

- Finding challenges and opportunities around OTT QoS Regulations.
- Implications of regulating OTT service into the regulatory framework.

The interview responses were transcribed and key points highlighted. Each text of interest was captured and the process below was followed to develop codes.

- Respondent: R1 to R8
- Question: Question 1 to Question 25
- Statement: What, Where, Example
- Code Words: Words capturing the key points in the text identified
- Actual Text: Actual Text lifted from the interview guide

The key codes were used to group similar codes into umbrella themes. These themes were like the pillars that were developed in the conceptual framework in Chapter 2 along which the theory of public interest regulation was evaluated. The themes below emerged from the interviews and are grouped in Tables 59 to 63.

Table 59: Competition and equity

Theme	Code
Competition and Equality	CE1: Level of Competition between MNOs and OTT
	CE2: Unequal Treatment
	CE3: Should they face the same regulatory burden
	CE4: Proposed elements for regulation to ensure fair competition and equality
	CE5: Cost Reduction and Affordability

Table 60: Consumer welfare

Theme	Code
Consumer Welfare	CW1: Perceived Quality provided by OTT
	CW2: Impact on Overall Service Experience on OTT
	CW3: Aspects Important for Consumer Welfare in OTT

Table 61: Sustainability

Theme	Code
Sustainability	SU1: Asymmetry and Impact on Sustainability
	SU2: Risk to sustainability with regulatory asymmetry
	SU3: Proposed regulation to promote sustainable practices

Table 62: Innovation

Theme	Code
Innovation	IN1: Does Asymmetry contribute to innovation capability of MNOs and OTT
	IN2: Areas of innovation regulatory from regulatory asymmetry
	IN3: Measures in regulation that will promote innovation

Table 63: Regulatory aspects

Theme	Code
Regulatory Aspects	RA1: Define Quality from an OTT perspective
	RA2: Expand on the EUSSC
	RA3: Utilise Ex-Post Regulatory Framework

The above themes and sub-themes are discussed in the next sections.

5.4 Analyses of themes

5.4.1 Competition and equality in the telecommunications sector

The respondents of the interviews were primarily centred around the following sub-themes:

- Level of Competition between MNOs and OTT.
- Unequal Treatment.
- Should they face the same regulatory burden?

5.4.1.1 Level of Competition between MNOs and OTT

This study focused on OTT service providers that offer similar services to MNOs. Competition was defined as the rivalry that develops between two or more organisations where the goal was to obtain something that they all cannot obtain (Listra, 2015). R2 and R1 highlighted that MNOs and OTTs are more ancillary services. R2 and R1 stated:

“I would think they both leverage off each and other to deliver their services.” –
R1

I see them as complementary services. The problem is that in our context, OTTs rely on MNOs to provide their services. Some even offer exclusive packages that promote the exclusive use of the OTT. OTTs help drive the revenue for MNOs other business streams where the data business thrives on. -R2

It is true that OTTs help drive data demand on the MNO network in the case where the MNOs are the ISP. In this case, however, the researcher is focusing particularly on the OTT service providers that provide the same services as MNOs.

R1 highlighted how the MNOs needed to reevaluate their offerings when OTTs started encroaching on the market. In the absence of regulation, the MNOs had to embrace their entry into the market. They had to readjust their business models

to embrace the existence of OTTs, especially seeing that there was a wait-and-see approach from government around regulating the OTTs.

R6 raised a concern about the decrease in voice revenues that the mobile operators are currently experiencing due to the increase in popularity of calling on OTT platforms. There has been a significant decline in voice revenue for MNOs.

“There has been a significant decline in voice revenue for MNOs. Even though I have no data to back up my claim, I believe it’s due to OTT services platform.” – R6

The above findings suggest that Group 1 OTTs and MNOs offer the same services and as such need to be bound by the same regulations.

5.4.1.2 Unequal treatment

All the respondents highlighted various elements that show how unequal MNOs and OTTs are being treated despite offering the same services in Group 1 OTT. Respondents highlighted the investment that MNOs make to build their networks and the QoS regulations that they need to meet to offer services and avoid fines from the regulator.

R1 showed the investment burden carried by MNOs to build networks:

It means MNOs would need to invest more to upkeep the physical infrastructure that supports the OTT and ensure that the products they offer are delivered according to set service quality requirements. More effort required on the side of the MNO and would suggest it is unfair.

R2 argued that the MNOs in future would be data pipes and the services would be left to the OTTs to carry:

OTTs helped to drive data demand on the MNO networks. In as much that there were revenues that were eroded, there’s new revenues that were

unlocked and therefore future growth of MNOs would be in data, and we move to a platform environment to cater for the service needs.

R8 argued that OTTs do not have to deal with regulation in their daily operations:

“It is unfair competition where the OTT providers have an advantage as they are not weighed down by regulation and allow them to be nimble and respond speedily as the market dictates.” – R8

5.4.1.3 Proposed elements for regulation to ensure fair competition and equality

Regulation required

All the respondents agreed that there needs to be some form of regulation around OTTs, but differed in what the most effective way would be to ensure equal competition and equity.

Symmetric regulation

Half of the respondents agreed that symmetric regulation was needed.

“Move from asymmetry to symmetry. Does not matter if you remove regulation, just make sure that consumers are protected.” – R6

“Symmetry is the best way to show fairness and equal treatment of market players.” – R8

Regulate same basket of services

A total of 63% (R1, R3, R4, R5 and R8) of the respondents proposed that the same service should be regulated to ensure that companies are judged on an equal footing, irrespective of the technology used to offer the service.

“With time we would need to protect similar services to the MNOs.” – R1

“I'm going just to ensure that we regulate the same things across the board.” – R5

“You should try creating symmetry, develop equivalent standards for OTT providers.” – R8

Regulate cost

Half of the respondents (R2, R4, R6 and R7) proposed that some sort of financial regulation is imposed on OTTs to ensure that the differentiator between MNOs and OTT becomes quality. The proceeds could either be used to ensure that the tax revenue remains in the country, regardless of what consumers use or used to compensate the MNOs for the additional investments in building networks.

“We could even look at different ways of regulating them. Ensuring that all the OTTs are registered in the country to ensure that the tax revenue remains in our country.” - R2

“You also need at some point, you also need to share costs because remember, your service providers maintain the network, they build sites to improve the quality of service for the consumers.” – R7

Linking to Proposition (P1): Inclusion of OTT services within the existing QoS framework may lead to increased competition and equality among OTT service providers and traditional MNOs, potentially resulting in a more level playing field for all market players.

The findings under the competition and equality section revealed that 88% of the respondents see Group 1 OTTs and MNOs as competitors due to them offering the same services. Even if they were seen as similar complementary services, our focus was more on the provisioning of services that are common between MNOs and OTTs. This was in line with the study done in Turkey which advocated for a level playing field (Bilbil, 2018). Studies that saw them as complementary services also agreed that a balance was required to level the playing field, but cautioned against reversing the gains that were obtained from the price reductions and innovation brought by OTTs (Stork & Esselaar, 2019). This balance would be in the domain of the regulators. There was unanimous agreement that OTTs benefit from not having to operate in an environment that

was regulated and as such could operate with greater agility in the market. All the respondents agreed that regulation was required around OTTs, but the difference was in the aspects that needed to be regulated. The majority (63%) advocated for same service regulation. This meant that a basket of important services is identified by countries that would need to be protected. This was very similar to the symmetric regulation proposed by 50% of respondents. Half of the respondents suggested some sort of cost being imposed to the OTTs to either be paid to the ISP carrying their traffic or the national regulator to ensure that monies do not leave our shores to global entities and that quality becomes a key differentiator in service provisioning. Currently cost is what is pushing people to OTTs. This meant that there was a need to ensure that the same services are regulated across the board to ensure fairness in line with the recommendations of Stork et al. (2020) and Bilbil (2018).

The quantitative section of our study revealed that transparency on price was the most important indicator to consumers, as was highlighted in Chapter 4. Any costs imposed on OTTs would result in either the providers leaving the markets or passing them on to consumers. It would therefore be best to adopt regulation on the same basket of services or symmetric regulation.

5.4.2 Consumer welfare

The responses to the interviews were primarily centred around the following subthemes:

- Perceived Quality provided by OTT.
- Impact of Overall Service Experience on OTT.
- Aspects important for Consumer Welfare in OTT.

5.4.2.1 Perceived Quality provided by OTT

Cost driving usage of OTT

Most respondents were not too concerned about the QoS provided by OTTs. Most respondents (75%) were quick to highlight cost being a primary driver of

consumer drive to OTTs. R1, R4, R5, R6, R7 and R8 all highlighted how OTT services are loved because of the price.

“Benefit consumers because they are cheap and reliable. OTTs have slashed the costs of communications.” – R1

“Honestly speaking, from a consumer welfare point of view, my perception is that they do add value from a consumer point of view because some of them appear to be more affordable.” – R4

What comes to mind is cost. So, the consumer benefit is just choosing which medium to use to communicate. OTT showed that you can do multiple things, text/t multimedia, and voice calls or voice notes as they call them at a very low cost almost close to nothing. -R5

“OTT have ensured that you can send texts, multimedia and make voice calls at a fraction of the cost.” – R8

No consequence for poor service

There was, however, concern raised by 38% of the respondents about the lack of legislative bodies to protect consumers when poor quality was experienced using OTT services. These were highlighted by R1, R5 and R8.

“There is also no recourse for consumers should their concerns around quality of service on the OTT platform, you must take whatever the platform offers.” – R1

OTTs are left to themselves to regulate and therefore cannot be held accountable for experience that consumers get but remember quality and cost, if you want better quality than the cost will be higher but then if you want cost low if lower costs and then you call it will always be questionable and you pay for what you get in a nutshell. – R5

OTT reliance on ISP

In total, 25% of the respondents highlighted that QoS in OTT cannot be solely left to the OTT. R1 and R6 flagged the role played by ISPs.

OTT service providers depend on the network quality you know to deliver that quality of service or experience that the customer demands. So, depending on the Wi-Fi speeds, if it is a 10 Meg link upwards or something higher, then I think they would satisfy some superior quality of service. – R1

“All that is required is for the user to have a smartphone and an internet connection. The challenge with OTT services is that there is a dependency on reliable internet connection which OTT providers cannot guarantee.” – R6

5.4.2.2 Impact of no QoS on overall service experience on OTT

Superior service in MNOs when compared to OTT

R1, R2, R3, R5, R6, R7 and R8 highlighted the superior experience offered by MNOs over OTTs (87,5%).

“It is difficult to protect the consumer under such circumstances. For those customers that have quality as a priority, OTTs currently aren’t the best way to communicate.” – R3

“... the likes of your WhatsApp and Facebook, the quality-of-service, I think it's dependent by the service provider. At the time, it's not the same and it's not as consistent as when you can pay your normal mobile operators.”-R7

No recourse for poor service in OTT

R1, R2, R4, R5, R7 and R8, who represented 75% of the respondents, further highlighted the lack of regulatory frameworks in OTT to protect users.

“OTT are complementary services over and above the data that would normally be on an ISP when you are not using an OTT. They do not have any licences, and therefore have no regulatory obligation.” – R2

“So, we must just take what the OTT providers offer little to no protection or regulatory on that. I have not seen one yet.” – R5

Cybersecurity concern in OTT

R5 and R6 highlighted security as a concern in OTT and added that it needs to be a major part of OTT QoS regulation. This highlighted that OTTs need to also consider cybersecurity as a major concern as they are IP-based services.

“From a security point of view, the fact that lawful interception and monitoring of traffic is not a regulatory requirement is a concern.” – R6

“What we also need to, to also consider is the security or rather the safety or protection of the consumer from a consumer perspective.” – R7

5.4.2.3 Aspects important for consumer welfare in OTT

This section was meant to highlight the important aspects around consumer welfare that the respondents deemed essential for OTT services when wearing the consumer welfare hat.

Maintain cost benefit to consumer

The major driver of users to OTT is the cost advantage that made them attractive to users over traditional services. All the users except R2 highlighted that those users benefited from the lower cost.

“They are cheap ...” – R1.

“They are cheap and have been good.” – R3

“Most of the time they are cheaper than mobile operators.” – R4

“International calls and messaging can be to anywhere in the world without enabling roaming services and incurring exorbitant costs.” – R6

Easier cross-border communications

Their low cost and global reach of the internet allowed for easier cross-border communications. R4, R6, R7 and R8, representing 50% of respondents, highlighted this fact as a benefit to users of having OTT.

“For example, OTT voice calls are a fraction of traditional cell phone voice costs. Reach – International calls and messaging can be to anywhere in the world without enabling roaming services and incurring exorbitant costs.” – R6

“It has resulted in reduced roaming charges as seen from the operators in South Africa where the trends have been to reduce the cost of roaming voice and data bundles.” – R8

OTTs provide an alternative

An extension to the global reach is that OTTs provide an alternative way to communicate where we previously had been largely depended on MNOs. This was highlighted by R4 and R8.

“They provide an alternative to an existing traditional option.” – R4

“Give choice, can communicate across borders where before it would incur huge charges.” – R8

Linking to Proposition (P2): Implementing efficient and cost-effective regulatory mechanisms for monitoring and enforcing QoS standards in OTT services can enhance consumer benefits by promoting affordability, accessibility, and transparency in service offerings.

The low cost charged for services on OTTs was highlighted by 75% of respondents as the reason for their popularity. The findings went further to highlight the superior service experience given by MNOs. This was in line with

the findings in the service quality survey where the second biggest gap in service quality was seen in the reliability dimension (Chapter 4). This would suggest that some of the gains obtained from having a well-regulated telecommunications sector with high quality standards might be negated if the OTTs continue to operate outside the regulatory frameworks. It should, however, be noted the benefits that OTTs brought into the market where many more people are able to communicate due to the reduced fees that OTTs charge and the subsequent reductions that were seen implemented by MNOs. Respondents further highlighted that there was no accountability in OTTs because of the lack of regulatory oversight. OTTs have also brought about new risks to consumers, with the major one being the risk of operating online. The majority, 88% of the respondents, highlighted the need to maintain this affordability provided by OTTs as it gave many consumers the ability and choice when communicating. The above highlighted the need for caution when regulatory balance in quality was implemented to ensure that there was no adverse effect on pricing for the consumer. This is in line with the findings of Stork and Esselaar (2019) where they advocated the need not to reverse the price benefits for consumers that were brought about by the introduction of OTTs.

5.4.3 Sustainability

This section investigated the long-term viability of the sector to ensure the best way forward. The following themes emerged.

- Asymmetry and impact on sustainability.
- Risk to sustainability with regulatory asymmetry.
- Proposed regulation to promote sustainable practices.

5.4.3.1 Asymmetry and impact on sustainability

The regulatory asymmetry has resulted in changes in the market as it evolved.

Services moving to OTTs.

OTTs have largely been able to operate within the environment without too much regulation. A total of 75% of respondents (R3, R4, R5, R6, R7, R8) have highlighted that MNOs are losing popularity to OTTs with the net effect of revenues declining in traditional voice and text operations. OTTs appear to be positioning themselves as the service value layer while MNOs are being relegated to internet providers.

“We might have to look at an environment where OTTs control the services offered on the networks provided by OTTs.” – R4

“So, OTTs took away the revenue from MNOs. MNOs used to make money with voice calls, and that being taken away from them, we saw that the revenue just disappeared.” – R5

“It has allowed OTTs for example to replace text and they are soon going to carry voice, all the voice. This would mean that long term, there would be no guarantee on service quality.” – R6

“MNOs will be a pipe where the OTT providers can monetise on the internet platform provided by the MNOs. The mobile operators have seen their revenues around the traditional business models being eroded by the OTT providers.” – R8

R8 further highlighted how mobile operators such as MTN and Vodacom have had to look for different revenue streams to compensate for this revenue decline.

“Mobile players would start looking for other growth providers such as financial services where MTN and Vodacom have already launched apps offering these services.” – R8

5.4.3.2 Risk to sustainability with regulatory asymmetry

OTT control of services

All the respondents appreciated the possibility of a future where MNOs will no longer be an option in the provisioning of communications services and will most probably be ISPs for their traditional business offerings.

“... otherwise, we run the risk of losing MNOs as communications companies and will evolve into other entities because consumers are leaning more to OTTs as they are reliable and cheap.” – R1

“We have the potential that the OTT will be the sole providers of certain services as the MNOs will look for other ways to remain profitable.” – R3

R3 highlighted the risk to quality as there were currently no standards or regulation governing this in OTTs:

“... in poor quality and accountability if there’s no adequate regulation developed soon.” – R3

R8 highlighted the risk of revenue leaving the country should a fee structure be implemented in OTTs because most of the OTTs are global entities.

Should WhatsApp decide to charge R2 a month in SA, we would be seeing R48 million moving to the platform as already highlighted prior. This would be money that leaves our country. The contribution of mobile operators to the fiscus via the traditional business models would therefore be diminished.” – R8

5.4.3.3 Proposed regulation to promote sustainable practices

The one area that was being recommended is to develop symmetric regulations to ensure that OTTs and MNOs are treated equally. A total of 50% of respondents (R3, R4, R7 and R8) felt that the long-term future of these entities will therefore not be determined by one entity being treated differently.

“Ensure the same quality standards that apply to MNOs are developed for OTT. That way OTTs and MNOs can compete on an equal footing and long-term sustainability of both is not determined by unequal handling.” – R3

“Symmetrical regulation. Ensure that whatever service that is being regulated like voice calls and text gets regulated throughout, regardless of how it is being accessed.” – R4

Create a symmetrical environment. Alternatively, decide on a policy direction. For example, if it is to promote innovation, make it less cumbersome for the mobile operators by removing some of the regulation and their costs to comply and ensure regulation around those that would safeguard the future of the industry where both compete on an equal footing.” – R8

R1 and R2 seem to have embraced that OTTs are the future and needed to adapt current regulation to cater for OTT.

“We need to see if we need regulation to assist with the reliability and safety aspects around OTT.”- R1

“Constant studies and peer reviews and recommendations, mainly because we rely mainly on recommendations made by the ITU.” – R2

R6 raised the issue of licensing OTT as this would ensure that tax revenue is protected either way the market chooses.

“OTT providers be licensed locally. This will ensure that they are liable for tax and future regulatory developments.” – R6

Link to Proposition (P3): Developing symmetric regulatory mechanisms for monitoring and enforcing QoS standards in OTT services could improve the long-term sustainability of MNOs’ traditional business.

The long-term prospects of mobile communications have a future where OTTs will be responsible for services and MNOs will no longer play in that space if

things remained the same. This would remove choice for consumers. Choice in a market result in greater competition and reduced prices for consumers (European Commission, 2024). These findings were in line with the mandate of the DCDT and regulatory of obligations of ICASA to ensure quality communications at affordable prices for all South Africans (DCDT, 2023; ICASA, 2005a). Stork et al. (2019) predicted that MNOs would be data-only companies by 2025, which might be a bit early, but the trend is already being seen with Vodacom and MTN reporting declines in traditional voice revenue (MTN, 2023; Vodacom, 2023). Respondents agreed that the introduction of symmetric regulation would result in an environment where services offerings are protected and possibly prolong the environment with both MNOs and OTTs. Even if we end up having a future where OTTs are the only service providers, it will mean that we still get the same high-quality communications services. The researcher can conclude that developing symmetric regulation for MNOs and OTTs would assist in ensuring that quality is maintained within the provisioning of communications. With the playing fields being fairer, it would encourage a situation where both MNOs and OTTs remain to benefit consumers with choice.

5.4.4 Innovation

Innovation investigated how the industry can remain abreast with latest global trends. The key with innovation is to ensure that it does not harm consumers. Consumer protection would normally come in the form of regulation. The prominent themes that arose were:

- Does asymmetry contribute to innovation capability of MNOs and OTTs?
- Areas of innovation regulatory from regulatory asymmetry.
- Measures in regulation that will promote innovation.

5.4.4.1 Does asymmetry contribute to innovation capability of MNOs and OTTs

All the respondents agreed that OTTs have benefitted from operating in an environment that has very little regulatory oversight. They can utilise feedback and other insights from users to improve their applications.

R1 highlighted the deliberate intent by our country to embrace digital technology. They further highlight the lack of regulatory oversight around OTTs.

OTTs have benefited from the country's drive to go digital and therefore, there's little regulation around them. It has allowed them to drive their products with little concern about being wrapped on the fingers for delivering any substandard products." – R1

R8 was one of the respondents who reinforced the idea that OTTs rely heavily on consumer insights from their platforms to continue innovating.

The lack of regulation has enabled the OTTs to move and operate with greater freedom as there's little regulation around their service offering. They have been able to continue improving their applications to meet consumer demands. They can furthermore get feedback from consumers on their apps." – R8

R2 acknowledged that although MNOs are regulated, their data business benefitted from the data demand driven up by OTT networks.

"MNOs benefit from what other players produce as services that are consumed on their data networks despite them being heavily regulated." – R2

MNOs operate in a regulated environment

All respondents highlighted regulation as one of the reasons why MNOs do not operate with as much innovation as the OTTs. Respondents highlighted that MNOs sometimes change their environment because of pressures from that

environment. MNOs need to operate within the regulatory framework, otherwise will risk getting fines.

“MNOs have a well-developed regulatory environment and therefore have a lot of things to check before they introduce any new products.” - R1

“MNOs must reduce their prices not because of them being innovative but because the market dictated so because the OTTs had produced ways to do these services for a fraction of the cost.” – R3

If you are regulated, then it means your innovation is limited to the borders defined by the regulatory framework. You cannot innovate outside what is legally permissible. MNOs have a well-defined regulatory framework that they operate and adhere to.” – R4

“MNO are stifled by regulation. For example, you can only operate within the spectrum allocated to you. This on its own is a limitation.”- R6.

5.4.4.2 Areas of innovation regulatory from regulatory asymmetry

In total, 50% of respondents (R8, R7, R6 and R5) highlighted that the major advantage that OTTs benefit from is the regular feedback from their platforms that they can use to improve their applications.

“An example would be if for instance Instagram launch ability to make voice calls or similar to the other apps and then there are regular continuous updates on apps to meet and satisfy customer requirements.” – R5

“OTTs make incremental improvements in their app offering without worrying about laws ... Sometimes even force user to get the latest apps once their apps become too old.” – R6

App improvements can be done using feedback right from consumers on the apps, like I've alluded previously. You are looking at other platforms such as ... umm Twitter (now called X), I think LinkedIn also launched calling functionality as well. – R7

App improvements can be done using feedback from consumers on the apps. Privacy for example is one which gets regularly updated to ensure that user data does not end up in the wrong hands. For any changes on the MNO, they must ensure that they do not contravene any existing laws that govern the industry. - R8

R3 further highlighted how OTTs had a hand in reducing the cost of text and voice communication because they were able to reduce the overall cost.

“Currently in SA, the drive has been to reduce the cost to communicate and so I doubt there’s going to be legislation around OTTs soon.” – R3

5.4.4.3 Measures in regulation that will promote Innovation

Softer approach to regulation

In total, 63% of respondents (R1, R2, R4, R5 and R7) agreed that there was a need to reduce the amount of regulation in the sector, especially around MNOs, to aid their innovation capabilities.

“The regulator should look at relaxing the environment to allow for greater fairness and promote growth and only step in to protect users.” – R1

“Ensure that we aren’t too strict with what MNOs and OTTs do with the allocated resources and ensure fairness.” – R2

“We should introduce regulation once potential threat is noticed in new innovative products.” – R4

“So, to promote innovation, uh, we thought you don’t want the regulatory to be stuck to make or you don’t want the greatly to be so strict so that it promotes innovation.” – R5

“I don’t think it really or I don’t think it necessitates any policy players or regular or regulations and we should also enable innovation to take place.” – R7

Protect the consumer

The majority, 75% of respondents (R3, R4, R5, R6, R7 and R8), highlighted that regulation is meant to protect the consumer.

“Regulation is required more to protect the end-user.” – R3

“Regulation is there to protect the end-user rather than to stop or limit innovation.”
– R4

“But then you want the regulatory to understand that they are regulating to benefit the customer.” – R5

“The regulator must level the playing field, ensure that consumers are protected.”
– R6

I honestly feel that the only person that needs to be protected in all these innovations or whatever that is being launched, be it by the OTT teams or your mobile operators, the one person that needs to be protected is there the end-user right end. – R7

“Regulation should be there to protect the end-user. You want regulation to promote innovation without causing harm to consumers.” – R8

Measuring quality

The goal of a regulator is to be seen as fair. R3, R7 and R8 were advocating for quality to be tested. R3 was advocating for quality standards to be developed for OTTs:

“Come up with OTT type quality standards.” – R3

R7 was advocating for benchmark tests to be done like the MNOs and have reports published to measure the quality experienced:

“ICASA needs to conduct benchmark trials on both OTT providers and MNOs.” – R6

R8 went further to highlight that the insights that are collected by OTTs have information that could be used to measure quality of OTTs and can be used to gauge the user experience.

The easiest way would be to ensure that the information that the OTT providers get around quality, gets filtered down to the regulator so that the level of quality can be established for each provider. An example are the insights after making a WhatsApp call, to rate the service. That information can be used to rate and investigate potential quality issues where the aim is to ensure that consumers get a quality service. Currently it is just the MNOs that have minimum standards.” – R8

Link to Proposition (P4): Reducing regulatory burden of OTTs and MNOs can improve the innovation capability of MNOs and OTTs.

The findings highlighted that OTTs were able to attract large volumes of consumers by delivering innovative solutions that cost a fraction of what MNOs charge. This was the view of all the respondents that OTTs have generally been more innovative than MNOs. The major benefit that was highlighted was that OTTs have access to almost real-time user information that they can use without having to worry too much about regulation. MNOs, on the other hand, have a well-defined regulatory framework that attracts penalties for non-performance. Innovation from OTTs has benefitted consumers by reducing the price to communicate. Almost 75% of respondents highlighted that when quality regulation is introduced, the consumer must remain a top priority. This is in line with the mandates of the DCDT and ICASA to protect consumers (DCDT, 2023; ICASA, 2005a). The respondents recommended softer symmetric regulation across the board to ensure that the regulation does not stifle the innovation capabilities of OTTs and MNOs to ensure that consumers continue to benefit and are not left behind as a country. This was in line with research in the Indonesian market that highlighted the need to protect the consumer without stifling innovation of the providers (Nandhiasa & Haryadi, 2015). The respondents highlighted that the same insights that are collected by OTTs could be used to

determine the service quality of consumers. This would require that quality is measured after the occurrence of an event. This was different from the current framework where standards are determined in advance for MNOs to adhere to. Robinson and Okeleke (2020) propose that consumer insights be collected to measure the experience of OTT users. The researcher concludes that reducing the regulatory burden would assist in the innovation capabilities of OTTs and MNOs.

5.4.5 Regulatory aspects

This section was used to understand what would be required if South Africa were to develop QoS standards around Group 1 OTTs. This was discussed around the following emerging themes.

- Define quality from an OTT perspective.
- Expand on the EUSSC.
- Utilise ex-post regulatory framework.

5.4.5.1 Define quality from an OTT perspective

Define OTT

In total, 63% of the participants (R1, R2, R4, R7 and R8) mentioned that OTTs need to be defined in legislation. You cannot regulate what you do not know.

” ... define the OTT before any adequate regulation can be drafted.” – R1

“We need to define them in regulation first before we can talk about regulation.”
– R2

“We also need to define these OTT services and investigate the feasibility of a licensing framework to ensure that it will be easier to enforce compliance around quality.” – R4

“The first thing that they need, that needs to be done is defining. It's some sort of regulation when it comes to the OTT. What is allowed and what's not allowed.” - R7

“Define OTTs in regulation first.” – R8

R1 further highlighted the need to clarify who would carry the policy mandate for OTTs as there was overlap with several bodies.

“There is a need to establish where the policy direction would come from before ICASA can regulate. There might be overlap with the mandate of the domain name authority (.zadna) and the DCDT.” – R1

Define OTT quality standards

A total of 75% of respondents (R1, R2, R3, R4, R6 and R8) highlighted the need for OTT QoS standards. They felt that it would be important to have equivalent service standards that match the MNOs.

“Example would be defining quality of an IP-based call to determine equivalent measurements.” - R1

“We need to then formulate ways to monitor the same service similar to the MNOs.” - R2

“Define the minimum quality of service requirement which would be able to cater for the OTT services.” – R3

R4, R6, and R8 went further to highlight that standards bodies like the ITU, to which South Africa is a signatory, could be consulted to get guidelines on best practices.

“Standard bodies like the ITU have already developed recommendations and best practices for OTTs.” – R4

“It must be mandatory for OTT providers to comply with minimum standards that are prescribed by different bodies.” – R6

“Adopt standards and guides as provided by ITU, internet task force, ETSI, etc., where they can be used to build regulations appropriate for the country. Standards are already there just need to adapt them for their needs.” – R8

5.4.5.2 Expand on the EUSSC

All the respondents agreed that the current EUSSC is not suitable for OTTs and needed some sort of adjustment to include OTT. Some 63% of the respondents (R1, R2, R4, R5 and R7) highlighted that EUSSC would be where OTT quality would most likely sit in the framework, alongside MNOs.

“The current EUSSC was evaluated, and it was noted that the current framework did not cater for internet-based applications.” - R1

“I suggest we ensure that there’s key services that are already identified in the EUSSC where we can extend this framework to cover OTT.” – R2

“... and need to expand on the current EUSSC because the current framework does not cater for OTT, it was specifically meant to cater for MNO.” – R4

“Expand on existing framework to include OTT and then we adopt from there to see what can what makes sense and what is still applicable.” – R5

“Decide with the existing stakeholders on how we then embed OTT to our regulations as South Africa and then we put the two together and we ensure that everything is regulated.” – R7

R8 went further to highlight that to measure service effectively in OTTs would need an end-to-end approach to QoS that would allow troubleshooting whenever failures occur.

“No, need quality of experience type KPIs that would distinguish where the experience is a problem to incorporate OTTs.” – R8

5.4.5.3 Utilise ex-post regulatory framework

All the respondents agreed that South Africa needed to get an ex-post type regulatory framework which would be more appropriate for OTTs if some sort of regulatory oversight was required. It caters for the rapidly growing, internet-based technology and would allow to investigate end-to-end quality of experience before attributing responsibility for any concerns in service quality.

“Would think the ex-post is applicable to the OTT because it would tie in with the customer experience, uh customer insights collecting that kind of data from, directly from the devices or something like that.” – R1

“OTTs are more IP type services, and it would be difficult to develop ex-ante regulation for something that is continuously changing and new.” – R2

“Ex-post. We moving to more IP type applications in an evolving environment.”- R3

“I believe if the regulator can adopt the ex-post regulatory framework, best way to monitor OTTs using feedback from providers and furthermore adopt a QoE type framework and not QoS.” – R4

Ex-post would allow OTTs to start working on their quality of service. So, if you want to monitor the OTTs effectively, you know what they're doing, then you, you'll start seeing a benefit of that. ex-ante, which is the current framework where we have the predefined KPI that service providers must meet which is difficult to implement with the OTTs. – R5

Ex-post regulation. OTTs are part of the recent technology that has disrupted traditional MNOs business models. OTTs are still growing in terms of users and number of users they are attracting to their networks as they diversify the numerous services that they offer.” – R6

“I think ex-post would allow for effective monitoring for OTT.” – R7

“Ex-post would allow to effectively monitor OTTs. Ex-ante is the current framework where we have pre-defined KPIs that providers must meet, difficult to implement with OTTs.” – R8

Link to Proposition (P5): Strengthening regulatory oversight and enforcement mechanisms to address non-compliance with QoS standards by OTT service providers and MNOs is essential for maintaining consumer trust and confidence in the regulatory framework.

Respondents highlighted that the major challenge with regulating OTTs is that they were not defined in legislation and had no licence obligations. This was in line with the work by Masemola (2019), where it was argued that there needs to be a clear definition of OTT in South Africa. BEREC (2016) had a similar proposal where it was suggested that the definition of ECS be expanded to include Group 1 OTT. Policymakers would need to decide in which organ of state the mandate of OTT would reside. QoS of licenced MNOs currently resides with ICASA, and it would be logical to keep it in the EUSSC and would be easier to implement symmetric regulation when quality is enforced by one entity (ICASA, 2005b). In total, 75% of users highlighted the need to develop QoS standards. It was highlighted that bodies like the ITU have well-defined guidelines that could be used as a basis for developing our own framework. This was in line with the mandate of the ITU to standardise uniform technical regulation for members (ITU, 2023). South Africa is a signatory to the ITU. All respondents highlighted that an ex-post regulatory framework was required if we were to cover OTTs adequately. This was because OTTs were developing and constantly changing as the consumer needs evolve. The proposals to measure consumer insights to measure quality would benefit from this approach. This was in line with literature where it was proposed that regulators would need to move to an ex-post framework that measures consumer feedback to adequately incorporate OTTs in quality regulation (Robinson & Okeleke, 2020). Narayanan and Lee-Makiyama (2020) highlighted that ex-ante regulatory frameworks do not promote innovation. In line with the DCDT advocating for digital technology and innovation (DCDT, 2023), it stands to reason that an ex-post framework was adopted to ensure that

OTTs continue to be innovative while the regulators ensure oversight to protect consumers.

5.4.6 Unexpected finding

5.4.6.1 OTTs used for awareness

R1 highlighted that due to the reach of OTTs, they could be used for general education and notices required by government agencies:

“They need to ensure that there’s education around offering OTT. They need to be sure that they know what they are using.” – R1

This was something that would benefit the consumers and government. As smartphone penetration increases, this would be a perfect platform to get insights for essential government services and share important notices. South Africa could even have a future where voting is done on an application like WhatsApp.

5.5 Convergence of qualitative and quantitative data

In the final section of the qualitative survey, the respondents were asked about what they perceived as important quality indicators that could be used to measure OTT service quality. The responses were grouped under our six indicators that had been defined for our quantitative survey. No new indicators emerged from the survey that the researcher could not add to the defined indicators. An example would be how R4 indicated how he would use the indicators to evaluate OTT service quality.

- i. Ease of use.
- ii. Cybersecurity.
- iii. Privacy.
- iv. Protection of minors in cyberspace.
- v. Price visibility.
- vi. Reliability.

R4 went further to substantiate the following as reasons for his choice.

I do not think aesthetics benefit the user in any way as much as that looks might be appealing, but for me that's a practical person in me talking. If it, this is form over function or function over form for me, I will go for function over form. It can look good but does not do what I want it to do then it does not help me.” – R4

Cybersecurity, privacy, and protection of minors in cyberspace would all be subsections of the main umbrella indicator privacy and security. The results were then summarised in Table 64.

Table 64: Summary of OTT service quality Indicators as given by experts

Row Labels	Count Mentions	Respondents	% of Respondents
Ease of Use	5	R1, R4, R5, R7, R8	63%
Enjoyment	3	R6, R7, R8	38%
Price Knowledge	8	R1, R2, R3, R4, R5, R6, R7, R8	100%
Privacy and Security	8	R1, R2, R3, R4, R5, R6, R7, R8	100%
Reliability	8	R1, R2, R3, R4, R5, R6, R7, R8	100%
Responsiveness	3	R1, R7, R8	38%

It was clear that everyone believes that reliability, privacy and security, and price knowledge are required for measuring OTT services. Ease of use was highlighted by 63% of the respondents. Only 38% of the respondents rated enjoyment and responsiveness as important. Enjoyment was related to graphics and personalisation of the platform. This makes sense as for many experts who would be worried about proper functioning of the application, aesthetics would not be a high priority. Responsiveness relates to how the OTTs respond to customers on their support channels.

5.5.1 Convergence with quantitative data

The results of Table 64 were used to compare with the findings of the quantitative survey. The main aim was to obtain a view that would encompass the consumer, regulatory and business view. Table 65 was used as the quest was to identify the basket of dimensions that are deemed important for OTT service quality in RQ1. The findings are listed in Table 65.

Table 65: Difference between qualitative and quantitative responses

Variable/Dimension	Rank Quantitative	Rank Qualitative	Difference
Transparency on Price	1	1	0
Reliability	2	1	1
Responsiveness	3	5	2
Enjoyment	5	5	0
Privacy and Security	4	1	3
Ease of Use	6	4	2

The biggest differences were noted in Privacy and Security, Responsiveness, and Ease of Use. South Africa had the 6th highest incidents of cybercrimes per 100 000 inhabitants in the world. It was the only developing country in the world that featured in the top ten (Durán, 2022). This would suggest the problem why consumers did not consider privacy and security as important, whereas regulatory professionals were employed to keep up with the latest trends to make informed decisions when developing regulations. Ease of use had the smallest gap between perceived and expected quality when the survey was administered and had the highest perceived score. This would suggest that users might perceive it as unimportant because it was so good and took it for granted. As people, we generally place importance on rarity (Sridharan, 2017). Responsiveness was similarly seen as not important from a regulatory perspective, but OTT users rated it high. This is another case where the regulators would need to ensure that the voice of the customers is incorporated into the frameworks being drafted as they feel the frustration of their queries not being attended by the OTTs. This could explain the lack of importance placed on this dimension. The rest of the dimensions is close, with the differences no more than 1. Transparency on price was perfect with alignment between regulators and consumers.

5.6 Summary

The challenges and opportunities that come with incorporating OTTs into the current regulatory framework were investigated. Factors affecting equity and

competition, innovation, consumer welfare, and regulatory aspects were explored and insights were obtained on the best way to incorporate OTTs into the regulatory framework. Analyses confirmed that regulation was loaded in the direction of MNOs, but very little centred around OTTs. The respondents were able to highlight what they believed was required to create regulation around quality to protect consumers and create a balance for fairer competition between MNOs and OTTs. The respondents cautioned not to affect price and innovation as that would impact negatively on consumers and negate the gains that had been obtained in the sector. The analyses were concluded by highlighting the need to define OTTs in legislation and developing quality standards that could be added into the EUSSC. Standards bodies can be consulted to obtain guidelines for the OTT framework that would measure the important indicators that emerged. An ex-post regulatory framework would be the best framework for incorporating OTTs into the service quality framework. The following were confirmed using the stated propositions.

Proposition (P1): Inclusion of OTT services within the existing QoS framework may lead to increased competition and equality among OTT service providers and traditional MNOs, potentially resulting in a more level playing field for all market players.

Proposition (P2): Implementing efficient and cost-effective regulatory mechanisms for monitoring and enforcing QoS standards in OTT services can enhance consumer benefits by promoting affordability, accessibility, and transparency in service offerings.

Proposition (P3): Developing symmetric regulatory mechanisms for monitoring and enforcing QoS standards in OTT services can improve the long-term sustainability of MNOs' traditional business.

Proposition (P4): Reducing regulatory burdens of OTTs and MNOs can improve the innovation capability of MNOs and OTTs.

Preposition (P5): Strengthening regulatory oversight and enforcement mechanisms to address non-compliance with QoS standards by OTT service providers and MNOs is essential for maintaining consumer trust and confidence in the regulatory framework.

The results of the qualitative data on the quality indicators were converged with the results of the quantitative survey in Chapter 4. Alignment was found between the regulatory data and consumer data for most of the data except for privacy and security and Ease of Use. This was attributed to a lack of knowledge of the importance of cybersecurity in South Africa. Ease of Use and Responsiveness was more of a challenge to explain and it could only be reasoned that they were dimensions that was underappreciated. More data is required to further understand the reasons behind this. Chapter 6 links the findings of research to the research questions to ensure that they have been answered and proposes areas for future studies.

CHAPTER 6 – CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

6.1 Introduction

The research questions for this study were as follows:

- i. What are the fundamental quality indicators related to quality-of-service of OTT providers as perceived by regulators and consumers?
- ii. What is the primary quality indicator that consumers consider as the most significant in relation to the quality of Over-The-Top (OTT) services?
- iii. What are the challenges and opportunities of regulating quality-of-Service in OTT?
- iv. What are the regulatory implications of incorporating Over-The-Top (OTT) services within the current Quality of Service (QoS) framework of the End User Subscriber Service Charter?

As part of the process of seeking to answer the research questions, the study undertook a quantitative approach to answer part of the research question RQ1 and RQ2. RQ1 could be seen as the most important question as our aim was to sensitise the reader on service quality in OTTs. RQs 3 and 4 utilised the qualitative data that were used to support the research in determining the framework that could be used to include these KPIs in regulation.

6.2 Conclusion on research question

6.2.1 Conclusion regarding research on the main RQ1

What are the fundamental quality indicators related to quality-of-service of OTT providers as perceived by regulators and consumers?

The question aimed to obtain service quality dimensions that consumers perceive as most important for the regulation of OTTs. The opinion was supposed

to give a balanced opinion on what consumers considered as important in the regulation of OTTs.

6.2.1.1 Consumer opinion

The researcher was able to ascertain that the dimensions had been identified using the service quality model in Reliability, Ease of Use, Responsiveness, Enjoyment, Privacy and Security, and Transparency on Price all had an impact on overall service quality.

6.2.1.2 Regulatory opinion

Utilising the results of the survey, the most important dimensions from a regulatory perspective were identified. The insights revealed that the expert opinion could be classed into the dimensions that were already identified. No new dimensions emanated from the analyses. Privacy and Security, Price Knowledge, and Reliability were the most common dimensions amongst regulatory professionals and we could therefore confirm them as the most important.

6.2.2 Conclusion regarding RQ2

What is the primary quality indicator that consumers consider as the most significant in relation to the quality of Over-The-Top (OTT) services?

The question aimed to understand the most important indicator according to consumers. This would allow a ranking to be established to the data. This data would be important to understand what consumers value most. The dimensions were ranked utilising the standardised Beta values. Transparency on price was the most important independent variable, followed by Reliability and Responsiveness. Privacy and Security was ranked the lowest priority.

6.2.2.1 Convergence between consumer and expert opinion

The regulatory opinion was compared with the results of the quantitative section. It was highlighted that the regulators were the ones that obtained input from affected stakeholders (OECD, 2021). It was highlighted that there was

convergence in some of the dimensions, except Ease of Use, Responsiveness and Privacy and Security (an allowance of +/-1 was given in the calculation). Ease of Use and Privacy and Security were the dimensions that displayed the most divergence with the results. The findings highlight the importance of getting a balanced opinion forming regulation as the goal was to protect the consumer. Privacy and Security was considered the lowest importance by consumers, but South Africa has the 6th highest density of cybersecurity globally. The regulatory experts in this case would need to play their oversight role and ensure that adequate oversight is placed on this dimension of OTTs.

6.2.3 Conclusion regarding research on the main RQ3

What are the challenges and opportunities of regulating Quality of Service in OTT?

This question aimed to explore some of the major challenges that come with regulating service quality in OTTs.

6.2.3.1 Challenges

OTT reliance on the internet

OTTs need an internet connection for them to operate. It was important to ensure that when quality is measured, it was done utilising a framework that embraced this reliance on the internet to ensure that accountability was apportioned to the correct party.

Current ex-ante regulatory framework

All the respondents agreed that some form of regulation was needed around OTTs. The current ex-ante regulatory framework of the EUSSC was not suitable for an environment that embraced innovation. It was confirmed with responses from the qualitative data and literature that it was not suitable for measuring the type of data that OTTs collect. It would be a cumbersome exercise to try to obtain a QoS framework utilising the ex-ante framework. A move would be needed to a

more experienced type of framework that would monitor the environment and enforce compliance retrospectively as that would not disrupt innovation within the sector.

Introduction of regulation might cause price increases

With the introduction of regulation, there is a risk of negating the gains that were made within the telecommunication sector. The lower prices had reduced the overall price to communicate. Introduction of regulation for OTTs might cause the incumbent OTTs to increase their pricing or leave the market if the regulations become too stringent.

OTT not defined in regulation or licensed

OTTs are not defined in regulation or need licences to operate within the country. National regulators cannot regulate what they do not know. It would be important to clearly define an OTT. This would allow for adequate policy and regulation to be developed around them.

6.2.3.2 Opportunities

Set up regulatory framework

The findings from the qualitative section highlighted the needed to bring OTTs into the regulatory framework. This would have to start by defining OTTs in legislation before any policy can be set around them. The most logical place for OTT policy to come from would be the DCDT. ICASA would be responsible for the regulatory oversight and setting up adequate regulation. Standards bodies like the ITU could be used to get minimum standards and guidelines around the dimensions chosen.

Move to ex-post framework

It was established that the best way to continue to promote innovation and embrace OTTs in the market, an ex-post regulatory framework would suffice. This would allow regulators to obtain the same data that OTTs use to improve their

platforms to play an oversight role without encroaching too much into this area. It would be an easy way of regulating without disturbing OTT operations.

Balanced treatment of OTTs and MNOs

The findings of the survey advocated for symmetry in regulation. This highlighted the need to ensure that MNOs and OTTs are treated equally to ensure that both have an equal chance of providing services long into the future. A future without choice is not encouraged because of the benefits that competition brings to the market. Reducing some of the regulations around MNOs would bring some benefits around innovation. Adding regulatory oversight in OTTs would improve the quality of their offering. This balance would ultimately benefit the consumer as they would be getting quality communications at a fraction of the price.

6.2.4 Conclusion regarding research on the main RQ4

What are the regulatory implications of incorporating Over-The-Top (OTT) services within the current Quality of Service (QoS) framework of the End User Subscriber Service Charter?

This question aimed to identify the implications that would arise from incorporating OTTs into the QoS framework.

Better service quality in OTTs

Bringing OTTs into the regulatory framework would result in OTTs being monitored around the six dimensions that were identified. This would ensure that South Africans receive quality communications regardless of the medium chosen. It would set grounds for oversight in the sector, whereby greater oversight could be enforced by the regulator. The major aim of the study was about improving service quality in OTTs and that would be a significant step in the process.

Room to investigate other factors around OTTs

With OTTs being defined in regulation, it would imply that they would need to comply with the laws of the country. They would, for one, need to contribute to the tax base. The risk of global entities leaving the country with revenue would be reduced. There has been an opinion that regulation would cause OTTs to leave countries. Countries like Dubai and Oman have banned the calling feature on the WhatsApp platform to protect the revenues of their states, but the application was still being used in the countries (Mangla, 2023). South Africa can also find the right regulatory framework to suit their requirements.

6.3 Limitations

Limitations of this study must be read in conjunction with those listed in section 3.8.

- i. The responses of the qualitative survey may have brought about insights from their field of expertise. Some of the questions might have been too technical for their experience.
- ii. The technical nature of the survey and interviews around a wide range topic might have impacted on the respondents' ability to fully express themselves.
- iii. There were limited prior studies around service quality in Group 1 OTT in South Africa. The results could not be compared with prior findings.
- iv. The study focused on Group 1 OTT (those that offer services that compete with MNOs). This would mean that the results can only be applied to such a group.
- v. While the researcher endeavoured to obtain a complete representation of the regulatory professionals in the telecommunications industry, our study focused on regulatory employees and telecommunication professionals.

6.4 Recommendations

The study first highlighted the important dimensions that consumers and regulators find important for OTT service quality. The study went further to determine the most important dimensions. This would allow regulators to see where the most important areas of enforcement would be required. The study went further to highlight the challenges and opportunities that would arise, should OTTs be brought into the regulatory framework, and lastly, the implications it would have for South Africa. The researcher therefore recommends that regulatory bodies, business, and policymakers in South Africa utilise these findings as a basis to establish a robust framework for our nation.

6.5 Areas of future research

6.5.1 Quality for Group 2 and Group 3 OTTs

OTTs were defined into three categories, namely:

Group-1 – Those that offered similar services as ECS providers and disrupt their business models, e.g. WhatsApp.

Group-2 – Those that offered services that ECS providers want as they promote usage and help increase revenue, e.g. YouTube.

Group -3 – Those that offered services that do not generate significant traffic for mobile operators but are critical as they manage sensitive user information, e.g. Capitec.

Future studies should focus on expanding on this research to cover Group 2 and 3 OTTs to determine if there are different quality requirements.

6.5.2 Develop framework for measuring quality of service

Future studies could be to expand on the study and develop an actual framework for OTTs around quality utilising data from standards bodies to expand on the findings from this research. The framework could formulate quality standards for

each dimension that was identified and determine the acceptable levels along with actions for non-compliance.

6.5.3 Privacy in data collection in guaranteeing OTT service quality

This would aim to find feasible ways to measure OTT quality of service utilising feedback from consumers and how the protection of privacy links to this.

References

- Ahmad, A., Floris, A., & Atzori, L. (2016). QoE-centric service delivery: A collaborative approach among OTTs and ISPs. *Computer Networks*, 168-179.
- Analyses INN. (2020, 19 April). *Average Variance Extracted (AVE)*. Retrieved from Analyses INN Web site: <https://www.analysisinn.com/post/average-variance-extracted-ave/>
- Armstrong, B., & Lee, G. J. (2021). Digital Business. In B. Armstrong, & G. J. Lee, *Armstrong, Brian; Lee, Gregory J* (pp. 501-502). Silk Route Press .
- Ayyagari, N. (2022, 26 April). *SMS vs WhatsApp: The Final Frontier*. Verloop.io Website. <https://verloop.io/blog/sms-vs-whatsapp-the-final-frontier/>
- Banerjee, A., & Chaudhury, S. (2010). Statistics without tears: Populations and samples. *Industrial Psychiatry Journal*, 60-65.
- Banerjee et al., (2009). Hypothesis testing, type I and type II errors. *Industrial Psychiatry Journal*, 127-131.
- Body of European Regulators for Electronic Communications (BEREC). (2016). *Report on OTT services*. Body of European Regulators for Electronic Communications.
- Berk, M., Otmar, R., Dean, O., Berk, L., & Michalak, E. (2015). *Chapter Six - The Use of Mixed Methods in Drug Discovery: Integrating Qualitative Methods into Clinical Trials*. Academic Press.
- Bhandari, P. (2020, 9 July). *Descriptive Statistics Definitions, Types, Examples*. [Blog] Scribbr. <https://www.scribbr.com/statistics/descriptive-statistics/>
- Bhandari, P. (2023, 22 June). *Correlational Research, When & How to Use*. Scribbr. <https://www.scribbr.com/methodology/correlational-research/#:~:text=A%20correlational%20research%20design%20investig>

ates%20relationships%20between%20two%20variables%20(or,experimental%20type%20of%20quantitative%20research.

Bilbil, E. (2018). Methodology for the Regulation of Over-the-top (OTT) Services: The Need of A Multi-dimensional Perspective. *International Journal of Economics and Financial Issues*.

Buchanan, J., & Tollison, R. (1984). *The Theory of Public Choice - II*. University of Michigan Press.

Caulfield, J. (2022, 23 June). *How to Do Thematic Analysis | Step-by-Step Guide & Examples*. Scribbr. <https://www.scribbr.com/methodology/thematic-analysis/>

Coghlan, D., & Brydon-Miller, M. (2014). *Transferability*. SAGE Research.: <https://methods.sagepub.com/reference/encyclopedia-of-action-research/n320.xml>

Creswell, J. (2009). *Research Design Qualitative, Quantitative and Mixed Methods*. SAGE.

Creswell, J., & Creswell, D. (2009). *Research Design Qualitative, Quantitative and Mixed Methods*. SAGE.

Cronin, J. J., & Taylor, S. A. (1992). Measuring Service Quality: A Reexamination and Extension. *Journal of Marketing*, 55-68.

Cummings J, H. P. (2004). The 2002 conference on the future of school psychology: Implications for consultation, intervention, and prevention services. *Journal of Educational & Psychological Consultation*, 239-256.

Department of Communications and Digital Technology (DCDT). (2023). *Our Mandate*. Department of Communications and Digital Technology: <https://www.dcdt.gov.za/about-us/mandates.html>

- Degenhard, J. (2023, 3 April). *WhatsApp users in South Africa 2019-2028*. Statista: <https://www.statista.com/forecasts/1146895/whatsapp-users-in-south-africa>
- D'Juan, G. (2018). *The Effects of Smartphones on Social Lives: How They Affect Our Social Interactions and Attitudes*. Old Dominion University : https://digitalcommons.odu.edu/cgi/viewcontent.cgi?article=1590&context=ots_masters_projects
- Downdetector. (2023). *Downdetector Insights™ reveals the stories behind the outages*. Downdetector: https://downdetector.com/insights/?_gl=1*odlijl*_ga*MTQ1MjEzNTQ5My4xNjgxNTQxNTA0*_ga_0PZM58H213*MTY4MzMwNjA1Ni4zLjEuMTY4MzMwNjA4MC4wLjAuMA..
- Durán, M. (2022, 7 December). *Cyber fraud comparison: Which countries have the most cyber criminals, and how to combat them*. Medium.com: <https://medium.com/@PagoNxt/cyber-fraud-comparison-which-countries-have-the-most-cyber-criminals-and-how-to-combat-them-c887d0b4ff2a>
- Elhaddouj, A., & Amiroune, K. (2018). QOE Aspects of OTTs. *ITU Workshop on Performance, QoS and QoE for Multimedia Services* (p. 16). Dakar: Midwex.
- Ellipsis. (2012, March). *Overview of Electronic Communications Regulation in South Africa 2012*. Ellipsis: <https://www.ellipsis.co.za/wp-content/uploads/2012/03/Overview-of-Electronic-Communications-Regulation-in-South-Africa-2012.pdf>
- Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2001). *Qualitative Content Analysis: A Focus on Trustworthiness*. SAGE.
- European Commission. (2024). *Competition Policy*. European Commission. https://competition-policy.ec.europa.eu/about/why-competition-policy-important-consumers_en

Griffin et al., (1994). Learning through Testing: An Investigation of Cooperative Assessment. ERIC, 18

Guba, E., & Lincoln, Y. (1989). What is this constructivist paradigm anyway? In fourth generation evaluation. Sage, 79-90.

Haqiqat, N. (2017). Airline service quality evaluation: A review on concepts and models. *Economics Management and Sustainability*, 31-47.

Heale, R., & Twycross, A. (2015). Validity and reliability in quantitative studies. *Evidence-Based Nursing*, 66-67.

Independent Communications Authority of South Africa (ICASA). (2005a). *Our Mandate*. Independent Communication Authority of South Africa

Independent Communications Authority of South Africa (ICASA). (2005b). *Electronic Communications Act, 2005*. Independent Communications Authority of South Africa: <https://www.icasa.org.za/uploads/files/Electronic-Communications-Act-2005.pdf>

Independent Communications Authority of South Africa (ICASA). (2016, 1 April). *End-User and Subscriber Service Charter Amendment Regulations*. Independent Communications Authority of South Africa: <https://www.icasa.org.za/legislation-and-regulations/regulations-underway/end-user-and-subscriber-service-charter-amendment-regulations>

Independent Communications Authority of South Africa (ICASA). (2019, 27 August). *Independent Communications Authority of South Africa Strategic Plan for 2020/21-2024/25*. Parliament Monitoring Group: https://static.pmg.org.za/ICASA_Strat_Plan.pdf

Independent Communications Authority of South Africa (ICASA). (2021). *ECS/ECNS (Telecoms) Compliance Annual Report 2020/2021*. Independent Communications Authority of South Africa.

Independent Communications Authority of South Africa (ICASA). (2022a). *Radio Frequency Spectrum Assignment* . Government Gazette.

Independent Communications Authority of South Africa (ICASA). (2022b, 8 August). *End-user and Subscriber Service Charter Amendment Regulations*. Independent Communications Authority of South Africa: <https://www.icasa.org.za/legislation-and-regulations/regulations-underway/end-user-and-subscriber-service-charter-amendment-regulations>

Independent Communications Authority of South Africa (ICASA). (2022c). *Bi-Annual-Tariff-Analysis*. Independent Communication Authority of South Afrca: <https://www.icasa.org.za/uploads/files/2021-22-FY-Q4-Bi-Annual-Tariff-Analysis-Report.pdf>

Independent Communications Authority of South Africa (ICASA). (2023, 28 March). *End-User and Subscriber Service Charter Fourth Amendment Regulations 2023*. Independent Communications Authority of South Africa. <https://www.icasa.org.za/uploads/files/End-user-and-Subscriber-Service-Charter-Amendment-Regulations-2023.pdf>

Independent Communications Authority of South Africa (ICASA). (n.d.). *Quality of Service Reports*. Independent Communications Authority of South Africa <https://www.icasa.org.za/pages/quality-of-service-reports>

Institute of Electrical and Electronics Engineers (IEEE). (2019, 1 April). *5G Evolution Wireless communications*. IEEE Puerto Rico and Caribbean Chapter Website: <https://prc.chapters.comsoc.org/2019/04/01/5g-evolution-wireless-communications/>

- Intven, H., Oliver, J., & Sepulveda, E. (2000). *Telecommunications Regulation Handbook*. The World Bank.
- International Telecommunication Union (ITU). (2017). *Quality of Service Regulation Manual*. International Telecommunication Union.
- International Telecommunication Union (ITU). (2023). *About International Telecommunication Union (ITU)*. International Telecommunication Union. <https://www.itu.int/en/about/Pages/default.aspx>
- Jayakar, K., & Park, E. (2014). Emerging frameworks for regulation of Over-The-Top services on mobile networks: An international comparison. *SSRN Electronic Journal*.
- Juran, J., & Gryna, F. (1993). *Quality Planning and Analysis*. McGraw-Hill.
- Kano, N. S. (1984). Attractive Quality and Must-Be Quality. *Journal of the Japanese Society for Quality Control*, 39-48.
- Kemp, S. (2022, 15 February). *Digital 2022: South Africa*. Datareportal Website. <https://datareportal.com/reports/digital-2022-south-africa>
- Kingstone, T., Saunders, B., & Sim, J. (2017). *Saturation in qualitative research: exploring its conceptualization and operationalization*. Springer.
- Kleinman, Z. (2023, 5 January). *Many Android phones to get satellite connectivity*. BBC. <https://www.bbc.com/news/technology-64182383>
- Križanović, I. (2020, 4 August). *Cell phone history: From the first phone to today's smartphone wonders*. Versus Website. <https://versus.com/en/news/cell-phone-history>
- Kumar, N. (2018). ServQual: A Multi-Dimensional Scale for Perceptual Measure of Service Quality in the Mobile Telecommunication Industry. *Kumar, N, 14(2)*.

- Laghari, A., He, H., Karim, S., Shah, A., & Karn, N. (2017). Quality of Experience Assessment of Video Quality in Social Clouds. *Wireless Communications and Mobile Computing*, 10.
- Lagharia, A., & Laghari, M. (2021). Quality of experience assessment of calling services in social network. *ICT Express*, 158-161.
- Lewis, C. (2013). Universal access and service interventions in South Africa: Best practice, poor impact. *The African Journal of Information and Communication*, 13.
- Lindemulder, G., & Kosinski, M. (2024, August 12). *Cybersecurity*. Retrieved from IBM Web site: <https://www.ibm.com/topics/cybersecurity#:~:text=Cybersecurity%20is%20important%20because%20cyberattacks,destroy%20businesses%2C%20communities%20and%20lives.>
- Listra, E. (2015). The concept of competition and the objectives of competitors. *20th International Scientific Conference Economics and Management* (pp. 25-30). Elsevier.
- Ma, C. (2018, January). *Self-Regulation versus Government Regulation: An Externality View*. *Journal of Regulatory Economics*, 58(2), 166-183.. <http://dx.doi.org/10.2139/ssrn.3242591>
- Malik, S. (2012). Customer Satisfaction, Perceived Service Quality. Mediating Role of Perceived Value. *International Journal of Marketing Studies*, 4(1). <https://doi.org/10.5539/ijms.v4n1p68>
- Mangla, S. (2023, 20 November). *5 countries where WhatsApp is banned*. Times of India. <https://timesofindia.indiatimes.com/etimes/trending/5-countries-where-whatsapp-is-banned/photostory/105187065.cms>

- Masemola, B. (2019). *An assessment of the need for policy and regulation of OTT Communications Services in the ICT sector in South Africa*. [Master's thesis, Stellenbosch University].
- McCombes, S. (2019, 19 September). *Sampling Methods: Types, Techniques & Examples*. Scribbr. <https://www.scribbr.com/methodology/sampling-methods/>
- McCombes, S. (2022, 22 June). *Descriptive Research Definition, Types, Methods & Examples*. Scribbr. <https://www.scribbr.com/methodology/descriptive-research/>
- Moran-Ellis, J., Alexander, V., Cronin, A., Dickinson, M., Fielding, J., Sleney, J., & Thomas, H. (2006). Triangulation and Integration: processes, claims and implications . *Qualitative Research* (pp. 45-60) Sage.
- Morgan, S. (2024, February 2024). *Top 10 Cybersecurity Predictions and Statistics For 2024*. Retrieved from Cybercrim Magazine Web site: <https://cybersecurityventures.com/top-5-cybersecurity-facts-figures-predictions-and-statistics-for-2021-to-2025/>
- MTN. (2023, September). *Quarterly update for the period ended 30 September 2023*. MTN Group Website. <https://www.mtn.com/wp-content/uploads/2023/11/MTN-Group-Q3-23-results-JSE-SENS.pdf>
- Mugerwa, S. (2016, 24 June). *WhatsApp Calls hits 100 million daily milestone, App co-founder insists it's nowhere near 'Critical Mass'*. Dignited Web site. <https://www.dignited.com/19641/whatsapp-calls-hits-100-million-daily-milestone/>
- Muhammad, F., & Valliappan, R. (2019, 6 April). Impact of Over-the-Top (OTT) Services on the Telecom Companies in the Era of Transformative Marketing. *Global Journal of Flexible Systems Management*, 1-3. <https://doi.org/10.1007/s40171-019-00209-6>

- Nandhiasa, A., & Haryadi, S. (2015, 9 April). Indonesian regulation management recommendation for Over-the-Top services. *2015 1st International Conference on Wireless and Telematics* (pp. 1-4). Manado: IEEE.
- Narayanan, B., & Lee-Makiyama, H. (2020). *Economic Costs of Ex ante Regulations*. JSTOR. <https://www.jstor.org/stable/resrep29233>
- National Planning Commission (NPC). (2020, 6 July). *Digital Futures: South Africa's Digital Readiness for the Fourth Industrial Revolution*. National Planning Commission. <https://www.nationalplanningcommission.org.za/assets/Documents/DIGITAL%20FUTURES%20-%20SOUTH%20AFRICA'S%20READINESS%20FOR%20THE%20FOURTH%20INDUSTRIAL%20REVOLUTION.pdf>
- Nayak, B. (2009, May). *Why learn research methodology*. Researchgate Web site: https://www.researchgate.net/publication/24346173_Why_learn_research_methodology
- Nijs, V. (2019). *Evaluate if data are appropriate for Factor analysis*. Radiant. https://radiant-rstats.github.io/docs/multivariate/pre_factor.html#:~:text=The%20KMO%20and%20Bartlett%20test,is%20correlated%20with%20other%20variables.
- Ngwenya, M. (2017). *Analysing Service Quality Using Customer Expectations and Perceptions in the South African Telecommunication Industry*. Pretoria: University of Pretoria.
- O'Grady, J. (2023, 5 January). *The Juran Trilogy*. LibreTexts. https://bio.libretexts.org/Bookshelves/Biotechnology/Quality_Assurance_and_Regulatory_Affairs_for_the_Biosciences/02%3A_Introduction_to_Quality_Principles/2.03%3A_Section_3-

- Oliver, R. L. (1980). A Cognitive Model of the Antecedents and Consequences of Satisfaction Decisions. *Journal of Marketing Research*, 460-469.
- Organisation for Economic Co-operation and Development (OECD). (2021). *OECD Regulatory Policy Outlook 2021*. OECD. <https://www.oecd.org/gov/regulatory-policy/chapter-two-evidence-based-policy-making-and-stakeholder-engagement.pdf>
- OECD. (2022). *Better Regulation Practices across the European Union*. Paris: OECD Publishing.
- Parasuraman, A., Zeithaml, V., & Berry, L. (1988). SERVQUAL: A multiple- Item Scale for measuring consumer perceptions of service quality. *Journal of Retailing*.
- Pannell, R. (2023, April 5). *The Importance of Identifying the Right Sample Size for Business Improvement*. Retrieved from Leanscape Web site: <https://leanscape.io/the-importance-of-identifying-the-right-sample-size-for-business-improvement/#:~:text=Identifying%20the%20right%20sample%20size%20for%20your%20research%20or%20study,a%20smaller%20margin%20of%20error.>
- Park, H. (2017). Discussions on Over-The-Top (OTT) in ITU-T SG3. *Regional Standardization Forum for Bridging the Standardization Gap* (p. 5). Seoul: International Communication Union.
- Parliament. (n.d.). *Portfolio Committee on Communications and Digital Technologies*. Parliament of the Republic of South Africa. <https://www.parliament.gov.za/committee-details/142>
- Parliament. (2024). *How a Law is Made*. Retrieved from Parliament of the Republic of South Africa: <https://www.parliament.gov.za/how-law-mad>Parliamentary Monitoring Group (PMG). (2016a, 26 January). *Industry Briefing on Over-the-Top (OTT) Services in South Africa*.

Parliamentary Monitoring Group:
<https://static.pmg.org.za/160126SACF.pdf>

Parliamentary Monitoring Group (PMG). (2016b). *Over-the-Top (OTT) policy and regulatory options*. Cape Town: Parliamentary Monitoring Group.
<https://pmg.org.za/committee-meeting/21942/>

Patino, C., & Ferreira, J. (2018). Internal and external validity: can you apply research study results to your patients? *Jornal brasileiro de pneumologia : publicacao oficial da Sociedade Brasileira de Pneumologia e Tisilogia (Brazilian Journal of Pulmonology)*, 44(3), 183.
<https://doi.org/10.1590/S1806-37562018000000164>

Ponto, J. (2015). Understanding and Evaluating Survey Research. *Journal for Advanced Practitioner in Oncology*, 168-171.

ProductPlan. (2024). *What is the Kano Model?* Retrieved from ProductPlan Web site:
<https://www.productplan.com/glossary/kano-model/#:~:text=Noriaki%20Kano%2C%20a%20professor%20of,to%20customer%20satisfaction%20and%20loyalty.>

Quantilope. (2022, May). *Dependability and Trustworthiness in Qualitative Research*. Quantilope. <https://www.quantilope.com/resources/glossary-trustworthiness-in-qualitative-research>

Rasyida, D., Ulkhaq, M., Priska, R., & Setyorini, N. (2016). Assessing Service Quality: A Combination of SERVPERF and Importance-Performance Analysis. *MATEC Web of Conferences*. Indonesia: ICIEA.

Republic of South Africa (RSA). (2000), . *Independent Communications Authority of South Africa Act 13 of 2000*. Government Printer.
https://www.gov.za/sites/default/files/gcis_document/201409/13000.pdf

- Resnik, B. (2001). Objectivity of Research: Ethical Aspects. In N. Smelser, & B. Baltes, *International Encyclopedia of the Social & Behavioral Sciences* (pp. 10789-10793). Pergamon.
- Robinson, J., & Okeleke, K. (2020). *Modernising QoS Regulations in Sub-Saharan Africa*. GSM Arena.
- Ross, S. A. (1973). The Economic Theory of Agency: The Principal's Problem. *The American Economic Review*, 134-139.
- Rotar, L., et al., (2017). The Use of the Kano Model to Enhance Customer Satisfaction. *Organizacija*.
- Rouse, M. (2017, 26 April). *Social Platform*. Technopedia. <https://www.techopedia.com/definition/23759/social-platform>
- Sablah, W. (2023, 14 February). *Countries where WhatsApp is Banned & How to Get Around the Ban in 2023*. Cloudwards. <https://www.cloudwards.net/countries-where-whatsapp-is-banned/>
- Sacred Heart University (SHU). (2020). *Organizing Academic Research Papers: Purpose of Guide*. Sacred Heart University: <https://library.sacredheart.edu/c.php?g=29803&p=185901>
- Shanapinda, S. (2019). Asymmetry in South Africa's Regulation of Customer Data Protection: Unequal Treatment between Mobile Network Operators (MNOs) and Over-the-Top (OTT) Service Providers. *The African Journal of Information and Communication* , 2-4.
- Shava, H. (2021). The relationship between service quality and customer satisfaction in the South African mobile network telecommunications industry. *Journal of International Studies*, 1.
- Shleifer, A. (2005). Understanding Regulation. *European Financial Management*, 431-451.

- Sim, J., Saunders, J., Waterfield, J., & Kingstone, T. (2018). Can sample size in qualitative research be determined a priori? *International Journal of Social Research Methodology*, 619-634.
- Singh, M. (2022, 25 October). *WhatsApp back after massive global outage that lasted for two hours*. Techcrunch. <https://techcrunch.com/2022/10/25/whatsapp-down/>
- Slack, N. (2013). *Operations Management*. Pearson.
- Sridhar, V. (2019). *Emerging ICT Policies and Regulations*. Springer Singapore.
- Sridharan, M. (2017, 19 December). *VRIO*. Think Insights. <https://thinkinsights.net/strategy/vrio-framework>
- Stahl, N., & King, J. (2020). Expanding approaches for research: understanding and using trustworthiness in qualitative research. *Journal of Developmental Education*., 44(1), 26-28 <https://files.eric.ed.gov/fulltext/EJ1320570.pdf>
- Stanford Encyclopedia of Philosophy. (2022, 22 August). *Mill's Moral and Political Philosophy*. Stanford Encyclopedia of Philosophy. <https://plato.stanford.edu/entries/mill-moral-political/>
- Starlink. (2023). *Starlink Roam*. Starlink. <https://www.starlink.com/roam>
- Statistics South Africa (Stats SA). (2021a). *General Household Survey*. Pretoria: Statistics South Africa. <https://www.statssa.gov.za/publications/P0318/P03182021.pdf>
- Statistics South Africa (Stats SA). (2021b, 9 September). *Post and telecommunications industry, 2019*. Statistics South Africa: <https://www.statssa.gov.za/publications/Report-75-01-01/Report-75-01-012019.pdf>

- Statistics South Africa (Stats SA). (2022, 28 July). *60,6 million people in South Africa*. Statistics South Africa. <https://www.statssa.gov.za/?p=15601>
- Statistics South Africa (Stats SA). (2023, 10 October). *Media Release: Census 2022 Population Count Results 10 October 2023*. Statistics South Africa. <https://www.statssa.gov.za/?p=16716>
- Stegner, B. (2023, 14 March). *What Is WhatsApp, and Why Is It So Popular?* Make Use Of Web site: <https://www.makeuseof.com/what-is-whatsapp-why-is-it-so-popular/>
- Stigler, G. J. (1971). The Theory of Economic Regulation. *The Bell Journal of Economics and Management Science*, 3-21.
- Stork, C., & Esselaar, S. (2019, 1 October). *Evolving Business Models are Driven by OTT Services*. Research ICT Solutions. <https://researchictsolutions.com/home/wp-content/uploads/2019/11/RIS-evolving-business-models.pdf>
- Stork, C., Nwana, H., Esselaar, S., & Koyabe, M. (2020). *CTO OTT REPORT 2020*. Commonwealth Telecommunications Organisation. <https://cto.int/wp-content/uploads/2020/05/CTO-OTT-REPORT-2020.pdf>
- SurveyMonkey. (2024). *What are the Advantages and Limitations of a Likert Scale?* SurveyMonkey. <https://uk.surveymonkey.com/mp/likert-scale-pros-cons/>
- Telkom. (2022, 4 August). *Telkom Submission Draft End-User Subscriber Service Charter Regulations_ 2022*. Retrieved from End-user and subscriber service charter fourth amendment regulations 2023: https://www.icasa.org.za/uploads/files/Telkom-Submission-Draft-End-User-Subscriber-Service-Charter-Regulations_-2022.pdf

- Thomas, L. (2023, 22 June). *Cross-Sectional Study | Definition, Uses & Examples*. Scribbr. <https://www.scribbr.com/methodology/cross-sectional-study/>
- Thompson, A. (2022, February). *WhatsApp calls are 90% cheaper than those using airtime - here's how SA mobile networks compare*. News24. <https://www.news24.com/news24/bi-archive/cost-of-whatsapp-call-in-south-africa-2022-2#:~:text=Comparatively%2C%20a%20one%2Dminute%20call,can%20have%20a%20reasonable%20impact.>
- Turney, S. (2022, 27 June). *What Is Kurtosis? Definition, Examples & Formula*. Scribbr. <https://www.scribbr.com/statistics/kurtosis/>
- Ulz, J. (2023, March 20). *What is a Research Paradigm? Types of Research Paradigms with Examples*. Retrieved from Researcher.Life Web site: <https://researcher.life/blog/article/what-is-a-research-paradigm-types-examples/>
- University of California, Los Angeles (UCLA). (2021, 22 August). *Introduction to SAS*. UCLA. <https://stats.oarc.ucla.edu/other/mult-pkg/faq/general/faq-how-do-i-cite-web-pages-and-programs-from-the-ucla-statistical-consulting-group/>
- UKZN. (2024). *RESEARCH PARADIGMS*. Retrieved from University of Kwazulu Natal: <https://chsdoctoralacademy.ukzn.ac.za/research-paradigms/>
- United Nations (UN). (2015, May). *Youth population trends and sustainable development*. United Nations Department of Economic and Social Affairs. https://www.un.org/en/development/desa/population/publications/pdf/popfacts/PopFacts_2015-1.pdf
- Vodacom. (2004). *Vodacom Group Annual Report*. Vodacom. <https://www.vodacom.com/pdf/investor/integrated-report/2004/integrated-annual-report.pdf>

Vodacom. (2023). *Vodacom Group Limited Integrated Report*. Vodacom.
<https://vodacom-reports.co.za/integrated-reports/ir-2023/documents/Integrated-report-2023.pdf>

Vodafone. (2005, March). *Africa: The Impact of Mobile Phones*. Southern African Regional Poverty Network.
https://sarpn.org/documents/d0001181/P1309-Vodafone_March2005.pdf

World Economic Forum (WEF). (2018, 13 March). *IBM created the world's first smartphone 25 years ago*. World Economic Forum.
<https://www.weforum.org/agenda/2018/03/remembering-first-smartphone-simon-ibm/>

Wilson, J. (2010). *Essentials of Business Research*. SAGE Publication.

Yüksel, A., & Yüksel, F. (2001). The Expectancy-Disconfirmation Paradigm: A Critique. *Journal of Hospitality & Tourism Research*, 107-131.

Zeithaml, V., Parasuraman, A., & Malhotra, A. (2000). Service Quality Delivery through Web Sites: A Critical Review of Extant Knowledge. *Journal of the Academy of Marketing Science*, 362-375.

Zeithaml, V., Parasuraman, A., & Malhotra, A. (2005). E-S-Qual: A Multiple-Item Scale for Assessing Electronic Service Quality. *Journal of Service Research*.

Zhang, W. (2020). Effects of Service Characteristics of a Subscription-based OTT on User Satisfaction and Continuance Intention: Evaluation by Netflix Users. *Journal of The Korea Contents Association*, 123-135

Appendix A: Ethics clearance

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/DB1571422/816

This certificate is only valid with a legitimate ethics protocol number and signed by the Researcher (below).

This certificate is only valid if permission has been granted by the Registrar's Office of Wits University.

Project title	Asymmetry in quality of service (QoS) regulation among over-the-top (OT) providers and mobile network operators from a South African consumers perspective
Investigator / Researcher	Mr Charity Ledwaba
Nature of Project	MM (Digital Business)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed confidentiality.
Issue Date of Certificate	28 08 2023
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

Declaration by Researcher

One copy must be signed by the Researcher and returned to the Chairperson of the Wits Business School Ethics Committee.

I fully understand the conditions under which I am authorized to carry out the abovementioned research and guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I undertake to resubmit the protocol to the Committee.

Signature

2023-08-28

Date:

Appendix B: Quantitative Survey

Age	Below 25	25-34	35-44	45-54	Above 55
Gender	Male	Female	Non-Binary	Trans	Prefer not to say
Race	Coloured	Black	White	Indian	Prefer not to say
Highest Qualification	High School	Graduate	Masters	PhD	Prefer not to say
Do you use OTT for either voice or text communication?	Yes	No			
Which OTT do you use most for:					
Voice Calls (Can select more than one)	WhatsApp	Telegram	Vibre	Teams	Other: XXX
Messaging (Can select more than one)	WhatsApp	Telegram	Vibre	Teams	Other: XXX
Work Communication (Can select more than one)	WhatsApp	Telegram	Vibre	Teams	Other: XXX

Section A: This section intends to identify your opinion regarding the expected levels of services required from an OTT application. Please answer based on the OTT you use most for voice (incl. voice notes) and messaging (text, video, pictures, etc).

Dimension	Expectation	Rating (1-5)				
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Reliability	1.1 Excellent OTT applications are always available/Suffer no downtime	1	2	3	4	5
	1.2 Excellent OTT applications always deliver messages without delay	1	2	3	4	5
	1.3 Excellent OTT applications always allow users to make and receive calls without any interruptions or failures	1	2	3	4	5
	1.4 Excellent OTT applications give dependable performance for my communication needs	1	2	3	4	5

2. Responsiveness	1.5 Excellent OTT applications companies respond to queries logged	1	2	3	4	5
	1.6 Excellent OTT applications companies have customer support that addresses queries raised timeously	1	2	3	4	5
	1.7 Excellent OTT applications proactively updates and notifies customers on any downtime	1	2	3	4	5
	1.8 Excellent OTT applications are accessible from any device	1	2	3	4	5
	1.9 Excellent OTT applications allow communications to all other users with no limitations	1	2	3	4	5
3. Ease of Use	1.10 Excellent OTT applications offer a wide range of features to suit my communication needs	1	2	3	4	5
	1.11 Excellent OTT applications allow for users to customise their interface to suit their preferences	1	2	3	4	5
	1.12 Excellent OTT applications has easily accessible privacy information and notification settings	1	2	3	4	5
	1.13 Excellent OTT applications have uncomplicated ways to send and receive call and messages	1	2	3	4	5
	1.14 Excellent OTT applications have no loading time delay	1	2	3	4	5
	1.15 Excellent OTT applications efficiently manage contacts and conversations	1	2	3	4	5
4. Enjoyment	1.16 Excellent OTT applications have designs that are visually appealing	1	2	3	4	5
	1.17 Excellent OTT applications use graphics and colours that are visually appealing	1	2	3	4	5
	1.18 Excellent OTT applications have attractive look and feel	1	2	3	4	5
	1.19 Excellent OTT applications allow for easy profile personalisation and settings change	1	2	3	4	5
	1.20 Excellent OTT applications allow for easy customisation of the theme and	1	2	3	4	5

	appearance of the application					
	1.21 Excellent OTT applications allow for features that cater for individual preferences	1	2	3	4	5
	1.22 Excellent OTT applications allow for easy navigation of the various sections and features	1	2	3	4	5
	1.23 Excellent OTT applications are easy to navigate to find functions and options	1	2	3	4	5
	1.24 Excellent OT applications have a layout and interface that are user friendly	1	2	3	4	5
5. Privacy & Security	1.25 Excellent OTT applications use robust security measures to safeguard my data	1	2	3	4	5
	1.26 Excellent OTT applications allow users to have control over privacy settings within the application	1	2	3	4	5
	1.27 Excellent OTT applications have options for encrypted and secure communications	1	2	3	4	5
	1.28 Excellent OTT applications ensure user information is encrypted and secure at all times	1	2	3	4	5
	1.29 Excellent OTT applications ensure that calls and messages are delivered confidentially	1	2	3	4	5
	1.30 Excellent OTT applications protect personal information of users from unauthorised access	1	2	3	4	5
6. Price Knowledge	1.31 Excellent OTT applications have transparent pricing structure	1	2	3	4	5
	1.32 Excellent OTT applications make users aware of the costs associated with using the OTT applications	1	2	3	4	5
	1.33 Excellent OTT applications provides clear information about any additional charges or fees	1	2	3	4	5
7. Customer Input	1.34 Is there any other requirement that you consider important from your OTT?	Text Answer				
	1.35 An excellent OTT application must have the above to be considered	1	2	3	4	5

	excellent					
Section B: This section intends to identify your opinion regarding the current levels of service you receive from your most used OTT application. Please answer based on the OTT you use most for voice (incl. voice notes) and messaging (text, video, pictures, etc).						
Dimension	Current Perception	Rating (1-5)				
Reliability	The OTT application I use rarely experiences downtime. Downtime refers to periods where consumers are unable to transact on the platform.	1	2	3	4	5
	The OTT application I use consistently delivers messages and calls without disruptions.	1	2	3	4	5
	The OTT application I use allows me to make calls without disruptions	1	2	3	4	5
	The OTT application I use is dependable in terms of its performance.	1	2	3	4	5
Responsiveness	The OTT application I use promptly responds to queries raised	1	2	3	4	5
	The customer support of the OTT application I use is quick in addressing my queries or concerns.	1	2	3	4	5
	The OTT application I use provides timely updates and notifications on downtime	1	2	3	4	5
	The OTT application I use is easily accessible on multiple devices (e.g., smartphone, tablet, computer).	1	2	3	4	5
	The OTT application I use allows me to connect with other users without any barriers	1	2	3	4	5
Ease of Use	The OTT application I use offers a wide range of features to suit my communication needs.	1	2	3	4	5
	I can customise the settings of the OTT application according to my preferences.	1	2	3	4	5
	The OTT application I use provides options for adjusting privacy and notification settings.	1	2	3	4	5

	The OTT application I use allows me to send and receive messages and calls without delays.	1	2	3	4	5
	The loading time of the OTT application is minimal, ensuring smooth usage.	1	2	3	4	5
	The OTT application efficiently manages my contacts and conversation	1	2	3	4	5
Enjoyment	The design and visual appeal of the OTT application are pleasing to the eye.	1	2	3	4	5
	The OTT application uses graphics and colours that enhance the user experience.	1	2	3	4	5
	The overall look and feel of the OTT application are visually attractive.	1	2	3	4	5
	The OTT application I use offers options for personalizing my profile and settings.	1	2	3	4	5
	I can customize the appearance and theme of the OTT application.	1	2	3	4	5
	The OTT application provides features that cater to my individual preferences.	1	2	3	4	5
	It is easy for me to navigate through different sections and features of the OTT application.	1	2	3	4	5
	I can quickly find the necessary functions and options within the OTT application.	1	2	3	4	5
	The overall layout and organisation of the OTT application's interface are user-friendly	1	2	3	4	5
Privacy & Security	The OTT application I use implements strong security measures to safeguard my data.	1	2	3	4	5
	I have control over my privacy settings within the OTT application.	1	2	3	4	5
	The OTT application provides options for encryption and secure communication.	1	2	3	4	5

	I feel confident about the security and privacy of my data when using the OTT application.	1	2	3	4	5
	I trust the OTT application ensures the confidentiality of my messages and calls.	1	2	3	4	5
	I trust the OTT application to protect my personal information from unauthorised access	1	2	3	4	5
Price Knowledge	The pricing structure and plans of the OTT application are transparent and easy to understand.	1	2	3	4	5
	I am aware of the costs associated with using the OTT application.	1	2	3	4	5
	The OTT application provides clear information about any additional charges or fees	1	2	3	4	5
Customer Input	Based on the answer in 1.34, my current OTT application delivers this excellent around this dimension	1	2	3	4	5

Appendix C: Qualitative Interview

Age

Gender

Race

Job Title

Work Experience in
Telecommunications
(Years)

Dimension	Research Question	Interview Questions
Consumer Welfare	RQ 3 and RQ 4	1. How do you perceive the quality of service provided by Over-the-Top (OTT) Providers? 2. In your opinion, how does the asymmetry in Quality of Service (QoS) regulation impact your overall service experience as a consumer on OTT? 3. What are the specific aspects of consumer welfare that you consider important in the context of OTT services?
Market Competition	RQ 3 and RQ 4	1. How do you perceive the level of competition between OTT Providers and Mobile Network Operators in the market? 2. How does the asymmetry in QoS regulation affect the competitive landscape between MNO's and OTT? 3. What specific market dynamics or practices do you believe should be regulated to ensure fair competition?
Sustainability	RQ 3 and RQ 4	1. From your perspective, how does the asymmetry in QoS regulation impact the long-term sustainability of both OTT Providers and Mobile Network Operators? 2. Are there any potential risks or challenges associated with the current regulatory asymmetry that may affect the sustainability of these entities? 3. What measures or regulations do you believe would promote sustainable practices in the industry?

Equity	RQ 3 and RQ 4	1. In your view, does the asymmetry in QoS regulation contribute to any disparities or inequities between OTT Providers and Mobile Network Operators? 2. Are there specific aspects of the service experience or access to services that you believe are influenced by this regulatory asymmetry? 3. How do you think the regulatory framework can address equity concerns and ensure a level playing field for both entities?
Innovation	RQ 3 and RQ 4	1. How do you perceive the impact of the asymmetry in QoS regulation on the innovation capabilities of OTT Providers and Mobile Network Operators? 2. Are there any specific areas of innovation that you believe are influenced by this regulatory asymmetry? 3. What regulatory measures or policies do you think would promote innovation while maintaining a balance between OTT Providers and Mobile Network Operators?
Regulatory	RQ 3 and RQ 4	1. How do you believe OTT can be effectively incorporated into the current Quality of Service (QoS) framework? 2. From your perspective, is it feasible for the current framework to accommodate both OTT and MNO (Mobile Network Operators)? 3. What potential impact, if any, do you think the shift from self-regulation to ex-post or ex-ante regulation in OTT would have on monitoring capabilities?" 4. Do you have any additional comments or insights regarding the current End-User Subscriber Service Charter (EUSSC) and its relationship with OTT services?
Regulatory	RQ 1	1. How do you define quality of service (QoS) when it comes to Group 1 OTT (OTT that provide similar services to MNO's)? 2. From a regulatory standpoint, what are the key objectives in regulating

		the quality of services offered by OTT providers and MNOs? 3. What factors do you consider while assessing the quality of services provided by OTT platforms? 4. In your experience, what are the fundamental quality indicators that should be taken into account when evaluating OTT services? 5. What is the current state of quality in OTT services based on the key indicators mentioned in 4? 6. What are differences in the quality indicators for OTT services compared to traditional MNO services?
--	--	--

Appendix D: Consent Form

Consent Form: Interview



University of the Witwatersrand
1 Jan Smuts Avenue
Braamfontein
Johannesburg
2000

01 September 2023

Title of the research project:

Asymmetry in Quality of Service (QoS) Regulation among Over-the-Top (OTT) Providers and Mobile Network Operators: from a South African Consumers Perspective

Name of researcher: Charity Ledwaba

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 the interview activity may be audio recorded	YES	NO
I agree that the interview activity may be audio recorded	YES	NO
I agree that direct quotations from my interview may be used by the researcher in their research report/ manuscript/book chapter	YES	NO
I agree that my participation will remain anonymous (my name will not be used by the researcher in their research report/manuscript/book chapter)	YES	NO

I agree that other researchers may use the information I provide in my interview (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)

..... (signature)
..... (Charity Ledwaba)
..... (date)

Consent Form: Survey



University of the Witwatersrand
1 Jan Smuts Avenue
Braamfontein
Johannesburg
2000

01 September 2023

Title of the research project:

Asymmetry in Quality of Service (QoS) Regulation among Over-the-Top (OTT) Providers and Mobile Network Operators: from a South African Consumers Perspective

Name of researcher: Lesiba Ledwaba

I,, agree to participate in this survey for the 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 survey	YES	NO
I agree that I am over the age of eighteen (18)	YES	NO
I agree that the results of the survey will be saved for analyses and future research and may be stored for a period no more than five (5) years	YES	NO
I agree that direct quotations from my survey may be used by the researcher in their research report/ manuscript/book chapter	YES	NO
I agree that my participation will remain anonymous (my name will not be used by the researcher in their research report/manuscript/book chapter)	YES	NO

I agree that other researchers may use the information I provide in my survey activity (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)

..... (signature)
..... (Charity Ledwaba)
..... (date)

Appendix E: Participant Information Sheet (PIS)

Interview - PIS

Participant Information Sheet (PIS)



University of the Witwatersrand
1 Jan Smuts Avenue
Braamfontein
Johannesburg
2000

1 September 2023

Dear Sir / Madam

My name is Charity Ledwaba I am a Master of Management student in Digital Business at the University of the Witwatersrand, Johannesburg. My supervisor is Dr Thembekile Mayayise. I am conducting a research study about Over-the-Top platforms. The study title is:

“Asymmetry in Quality of Service (QoS) Regulation among Over-the-Top (OTT) Providers and Mobile Network Operators: from a South African Consumers Perspective”

I am inviting you to take part in an interview. If you decide to take part, your participation in this research study will last about One (1) hour. The interview activity will take place online via a platform of your choice or physically at a preferred location of your choice.

With your permission, I would like to audio and video record the interview. This data will be stored on a laptop for five (05) years and deleted after five (05) years lapses. Only the researcher will have access to the data.

During the research activity, I will need to ask for some personal information about you, including age, gender, race, job title and industry of occupation.

The interview 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 decided 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.

The risks for this research study are no more than what happens in everyday life. And some of the questions asked may make you feel sad or upset. If this happens, I will stop the interview and continue another time. Remember you also have the right to stop participating altogether.

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,
Charity Ledwaba

Researcher:
Charity Ledwaba, 1571422@students.wits.ac.za, 082 998 6155

Supervisor:
Thembekele Mayayise, Thembekele.Mayayise@wits.ac.za, (011) 717 8395

Survey - PIS

Participant Information Sheet (PIS)



University of the Witwatersrand
1 Jan Smuts Avenue
Braamfontein
Johannesburg
2000

1 September 2023

Dear Sir / Madam

My name is Charity Ledwaba I am a Master of Management Student in Digital Business at the University of the Witwatersrand, Johannesburg. My supervisor is Dr Thembekile Mayayise. I am conducting a research study about Over-the-Top platforms. The study title is:

“Asymmetry in Quality of Service (QoS) Regulation among Over-the-Top (OTT) Providers and Mobile Network Operators: from a South African Consumers Perspective”

I am inviting you to take part in a survey questionnaire. If you decide to take part, your participation in this research study will last about 30 minutes. The interview activity will take place online via a platform of your choice or can be delivered to a location of your choice.

During the research activity, I will need to ask for some personal information about you, including Age, gender, and race.

The survey 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 decided not to join. Taking part in the research study will not cost you anything

The risks for this research study are no more than what happens in everyday life / some of the questions asked may make you feel sad or upset. If this happens, you can stop the survey and re attempt at another time.

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,
Charity Ledwaba

Researcher:
Charity Ledwaba, 1571422@students.wits.ac.za, 082 998 6155

Supervisor:
Thembekele Mayayise, Thembekele.Mayayise@wits.ac.za, (011) 717 8395