The impact of information and communication technologies (ICT) infrastructure on remote work service delivery for Administrators in South African SMEs

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By

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Masters' of Commerce, majoring in Information Systems

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ABSTRACT

Adopting information and communication and technologies (ICT) infrastructures is very crucial for business sustainability but can also have detrimental drawbacks where there are limited ICT infrastructure resources to support daily technology demand. This leads to challenges like cyber risks, job dissatisfaction and may ultimately affects administrative service delivery, particularly in remote work situations. To examine the impact of information and communication technologies (ICT) infrastructure on remote work service delivery for administrators in South African Small and Medium Enterprises (SMEs), a conceptual model was developed to guide this study, and the research adopted the objectivism and positivism research philosophies. Quantitative research method was used to collect cross sectional data through an online survey involving administrators in South African SMEs. The study gathered data from 76 participants, accounting to a 76% response rate. Statistica software was then used to analyse the data and linear regression models were tested to determine the impact of ICT infrastructure on remote work service delivery.

The study findings reveal that a comprehensive ICT Infrastructure enhances the remote work service delivery for South African administrators working in the Small to Medium Enterprises (SMEs) organisations. Furthermore, the study discovered that the administrators' remote work satisfaction positively impacts on their remote work service delivery. In addition, the study found that administrators who work in ICT Job Industries have an increased chance of enhancing their remote work service delivery, by utilizing a Comprehensive ICT infrastructure, than those who work in non-ICT Job Industries. Additionally, the study also reveals that non cyber security challenges, such as 'connectivity'- accounting for 46% of the respondents, and team communication breakdown'-accounting for 32% of the respondents, impact remote work service delivery more than does cyber security issues. Furthermore, the general study trend shows that the most valuable use of remote work ICT tools is 'communication' (67% of respondents), followed by 'collaboration' (40,8% of respondents). Finally, the study reveals that gender has no impact on remote work satisfaction, however, it has impact on remote work service delivery, as the female gender experiences a decrease in remote work service delivery. This therefore suggests that they experience lower remote work service delivery as compared to their male counterparts because women spend more energy and time managing the home and taking care of others, which negatively impacts their remote work service delivery.

The study recommends that Small and Medium Enterprises (SMEs) prioritize investing in a robust ICT infrastructure that includes key tools such as mobile phones, laptops, extra screens,

Virtual Private Networks (VPNs), and a reliable internet connectivity. These technologies are critical for enhancing communication, collaboration, file sharing, and meetings, which are crucial components of remote work. Furthermore, the study recommends SMEs to prioritise investing in adequate power backup resources, such as solar power and uninterruptible power supply (UPS), so to address the connectivity challenge that the Administrators encounter, while working remotely. In addition, for future studies, the researcher suggests a mixed methods approach, including surveys of both employees and employers so to gain a better perspective of the phenomenon, as well as longitudinal research so to track the study's outcomes over time, considering the evolving nature of technology.

The study contributes to the body of knowledge by developing the Conceptual Model: The ICT Infrastructure Impact on Remote Work Service Delivery, which can be utilised by other researchers, as well as other SMEs with interest of adopting ICT Infrastructure for remote working, specifically in developing economies. Additionally, the study's developed model, and findings support the advancement of the United Nations Sustainable Development Goals, particularly Goals 8 and 17, that promote sustainable growth, productive employment, technological and innovation enhancement, with emphasis on SMEs, especially in developing economies such as South Africa. Furthermore, the study also supports the South African National Development Plan 2030, that aims to invest in ICT infrastructure that supports the economy growth, as well as to develop a more comprehensive and integrated e-strategy that depicts the interconnectedness of the ICT sector in the country. Finally, the study also supports South Africa's G20 high-level priority of artificial intelligence (AI) and innovation for sustainable developments, which is also evidenced by the recent Microsoft's investment in AI infrastructure is South Africa.

Key Words: remote work service delivery, remote work satisfaction, remote work, ICT infrastructure, cyber security issues, Administrators, SMEs.

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Above all, I am profoundly grateful to the Almighty God, who has been my constant and unfailing helper, guide and protector throughout every step of this challenging, yet rewarding long journey. I am a living testimony to the prominent African Proverb that says, “It takes a village to raise a child”, and my sincere gratitude, love and appreciation goes to my whole family, friends, work colleagues, fellow congregants and study peers who contributed to me getting to where I am on this day. A special acknowledgment goes to my resilient son, Anashe Linus Mazvimavi and my mother- my ride or die, Ms Clara Vailett Gato, who both have always provided unwavering support, love and prayers- looking back we can only say ‘Ebenezer!’

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DEDICATION

My thesis is dedicated to my mother, Ms. Clara Vailett Gato, and my son, Anashe Linus Mazvimavi, for their unwavering support. I am eternally grateful for their prayers, sacrifices, perseverance, and encouragement throughout my academic career and beyond. Like the biblical account of Aaron and Hur lifting Moses' tired hands during the Amalekite battle, their steadfast support played a vital role for this dissertation' completion and success. Together we proclaim "Ebenezer!", for the Lord has taken us thus far, and I would like to express my sincere utmost gratitude to these two pillars and declare a blessing: "May the LORD bless you and keep you; the LORD make His face shine upon you and be gracious to you; the LORD lift up His countenance upon you and give you peace" (Numbers 6:24-26).

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1. AAD: Azure Active Directory
2. AI: Artificial Intelligence
3. ANOVA: Analysis of Variance
4. COO: Chief Operating Officer
5. DDoS: Distributed Denial of Service
6. FSS: Financial Software and Systems
7. GDP: Gross Domestic Product
8. HR: Human Resources
9. ICT: Information and Communication and Technologies
10. IT: Information and Technologies
11. KZN: KwaZulu-Natal
12. MIS: Management Information Systems
13. NDP: National Development Plan
14. NSFA: The National Student Financial Aid Agency
15. POPIA: Protection of Personal Information Act
16. RR: Response Rate
17. ROLEXP3: Role Expectation
18. RWSD: Remote Work Service Delivery
19. RWSD3: Remote Work satisfaction
20. SA: South Africa
21. SASSA: South African Social Security Agency
22. SME: Small and Medium Enterprises
23. TLS2123: Comprehensive ICT Infrastructure
24. TLSRSD: Tools that enhance Remote Work Service Delivery
25. TLSSAT: Remote Work Tools Satisfaction
26. UCT: University of Cape Town
27. USD: United States Dollar
28. VPN: Virtual Private Network
29. ZAR: South African Rand

CHAPTER 1: INTRODUCTION

This introductory chapter of the dissertation provides an overview of the study's background, problem statement, research questions, and objectives. In addition, the chapter outlines the structure of the dissertation, offering a roadmap for the subsequent chapters, that include 'Literature Review (Chapter 2), 'Research Methodology' (Chapter 3), 'Data Analysis and Discussion' (Chapter 4), and Conclusion and Recommendations (Chapter 5).

1.1 Background and statement of the problem

Due to the growing importance of Information and Communication and Technologies (ICT) in business strategy and the significant financial benefits it provides, as well as to facilitate and boost corporate efficiency (Rachmawati, Choirunnisa, Pambagyo, Syarafina, & Ghiffari, (2021), particularly in support of remote work: recently exacerbated by the Covid (Coronavirus disease)-19 pandemic (Battisti, Alfiero, & Leonidou, 2022), there has been a surge in interest in the use of ICT by organizations, subsequently leading to more companies investing in cutting-edge Information and Technologies (IT) infrastructures (Aruleba & Jere, 2022; Pass & Ridgway, 2022).

Remote work is work that is carried out outside of an employer's office and is supported by ICT technology infrastructure (Urbaniec, Małkowska, & Włodarkiewicz-Klimek, 2022; Nakrošienė, Bučiūnienė, & Goštautaitė, 2019). IT infrastructure is the combined components required for the operation and management of an organization's IT services and IT environments (IBM, n.d). It is critical to have an IT infrastructure and structure in place that allows for efficiency, smart decision-making, and effective communication (Bick, Chang, Wang, & Yu, 2020) and new IT technologies will make remote work more effective (Rachmawati, et al., 2021), lower barriers, and address the issues that remote worker's encounter, such as agency issues, inefficiencies, and cybersecurity (Ilag, 2021; Urbaniec, et al., 2022), thereby enhancing remote work service delivery.

On the contrary, Urbaniec, et al., (2022) study found that a company's adoption of new ICT tools to allow remote work had a negative impact on the level of benefits as compared to entities that did not implement new ICT solutions. In agreement, Bakos & Kemerer (1992) and Battisti, et al., (2022), cite that ICT infrastructures are usually high-cost capital investments that require economies of scale, suggesting that full benefits can only be achieved as the number of users grows, and only when compatible systems are employed. Furthermore, the technology's actual benefits are a source of considerable scepticism, even after a corporation has integrated

technology, there will be times when it is uncertain. In addition, it is argued that firms implementing ICT infrastructures may incur significant switching technological and organizational expenses if they choose for a new technology, and cost patterns in hardware and software also have a big impact on the demand for infrastructure (Bakos & Kemerer, 1992). According to Adeola, & Evans, (2020) and Ntorukiri, Kirugua, & Kirimi, (2022), limitations are more dominant and problematic in developing countries, such as South Africa (Aruleba & Jere, 2022), where digital divide is more prominent due to lack of technology skills and most businesses not affording adequate ICT infrastructure to support daily technology demands (Kondo, Oosterwyk, & Van Belle, 2022) like remote work. Kariuki, Ofusori & Subramaniam, (2023) cite that such limitations lead to cyber security issues, poor broadband speed, and poor ICT policies implementations, that all subsequently impact on administrative service delivery (Aruleba & Jere, 2022). According to Weil & Murugesan, (2020) cyber security challenges are the most complex and harmful in business sustainability, and they have been spreading at an alarming rate since the advent of the Covid-19 pandemic, owing to the usage of IT infrastructure, particularly in remote work. Because SMEs in developing economies, such as South Africa, do not prioritize cyber security, the cyber security issues are more prevalent (Eybers & Mvundla, 2022).

Literature therefore has depicted that adopting ICT infrastructure is a double-edged sword. It can be crucial for enhancing service delivery, however, also comes with its detrimental limitations.

1.2 Problem Statement

Adopting ICT infrastructures is a double-edged sword: it may be vital for enhancing service delivery; however, it may also pose negative consequences. Limitations are more prevalent and problematic in developing countries like South Africa, due to the digital divide (Aruleba & Jere, 2022; Adeola, & Evans, 2020), where most people lack technology skills and most businesses in these developing economies cannot afford adequate ICT infrastructure to support daily technology demands, such as remote work, resulting in slow broadband speeds, cyber security issues, poor ICT policy implementations, all which subsequently impact on the administrative service delivery, particularly in remote work situations. Weil and Murugesan, (2020) consider cyber security challenges as the most detrimental and complex, and they are increasing at an alarming rate, endangering business sustainability, particularly in SMEs in developing countries (Eybers & Mvundla, 2022), subsequently affecting service delivery. As seen by service delivery protests around the country (Sebola, 2021), South Africa continues to have significant service delivery challenges (Mamokhere, Musitha, & Netshidzivhani, 2021).

Inefficiencies in administrative services, exacerbated by technological infrastructure limitations, have harmed individuals, businesses, and the country's GDP. The National Student Financial Aid Agency (NSFA) used technology mistakenly to transfer a ZAR14 million (USD 773 681,56) loan to a student when it should have been ZAR14 000 (USD 773,58). Furthermore, the SASSA, Financial Software and Systems (FSS) Technologies, and Postbank case is yet another example of administrative inefficiencies related to ICT infrastructure use, in which a critical supplementary technology service -'payment switch' - was provided between the above-mentioned companies for over two years without any recorded contract, potentially causing enormous inconveniences for the innocent grant beneficiaries who solely rely on these funds, as well as a possible national crisis and long-term harm to the organizations in question (Dewald van Rensburg, 2022).

Moreover, remote work presents additional challenges such as communication breakdown, lack of collaboration, and productivity gaps. To overcome these challenges, organizations should implement some forms of ICT tools such as Microsoft Teams and Unified Communication & Collaboration platforms, namely Microsoft Office365 that enables file sharing, collaboration, voice and video conferencing, instant messaging and email integration. A combination of tools, both hardware and software, like mobile phones, laptops, extra screens, VPNs, and the internet can enhance remote work service deliver and remote work satisfaction, subsequently leading to effective remote work (Ilag, 2021).

1.3 Research Questions and Objectives

This section states the research questions as well as the objectives of the study.

1.3.1 Research Question

This study answers the question 'What is the impact of information and communication technologies (ICT) infrastructure on remote work service delivery for Administrators in South African SMEs?'

1.3.2 Research Sub-Questions

The following sub-research questions are addressed in relation to the primary research question stated above:

a) What are the various forms of IT infrastructures that facilitate effective remote work for Administrators in South African SMEs?

b) What are the challenges associated with the use of ICT Infrastructure for the use of remote work.

c) What factors impact remote work service delivery for Administrators in South African SMEs?

1.3.3 Research Objectives

To address the proposed research question, the following are the research objectives:

a) To explain the various forms of ICT infrastructures that impact remote work service delivery for Administrators in South African SMEs

b) To profile the challenges that are associated with the use of ICT infrastructure for remote work for Administrators in South African SMEs.

c) To determine the factors that impact remote work service delivery for Administrators in South African SMEs

1.4 Chapter Outline

The five chapters of this dissertation are organised as follows:

Chapter 1-Introduction: This chapter serves to introduce and describe the study's background and problem statement. It then moves on to the research questions and objectives before showing the structure of the remaining chapters of the dissertation.

Chapter 2-Literature Review: This 2nd chapter highlights relevant historic literature on the study's concepts of IT infrastructure, remote work service delivery, and cyber security, as well as the gaps in the literature. The chapter also discusses the theoretical and conceptual approaches that have influenced this research.

Chapter 3-Research Design: This section describes the research philosophy, research method, research purpose, research approach, research strategy, and research time frame. Furthermore, the chapter covers how the study's sample was selected, as well as how the research instrument utilized in the study was constructed and the ethical considerations that were made prior to data collection.

Chapter 4-Data Analysis, Findings and Discussion: This chapter analyses the data acquired from a demographic and descriptive standpoint. The study employs regression analysis and cross-thematic analysis. This chapter also contains the study findings and the subsequent study discussion.

Chapter 5-Conclusion, Drawbacks and Recommendations: This is the dissertation's concluding chapter, and it includes a summary of the results or findings, explains the study's limitations, and highlights the study's contributions, as well as recommendations for future research.

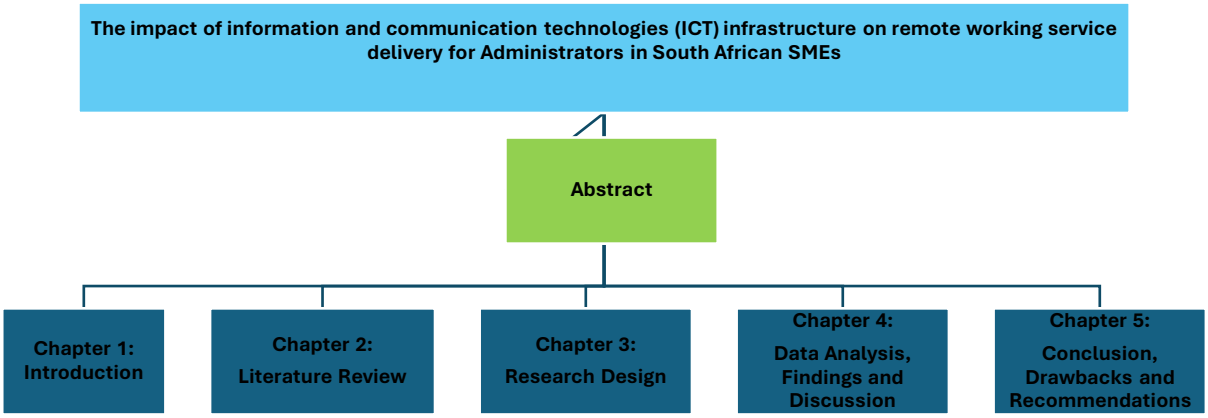


Figure 1.1: An illustration of the dissertation structure.

CHAPTER 2: LITERATURE REVIEW

This chapter demonstrates a critical analysis of existing literature, scholarly arguments, and theories pertinent to this research phenomenon. A conceptual model was developed, and hypotheses presented based on the reviewed literature. This literature review delves into ICT infrastructure, cyber security issues, remote work satisfaction, role expectation and remote work service delivery, as well as the various theories that underpin each of these research concepts. It goes on to emphasize the gaps in the literature and discusses the conceptual model developed for this study.

2.1 Introduction

Due to the growing importance of IT in business strategy and the significant financial benefits it provides, as well as to facilitate and boost corporate efficiency, particularly in support of remote work: recently exacerbated by the Covid-19 pandemic (Battisti, et al., 2022), there has been a surge in interest in the use of ICT by organizations, subsequently leading to more companies investing in cutting-edge IT infrastructures (Aruleba & Jere, 2022; Pass & Ridgway, 2022).

Adopting an ICT infrastructure is a double-edged sword, which can be crucial for enhancing remote work service delivery, however, also comes with its detrimental limitations, such as cyber threats (Urbaniec, et al., 2022). As such, the purpose of this research is to critically examine existing frameworks for remote work, ICT infrastructure, and cyber-security issues, to develop an integrated framework that explains the role that ICT infrastructure has in the effectiveness of remote work for South African administrators in SMEs.

The study focuses primarily on SMEs as, which according to Matekenya & Moyo, (2022), account for the vast majority of enterprises and employment in the global economy. Furthermore, they contribute significantly to the country's economic growth and job creation (SA News.gov.za, 2025, March 11) and are critical drivers for the achievement of the socio-economic goals and innovation stipulated in the National Development Plan (NDP), (Matekenya & Moyo, 2022). Opposing SMEs success, they have limited resources to invest in adequate ICT infrastructure (Scott & Kyobe, 2021; Kondo, Oosterwyk, & Van Belle, 2022), which enhances service delivery and, as a result, productivity, negatively impacting the NDP.

2.2 Information and Communication Technologies Infrastructure

Information and Communication Technologies refers to the set of hardware and software components (Gartner.com) needed to run and administer an organisation's IT services and environments (IBM, n.d). Some of the hardware and software infrastructure that supports remote work includes computers, monitors, servers, networking equipment such as routers and switches, internet connectivity, cloud infrastructure (Rahaman, 2018), VPN, Mobile application and software as a service (Davies, 2021). The primary goal of IT infrastructure development being to support information integration allowing collaboration and information sharing within teams and across organisations, thereby enabling globalisation (Aruleba & Jere, 2022). With the rise of the Covid-19 pandemic, organizations' investment in ICT infrastructure, mainly for remote work (Pass & Ridgway, 2022).

Implementing an ICT infrastructure in remote work can be critical for efficiency, smart decision-making, and effective communication (Bick, et al., 2020), and new IT technologies will make remote work more effective, lower barriers, and address the issues that remote worker's encounter, such as agency issues, inefficiencies, and cybersecurity (Ilag, 2021; Urbaniec, et al., 2022), subsequently enhancing remote work service delivery.

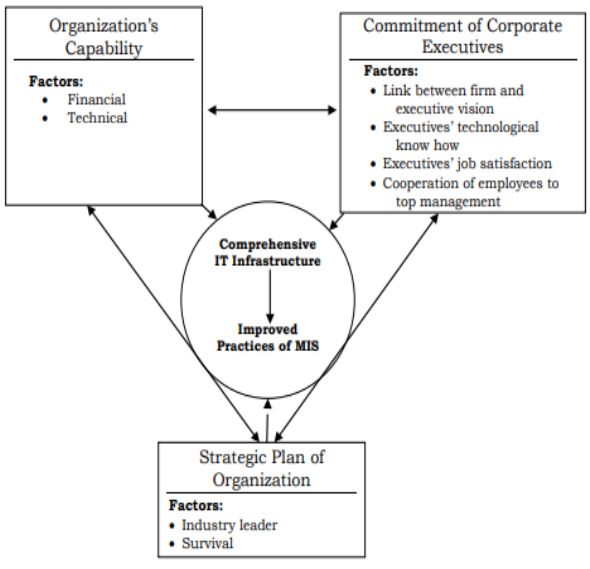
On the contrary, Urbaniec, et al., (2022) argues that the implementing of ICT infrastructure solutions can negatively impact a company as compared to those without it. In agreement, Bakos & Kemerer (1992) & Battisti, et al., (2022), cite that ICT infrastructures are high-cost investments that require economies of scale, and that full benefits may only occur when users multiply, and when compatible systems are employed. Additionally, the actual benefits of technology can be uncertain and switching costs can be significantly high (Bakos & Kemerer, 1992).

Historic literature has confirmed that these limitations are more dominant and problematic in developing countries (Ntorukiri, et al., 2022), such as South Africa (Aruleba & Jere, 2022), where digital divide is more prominent due to lack of technology skills and most businesses not affording adequate ICT infrastructure to support daily technology demands (Kondo, et al., 2022) such as remote work. According to Kariuki, et al., (2023), such limitations lead to cyber security risks, poor broadband speed, and poor ICT policies implementations, that all subsequently impact on administrative service delivery (Aruleba & Jere, 2022). Weil & Murugesan, (2020) consider cyber security issues as the most detrimental and complex, and they are increasing at an alarming rate, endangering business sustainability, particularly in

SMEs in developing countries (Eybers & Mvundla, 2022), subsequently negatively impacting remote work service delivery. As seen by service delivery protests around the country (Sebola, 2021), South Africa continues to have significant service delivery challenges (Mamokhere, et al., 2021). Inefficiencies in administrative services, exacerbated by technological infrastructure limitations, have harmed individuals, businesses, and the country's GDP.

Limitations are more dominant and problematic in developing countries (Ntorukiri, et al., 2022), such as South Africa (Aruleba & Jere, 2022), where digital divide is more prominent due to most businesses not affording adequate ICT infrastructure to support daily technology demands (Kondo, et al., 2022) such as remote work, thereby negatively impacting on remote work service delivery. According to Kariuki, et al., (2023), such limitations lead to cyber risks, poor broadband speed, and poor ICT policies implementations, and more distinguished, cyber security risks, more specifically in Small to Medium Enterprises in developing economies, such as South Africa (Murphy, Mtegha, Chigona, & Tuyeni, 2022). Ghelani, (2022) cite that cyber security challenges are on the rise, particularly in remote work (Nwankpa, & Datta, 2023), due to the increase in ICT infrastructure utilization. It is therefore evident that adopting ICT infrastructure, specifically to support remote work, is a double-edged sword, which can be crucial to enhance service delivery, however, also comes with its detrimental limitations.

Conceptual Framework of IT Infrastructure for improved Practices of Management Information Systems MIS



Source: Constructed by the Authors based on Keen (1991)

Figure 2.1: Conceptual Framework of IT Infrastructure for Improved Practices of MIS.

The conceptual Framework of IT infrastructure for Improved Practices of MIS depicted above, shows that a comprehensive IT Infrastructure which supports improved practices of MIS, is impacted by three variables, namely organizational capabilities, executive commitment, and the organization's strategic plan (Rahaman & Arif, 2018). The conceptual Framework of IT Infrastructure for Improved MIS Practices can be used to demonstrate how organizations can leverage a combination of several diverse ICT infrastructures to improve overall company efficiency and subsequently service delivery, rather than relying on a single infrastructure in isolation. This method focuses on the holistic integration of diverse ICT components to support and optimize operational processes and management information systems to support business operations, specifically remote work in this study.

It is vital that management supports the IT infrastructure for enhanced practices of MIS framework since executive support has an impact on the successful adoption and implementation of ICT Infrastructure in an organization. According to Rahaman and Arif (2018), the IT infrastructure is crucial to the efficient operation of Management Information Systems (MIS), which processes data into useful information for decision-making. As a result of the lack of executive support would lead to ineffective decision-making, posing a threat to the business's long-term viability. In addition, Urbaniec, et al., (2022) concur that the executives' support for the implementation of new IT technologies to enable remote work lowers barriers in an organisation, while the opposite is true.

To enhance remote work service delivery, the study forecasts a future increase in executive support (Srivastava, et al., 2022), in the adoption of new and secure ICT Infrastructure (Urbaniec, et al., 2022) that enables remote work. The secure infrastructure will in turn alleviate cyber security issues.

2.3 Cyber Security Issues

Srivastava, et al., (2022), and Ghelani, (2022), defines cybersecurity as the protection of digital information, encompassing confidentiality, integrity, and accessibility, and comprises processes, people, and technology, expanding its scope to include IoT (Internet of Things) and industrial contexts. It is a combination of tools, policies, security concepts, security safeguards, guidelines, risk management approaches, activities, training, best practices, assurance, and technology used to safeguard an organization's and its users' assets from cyber security threats like ransomware and phishing attacks. Assets include computing machines, infrastructure, applications, and telecommunications systems (Von Solms, & Van Niekerk, 2013).

According to Srivastava et al., (2022), cyber security has become a global issue, and Weil and Murugesan, (2020) consider cyber security challenges as the most detrimental and complex. These challenges are increasing at an alarming rate, specifically in the context of remote work (Nwankpa, & Datta, 2023), due to the increase in ICT infrastructure utilization. In agreement, Ghelani, (2022), Lallie, Shepherd, Nurse, Erola, Epiphaniou, Maple & Bellekens, (2021), Weil & Murugesan, (2020), and Matsikidze, (2022), cite that cyber-attacks have been exacerbated by the advent of ICT Infrastructure innovations, particularly those developed to support remote work, such as Cloud Computing Infrastructure, a trend that was accelerated by the Covid-19 pandemic. The authors claim that new cyber risks have emerged, such as, whaling phishing, zoom bombing, spear phishing, business email comprise phishing, malware, and service outage spikes. Furthermore, Scott & Kyobe, (2021), project the threats to worsen as they use machine learning techniques to automate threats, and as businesses increasingly depend on ICT Infrastructure to support remote work. Cyber security breach, according to Ghelani, (2022), can have severe and long-term consequences, which can cause detrimental financial impact, ultimately negatively impacting the business' service delivery and sustainability. Examples of cyber security threats that greatly impacted service delivery include the ongoing Distributed Denial of Service (DDoS) Russian and Ukraine cyber war (Khoirunnisa & Sugiati, 2024), AWS DDoS 2020, ICMR Indian Council of Medical Research, Dyn DDos attack (CloudFare.com, n.d), South Africa Experian Data Breach 2020 (Experian.co.za, n.d) and the ongoing ransom attacks on the South African entities (IOL, 2025), only to mention but a few. All these attacks have led to financial loss (Cele & Kwenda, 2025) & vastly disrupted service delivery (Khoirunnisa & Sugiati, 2024). Eybers & Mvundla, (2022) & Murphy, et al., (2022) studies suggest that cyber issues are more destructive in SMEs, particularly in developing countries, such as South Africa due to insufficient cyber security investments Scott & Kyobe (2021), and the digital divide (Aruleba & Jere, 2022).

On the contrary, Ilag (2021) argued that the use of adequate ICT infrastructure is vital to overcome remote work challenges. This infrastructure helps address challenges like cyber threats, which can negatively impact remote work efficiency and service delivery.

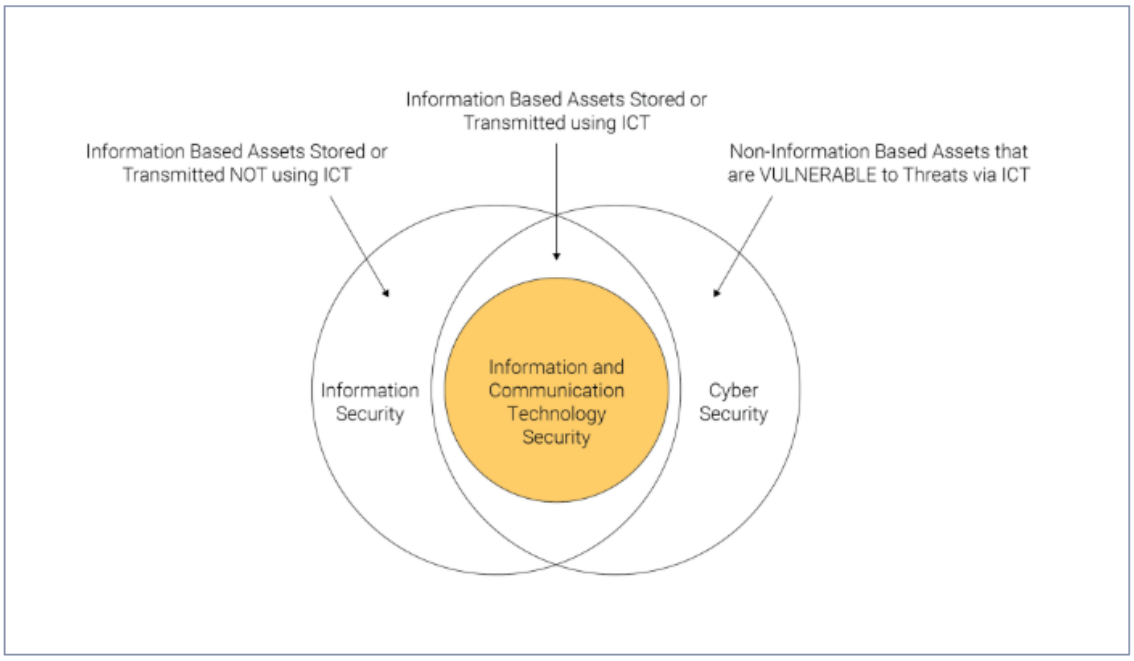


Figure 1: Relationship between information security, ICT security, and cybersecurity. Source: Von Solms and Van Niekerk (2013)

Figure 2.2: Cyber Security Framework.

The above framework depicts the relationships of three overlapping concepts of information security, ICT security and cyber security. Von Solms, & Van Niekerk, (2013) explains that 'Information security' is an asset which safeguards information against threats and weaknesses. Cyber security, on the other hand, encompasses not only the protection of the cyberspace but also the protection of the users' assets too. The relationships between the three overlapping concepts of information security, ICT security, and cyber security are illustrated in the cybersecurity framework. According to Von Solms and Van Niekerk (2013), information security is an asset that protects data from attacks and vulnerabilities while cyber security includes both the safety of the users of the assets as well as the protection of cyberspace. Cyber security issues associated with ICT Infrastructure adoption, fall in the 'Non-Information Based Assets that are vulnerable to threats via ICT' segment of the framework.

In the near future, cyber security is projected to get more complicated and hence negatively impacting remote work service delivery. This is owing to developments in ICT infrastructure to support remote work, changes in the global political climate that led to the Ukraine Cyber war, and advancements in artificial intelligence (AI) (Lallie, et al., 2021). These problems fall in the right circle of the framework as they are to do with ICT security as well as cybersecurity, which are characteristics of remote work. Matli, 2020 proposes considering and implementing

safety and security measures to combat data breaches caused by an organization's information system being accessible from outside networks. Implementing multi-factor authentication, using web application firewalls, and enforcing security hygiene practices are some of the security steps that can be used. Furthermore, according to Weil & Murugesan, 2020, industries should revisit critical crisis management standards, as well as IT and business risk management strategies.

2.4 Remote Work

Remote work is professional tasks and business operations, done outside of an employer's office (Ilag, 2021) and assisted by ICT technological infrastructure (Urbaniec et al., 2022). Telework, telecommuting, ICT-based mobile work, mobile eWork, mobile virtual work, homeworking, and home-based work are all terminology used to describe remote work applications (Urbaniec et al., 2022). The term "remote work" is utilized for the purposes of this study. Jack Nills first proposed remote work in 1976 to reduce road congestion and save energy (Wang, Liu, Qian, & Parker, 2021). Remote work has grown increasingly popular and necessary after the advent of the Covid-19 pandemic (Wang et al., 2021). Ilag, (2021) argues that remote work is expected to increase in the future as employees are advocating for it and are working towards creating policies that enable it, owing to various benefits such as increased productivity and service delivery, and the ability to recruit skilled and diverse personnel from dispersed geographic regions. In addition, more businesses are investing in cutting-edge IT infrastructures, particularly to support remote work (Urbaniec et al., 2022).

Having an IT infrastructure and framework in place that allows for efficiency, smart decision-making, and good communication is critical in remote work, according to Bick et al., (2020). In agreement, Ilag and Urbaniec (2021) and Urbaniec, et al., (2022), cite that new IT technologies will make remote work more successful, reduce barriers, and address the issues that remote employees confront. Ilag, (2021) and Prasad, Mangipudi, Vaidya, & Muralidhar, (2020) argue that remote work has several advantages for both the employee and the employer, namely increased productivity, the ability to recruit skilled and diverse personnel from dispersed geographic regions, improved work-life balance, reduced commute time and office resources, pursuing hobbies, time planning freedom, improved autonomy, and a more flexible lifestyle, all subsequently leading to a better service delivery.

On the contrary, remote work presents major challenges such as agency issues, agency costs, and most detrimental- cyber security issues (Nwankpa, & Datta, 2023), due to the increase in

ICT infrastructure utilization. Furthermore, when compared to organizations that do not employ new ICT solutions, a company's adoption of new ICT tools to allow remote work has a negative impact on the number of advantages (Urbaniec et al., 2022). In addition, developing and maintaining an effective ICT infrastructure to support remote work can be difficult and expensive (Urbaniec et al., 2022) and gives rise to cybersecurity concerns (Weil, & Murugesan, 2020).

2.4.1 The Role Theory

The Role Theory is about expectations, and it claims that people react in a given way because they expect a specific response from their actions. A role, according to Biddle (2013), is a set of expectations placed on a person in a certain position, and we all have expectations about how individuals will act. In addition, Matsikidze & Kyobe (2022) cite that Role theory posits that human behavior is shaped by social roles and expectations, with understanding and performance being influenced by past experiences and education. When students march for the 'Fees Must Fall' Campaign, for example, they will expect the university administration to reduce their fees.

This study is based on the experiences of remote work Administrators in South African SMEs. The following section therefore examines the Administrator's expectations of their role and how it impacts on their remote work service delivery.

Remote worker Expectations

The emergence of Covid-19 in 2019 dramatically impacted employees' working lives, prompting most organizations implementing remote work for some roles. As a result, there has been a significant increase in remote workers' reliance on technology (Pass & Ridgway, 2022). While remote work was not obligatory in previous years, it has increased since the emergence of Covid-19 pandemic. Projections by Wang, et al., (2021) and Pass & Ridgway, (2022), suggested that remote work could become the "new normal," although it might be optional or follow a hybrid model in the post-Covid-19 future. Pass & Ridgway, (2022) argue that the changing work environment disproportionately affected remote workers' roles mostly women and young people, as well as the role of the Human Resources (HR) personnel which was unclear. The HR personnel had to enable the remote work workforce to adapt and become agile, while managing remote work expectations for both parties as well as their remote work performance. The abrupt shift in expectations from working in a physical office to working remotely might pose several difficulties in the implementation of remote work, thereby

negatively impacting remote work service delivery. As depicted in figure 2.3 below, Carraher-Wolverton, (2022), claims that workers who are compelled to work remotely due to circumstances beyond their control, such as a pandemic, will bring with them a set of expectations about working remotely, and how they perform their role under the circumstances, will impact their job satisfaction and whether they would want to continue working remotely in the future. Some of the challenges attributed to unfulfilled expectations and poor role performance for remote workers would be job dissatisfaction, leading to inefficiencies, which subsequently negatively impact on the remote work service delivery.

Before Covid-19 lockdowns made remote work mandatory, users would physically visit a service provider and expect the administrator to perform their role well, as depicted by promptness and delivery of service before leaving; but, with remote work, expectations and performance may not be realized immediately because the user is not in physical contact with the remote worker, Pascoe, (2021), resulting to poor problem resolving turnaround times subsequently impacting on remote work job satisfaction which in turn would result to poor service delivery.

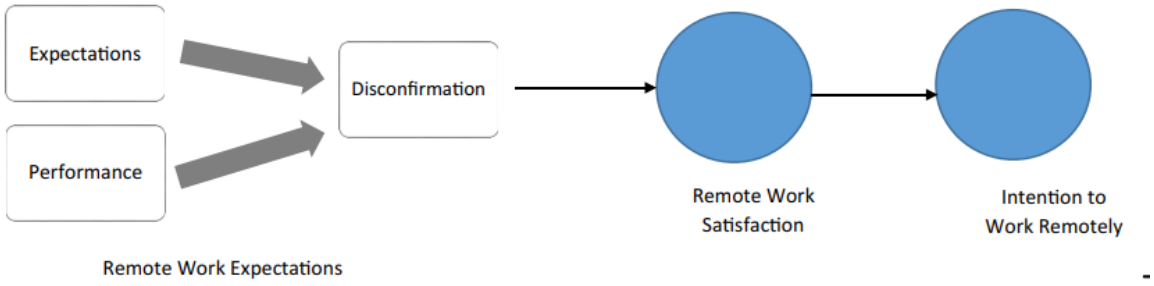


Figure 2.3: Remote Work Expectations

Remote Work Satisfaction -Employee-Employer Relationship

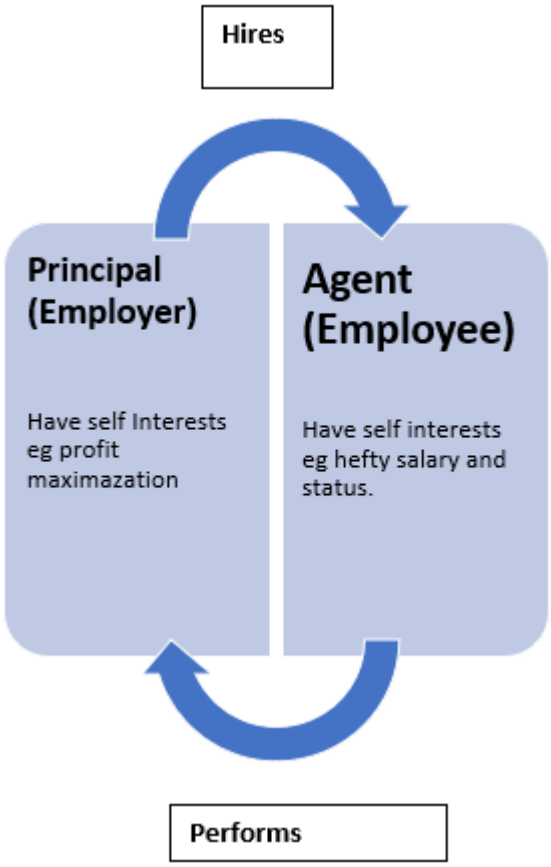


Figure 2.4: Agency theory

According to Shapiro, (2005), the agency theory involves an agent-principal relationship, where the employee represents the agent, whereas the employer is the principal. The two parties both have different and sometimes conflicting interests which results in agency problems that strain their relation. For example, the employer (principal)'s interest in business is profit maximization and good interest rates, whereas the employee (agent)'s interest is a substantial salary and status (Panda, & Leepsa, 2017). According to Delany, (2022) and Nakrošienė, et al., (2019), an employee (agent) – employer (principal) relationship is built on mutual trust and employees have a responsibility to operate in good faith with their employer, more essential for remote work employees. In addition, conflicts arise from unequal data distribution, and the agent's possible breach of security measures for malicious or convenient motives jeopardizes the agency theory's key ideals of security and trust (Matsikidze & Kyobe ,2022)

When organizations allow their employees to work from home, there are several risks associated with the decision, in the agent-principal relationship (Shapiro, 2005). The risks

include agency costs which are as a result of agency issues (White, 2019). The biggest agent costs include challenges in monitoring agent behavior, shirking responsibilities, and goal conflict. Shapiro, (2005) highlights that agency costs, namely recruitment costs, monitoring, policy costs, and incentives, have risen due to the Covid-19 pandemic lockdowns. Furthermore, Shapiro, (2005), cites that agency costs have risen because of the increase in remote work necessitated by the Covid-19 pandemic lockdowns (Molino, et al., 2020).

On the contrary, White, (2019) cites that, due to advancements in technology such as electronic mail, video conferencing software, and mobile communication over ubiquitous cellular communications networks, monitoring costs for remote work employees have declined over the past years. Companies have resorted to monitoring only the employee work output, rather than their behavior towards achieving those outcomes, to address the agency problem in remote work, according to Shapiro, (2005), implying that employees can be flexible with their time if they produce the desired output. Shapiro, (2005), also adds corporate governance, monitoring, and employee incentives to align agent-principal interest and relationship to reduce the agency problem, thereby enhancing the agent's remote work satisfaction.

Considering that remote work has become the "new normal" and there is a greater demand for workplace flexibility, this study predicts that agency problems and costs will continue to rise, however may be lowered with the use of advanced ICT infrastructure technologies which enhance team communication and monitoring, thereby enhancing on the agent's remote work satisfaction and subsequently the agent's remote work service delivery.

2.5 Age

The Cambridge Dictionary defines age as a person's number of years that they have lived from birth to the present time. A person is classified as young or old based on their age. Kłopotek, (2017), characterizes young workers as those workers who are under 30 years, highlighting their requirement for flexible work schedules and shorter commute times when working remotely. Kłopotek, (2017) further cites that, as compared to their older counterparts, younger workers could find it difficult to maintain the discipline needed for remote work, thereby negatively impacting their remote work satisfaction and remote work service delivery. In addition (Ipsen, van Veldhoven, Kirchner, & Hansen, 2021) cite that, in comparison to older generations, young workers experienced greater difficulties with work uncertainties and that, in contrast to the younger generations, the elder generations believed that inadequate ICT tools were an even a bigger problem.

Kłopotek, (2017) further argues that young remote workers' remote work satisfaction might be greatly increased by offering flexible hours, which could encourage them to take advantage of remote work opportunities in the face of changing work attitudes and lifestyles. Ironically, despite digital connectedness, social isolation is still a major concern for this age group, indicating a preference for in-person interactions. In addition, young workers also face difficulties managing their personal and professional responsibilities, increased organizational expectations, and mostly, a decreased regard for participation in the company culture (Kłopotek, 2017)

2.6 Gender

Lindqvist, Sendén & Renström, (2021) cite that “gender" is a term used to describe a person's social and personal identification as a man, woman, or non-binary person, that is, as someone who identifies as neither entirely male or female. In addition, the authors further cite the four components of gender, namely legal gender, self-defined gender identity, physiological or bodily aspects, and gender expression, which include societal standards connected to conduct and appearance. For the purpose of this study, gender refers to either male or female.

By providing remote work opportunities, employers are adjusting to the growing trend of women and mothers entering the workforce. There are benefits to working remotely for both men and women who want to spend more time with their families and do not want to put their entire career on hold (Nakrošienė, et al., 2019; Felstead & Henseke, 2017). Pass; Ridgway (2022), cite that women are less inclined to recognize remote work service satisfaction as they are severely impacted by the interference in the home setting (Nakrošienė, et al., 2019; Urbaniec, et al., 2022). This is because they bear a greater burden of caring for others and managing the home, which subsequently takes up more of their time and energy to effectively work remotely (Pass & Ridgway ,2022). On the contrary, González Ramos & García-de-Diego, (2022) point out that men are more affected by health-related issues amid remote work, thereby negatively impacting their remote work satisfaction. Despite the possible advantages of working remotely in resolving gender gaps, both studies point to a need for greater support from men at home in order to achieve a more equal allocation of household tasks, thereby improving remote work satisfaction and enhanced service delivery for both genders. Moreover, gender can be a moderating factor between remote work satisfaction and the use of ICT infrastructure to support remote work. According to Kyobe, (2011), males may be more

successful at utilizing technology, which could enable male employees to thrive in remote work environments, given the emphasis on rewards, recognition, and individual development in a male-dominated innovation environment, thereby enhancing their remote work satisfaction.

2.7 Job Industry

An industry is a collection of manufacturers or companies that deal with a specific type of product or service. It may also relate to a particular economic sector, such manufacturing, building, or financial services.

Due to the Covid -19 pandemic mandatory lockdowns, remote work has grown increasingly popular and necessary (Wang et al., 2021). Technology played a pivotal role in the transition to remote work during this period. Urbaniec et al. (2022) found that technology and finance industries experienced growth with remote work adoption, while industries like hospitality, arts, retail, and construction encountered challenges. Despite being non-tech sectors, these industries are gradually integrating remote work practices post-pandemic. Major technology companies such as Apple, Facebook, Microsoft, and Amazon reported significant sales growth during this period (Pass & Ridgway, 2022), contributing to employees' reduced visibility within their industries. While the transition highlighted gaps in industry readiness, it also accentuated on the benefits of remote work (Urbaniec et al., 2022), which includes improved productivity and service delivery. According to Gigi & Sangeetha, (2020), the enhanced remote work service delivery is attributed to the available state-of-the-art technologies that enhance connectivity, such as cloud infrastructure, which are synonymous with the IT job industry.

2.8 Literature gaps

According to the literature review for this study, there are various gaps in the studied material and theories. Because the theories, namely the Agency theory, the Role theory, Cyber security theory, and the Conceptual Framework of IT Infrastructure for Improved MIS Practices, do not specifically address the relationships between infrastructure and remote work service delivery, they will be used to deductively create propositions for testing as well as a conceptual model that better explains the relationship between the stated concepts. Furthermore, the theory has been applied to other concepts such as IT adoption but has not been applied to remote work (Carraher-Wolverton, 2022).

Because mandatory remote work, or remote work on a larger and unprecedented scale, did not begin until after the Covid-19 outbreak in 2019 (Wang et al., 2021), despite a recent increase

in literature, there is still knowledge gaps (Ropponen, 2025). Furthermore, prior to the Covid-19 pandemic, only a few professions could be performed remotely; but, with the mandated pandemic lockdown, professions that had previously been unable to work remotely are now able to do so (Wang et al., 2021). In addition, Matli (2020) claims that it is still too early to find evidence in the literature on study that explored remote work service delivery and the impact that ICT infrastructure has on the phenomenon. Furthermore, because ICT infrastructure, particularly for remote work, is evolving at a rapid pace, previous studies may no longer be reliable (Ropponen, 2025), specifically with the advancement of AI, necessitating more research into the phenomena. Moreover, the existing literature has limitations as it lacks extensive research on IT infrastructure and remote work service delivery in developing nations like South Africa (Statssa, 2020), where digital divide is more pronounced, due to scarcity of technology skills, and financial barriers to the adoption of sufficient ICT infrastructure to support remote work (Kondo, et al., 2022).

2.9 Integrated framework

The proposed conceptual model in Figure 2.5 has been deductively created by the combination of the four theories that support this study, namely the Conceptual Framework for ICT Infrastructure for Improved Practices of MIS, The Agency theory, the role theory, and the Cyber Security theory. The proposed framework depicts that administrator remote work service delivery is impacted by three variables, namely Comprehensive IT Infrastructure, Administrator (Agent) role expectation, and Administrator remote work satisfaction.

The adoption of ICT Infrastructure for remote work comes with several threats, such as cyber threats and connectivity issues, which indirectly impact on the Administrator's remote work service delivery. In addition, the relationship between the above two stated variables: Administrator's remote work service delivery and ICT Infrastructure is moderated by the Administrator demographics namely age categories, gender and job industry.

The study depicts that there are several gaps in the reviewed theories that guide this study, namely, the Agency theory, the Role theory, Cybersecurity theory and the Conceptual Framework of IT Infrastructure for Improved Practices of MIS, do not specifically address the relationships between infrastructure and remote work service delivery, hence were used to deductively create the proposed comprehensive conceptual model in Fig 2.5.

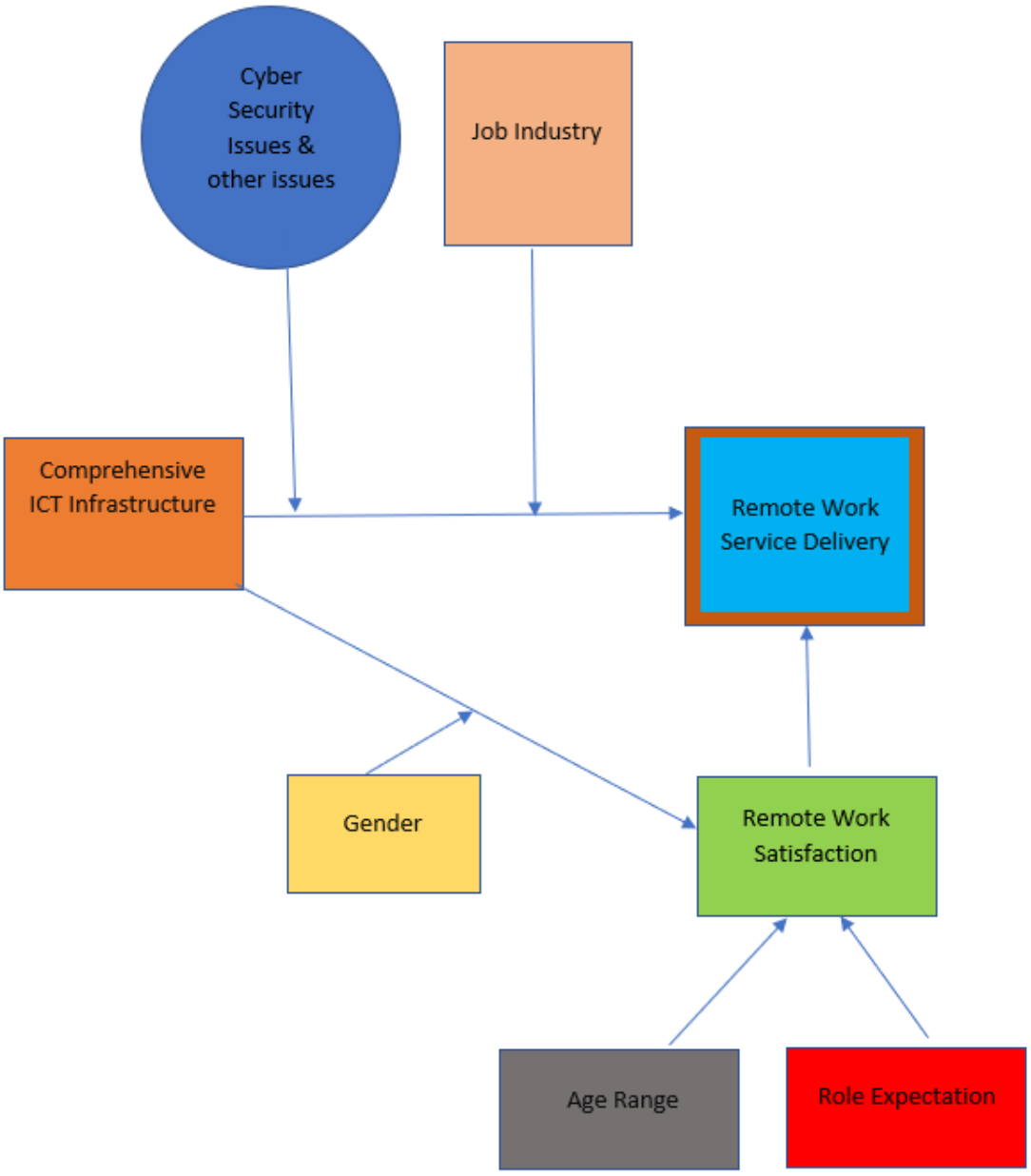


Figure 2.5: Conceptual Model: The ICT Infrastructure Impact on Remote Work Service Delivery

2.10 Hypotheses

Based on the reviewed literature as well as the integrated theoretical framework outlined above, the following hypotheses were formulated.

Hypothesis 1

A Comprehensive ICT Infrastructure positively impact on remote work service delivery for administrators in South African SMEs.

Implementing a comprehensive ICT infrastructure for remote work is critical for remote work service delivery (Bick et al., 2020). According to Ilag, (2021), and Rachmawati et al, (2021), advanced ICT Infrastructure technologies will make remote work more effective, thereby improving remote work service delivery.

Hypothesis 2

Cybersecurity issues moderate the relationship between the use of comprehensive ICT infrastructure and remote work service delivery.

Due to the increase in ICT infrastructure utilization to support remote working purposes, cybersecurity issues have skyrocketed (Nwankpa, & Datta, 2023). In agreement, Ghelani, (2022), Lallie, Shepherd, Nurse, Erola, Epiphaniou, Maple & Bellekens, (2021), Weil & Murugesan, (2020), and Matsikidze, (2022), cite that cyber-attacks have been exacerbated by the advent of ICT infrastructure innovations to support remote work. Cyber security breach may lead to severe and long-term consequences, which ultimately negatively impact the business' remote work service delivery (Ghelani, 2022).

Hypothesis 3

The administrator job industry they work in moderates the relationship between the use of comprehensive ICT infrastructure and remote work service delivery.

Enhanced remote work service delivery is attributed to the comprehensive ICT infrastructure that enhance connectivity, such as cloud infrastructure, which are synonymous with the IT job industry (Gigi & Sangeetha, 2020).

Hypothesis 4

The administrator gender moderates the relationship between the use of comprehensive ICT infrastructure and remote work satisfaction.

Gender can be a moderating factor between remote work satisfaction and the use of Comprehensive ICT infrastructure to support remote work. According to Kyobe, (2011), males may be more successful at utilizing technology, which could enable male employees to thrive in remote work environments, given the emphasis on rewards, recognition, and individual development in a male-dominated innovation environment, thereby enhancing their remote work satisfaction.

Hypothesis 5

The administrator remote work satisfaction is impacted by their age range while working remotely.

As compared to their older counterparts, younger workers could find it difficult to maintain the discipline needed for remote work, thereby negatively impacting their remote work satisfaction (Kłopotek, 2017). Kłopotek, (2017) further argues that young remote workers' remote work satisfaction might be greatly increased by offering flexible hours, which could encourage them to take advantage of remote work opportunities in the face of changing work attitudes and lifestyles.

Hypothesis 6

The administrator remote work satisfaction is impacted by their role expectation while working remotely.

Carraher-Wolverton, (2022), claims that workers who are compelled to work remotely due to circumstances beyond their control, will bring with them a set of expectations about working remotely, which will impact their job satisfaction. Before mandatory remote work brought about Covid-19, users would physically visit a service provider and expect to be promptly served before leaving; but, with remote work, expectations may not be realized immediately because the user is not in physical contact with the remote worker, Pascoe, (2021), resulting to poor problem resolving turnaround times subsequently impacting on remote work job satisfaction.

Hypothesis 7

Remote work satisfaction positively impacts on remote work service delivery for administrators in South African SMEs.

The use of advanced ICT infrastructure technologies which enhance team communication and monitoring, enhances employee remote work satisfaction and subsequently the employee's remote work service delivery, (Shapiro, 2005).

Hypothesis 8

A Comprehensive ICT Infrastructure positively impact on remote work satisfaction for administrators in South African SMEs.

The adoption of advanced ICT infrastructure technologies which enhance team communication and monitoring, subsequently enhances employee remote work satisfaction, (Shapiro, 2005). In agreement, Kyobe, (2011), cites that the use of remote working ICT infrastructure has a positive impact on remote work environments, thereby enhancing their remote work satisfaction. Furthermore, this study indicates that agency problems can be reduced by implementing modern ICT infrastructure technologies that improve team communication and monitoring, consequently enhancing agent remote work satisfaction. Buonomo, Ferrara, Pansini, & Benevene, (2023) also concur and suggest that future research investigate the specific dimensions of remote work satisfaction as a result of utilizing more comprehensive ICT tools.

Table 2.1: Concepts Definitions

Construct	Definition	Source
ICT Infrastructure	ICT infrastructure refers to any hardware or software applications that are used to collect, process, store, or transfer information and the services that are associated with it.	Byrd & Turner, (2000)
Comprehensive ICT Infrastructure	A comprehensive ICT infrastructure entails the integral and interconnected technical resources such as hardware, software, and communication technologies, as well as the human expertise and knowledge needed to promote efficient business activities, increase productivity, and enable seamless communication and collaboration within the organization.	Rahaman, & Arif, (2018)
Remote Work	Remote work is work that is carried out outside of an employer's office and is supported by ICT technology infrastructure	Urbaniec, et.al., (2022)
Remote Work Service Delivery	This is the actual work that is done outside of an employer's office, providing goods and services to the client or customers, and it is supported by ICT infrastructure.	Remote Work Service Delivery
Agent	Agents are employees of an organization who are paid by the business owners to manage the daily affairs of the organization. The agent's primary interest is a high salary and perks; therefore they might not operate in the best interests of the business owner. For this study, the agents are administrative personnel under study.	Linder, & Foss, (2013) Shapiro, (2005)
Role	A role is a set of expectations placed on a person in a certain position.	Biddle, (2013)

Cyber security issues	Cyber security is a combination of tools, policies, security concepts, security safeguards, guidelines, risk management approaches, activities, training, best practices, assurance, and technology used to safeguard an organization's and its users' assets from cyber security threats like ransomware and phishing attacks.	Von Solms, & Van Niekerk, (2013)
Other Issues	These are non cyber security threats on remote work associated with an organization's implementation of ICT hardware or software applications that enable employees to work outside of an employer's office.	Urbaniec, et.al., (2022) Byrd & Turner, (2000) Dimitrov, & Nedeltcheva, (2017)
Job Industry	A job is a collection of manufacturers or companies that deal with a specific type of product or service. It may also relate to a particular economic sector, such as manufacturing, building, or financial services.	Vocabulary.com
Role Expectation	Role Expectation refers to the set of activities and behaviours that the administrative personnel anticipate performing within an organization.	Biddle, (2013)
Remote work satisfaction	Remote Work Satisfaction refers to the level of contentment or fulfilment experienced by administrators who perform their duties out outside of an employer's office and is supported by ICT technology infrastructure.	Urbaniec, et.al., (2022) Rožman, & Čančer, (2022)
Gender	Gender is a term used to describe a person's social and personal identification as a man, woman, or non-binary person, that is, as someone who identifies as neither entirely male nor female.	Lindqvist, Sendén, & Renström, (2021)
Age Range	The age range is the complete group that is included between two points on a scale of measurement or quality, indicating the upper and lower ages considered suitable for a specified thing.	Collinsdictionary.com

2.11 Summary

The ICT Infrastructure Impact on Remote work Service Delivery model proposed in this study was developed by integrating the Agency theory, Role theory, the Cybersecurity framework, and Conceptual Framework of IT Infrastructure for better Practices of Management Information Systems (MIS). As each theory individually has limitations in terms of understanding how ICT infrastructure impacts Administrators' capacity to operate effectively remotely, the four theories were combined to create a comprehensive model to better explain the phenomenon under study. To better comprehend the influence that ICT Infrastructure has on Administrators' capacity to work effectively remotely, the model integrates threats associated to the interactions, such as cybersecurity.

Due to its attempt to explain a modern phenomenon that has emerged and contributed to the "new normal" and "future of work," this study contributes to the body of knowledge. One of the study's shortcomings is that the suggested model has not yet been validated, hence its accuracy and applicability are not guaranteed. Furthermore, other than the remote work Administrators' role, the study may not be generalizable to non-remote work roles such as waiters and nurses. In addition, the results may not be generalizable to SMEs companies outside of South Africa.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This section describes the research philosophy, research method, research purpose, research approach, research strategy, and research time frame. Furthermore, the chapter covers how the study's sample was selected, as well as how the research instruments utilized in the study were constructed and the ethical considerations that were made prior to data collection.

3.2 Philosophical consideration

A research philosophy, according to Saunders, Bristow, Lewis, & Thornhill (2015), is a set of beliefs and assumptions about how knowledge is created and consists of two philosophical considerations: ontology and epistemology. These two considerations, as highlighted by Berryman (2019), provide insight into the researcher's beliefs about the nature of truth, the nature of the world, and methods of being in that world; thereby they characterize the researcher's world view. To shape the research question, ontology and epistemology operate in conjunction with the researcher's theoretical approach Berryman, (2019).

3.2.1 Ontology

The philosophical study of existence is known as ontology. It describes what is known and encompasses what we believe exists, as well as what we perceive to be essential or basic (Berryman, 2019). According to Berryman, (2019) and Sheppard, (2020), ontology can either be objective or subjective and quantitative researchers aim to remain objective and separate from their experiments, while qualitative researchers are subjective and believe that social reality exists when we experience it. This study takes an objective ontological viewpoint as the researcher believes that the phenomenon being investigated is external to ourselves and the social players (Saunders, et al., 2015).

3.2.2 Epistemology

Epistemology is the study of how we know what we know and who is a knower (Sheppard, 2020; Berryman, 2019). Researchers can be positivists or interpretivists. Positivist researchers assert that truth exists independently of human consciousness and can be discovered through repetitive observation. They employ quantitative methodologies, such as experiments and surveys, to establish relationships between variables, emphasizing elements like bias, objectivity, validity, and generalizability. This approach involves quantitative data collection, statistical analysis, and set standards of validity and reliability to test theories, hypotheses, and

explanations. Positivism emphasizes the hypothetical deductive approach to proving a prior assumption and produces explanatory links or causal relationships (Park, Konge, & Artino, 2020) between concepts (Saunders et al., 2015). On the contrary, Interpretivist researchers explore multiple truths shaped by social constructions and interactions, prioritizing explication, and understanding over establishing cause-and-effect relationships. They opt for qualitative research methodologies such as ethnography or grounded theory to grasp participants' meanings and interpret phenomena, employing techniques such as open-ended questions and textual analysis and validate research with confirmability, dependability, and credibility (Berryman, 2019).

This study employs positivist epistemology in that hypotheses are deduced from existing theories, namely the agency theory, the role theory, Cyber Security Framework, and the Conceptual framework of IT Infrastructure for improved practices of MIS, to create an integrated framework that explains causal relationships between the concepts of ICT infrastructure and remote work service delivery, for South African administrators in SMEs.

3.3 Research Method

Taherdoost, (2022) identifies three research approaches: quantitative, qualitative, and mixed methods, which are classified based on a range of criteria including the application of study, the objectives of the research, and information sought. To investigate societal issues, qualitative research, a naturalistic and interpretative method, employs empirical data such as case studies and life experiences. It is useful for exploring limited information and generating new insights, ideas, and theories. It emphasizes in-depth understanding of events in specific contexts and times, without necessarily generalizing results for the future or other contexts. Quantitative research, on the other hand, employs numerical values from observations to explain and describe phenomena, with the goal of understanding the causal or correlational relationship between variables through hypotheses testing. It employs empirical approaches, focusing on the real qualities of cases rather than their ideal conditions, and the data gathered is analyzed mathematically. According to Mcleod, (2023), Mixed-method research integrates both qualitative and quantitative methodologies in a study, either concurrently or sequentially, and depends on the study's objective and the research question to acquire an in-depth knowledge of the issue. This merging of qualitative and quantitative methodologies is called triangulation (Al-Ababneh, 2020; Kaplan & Duchon, 1988) as it enhances the validity and credibility of the research findings. In addition, the mixed method approach proves useful in addressing difficult research phenomenon, as it covers the benefits of both approaches, or when one method is

insufficient for a study (Taherdoost, 2022). This study follows a quantitative approach to explain the association between ICT infrastructure and remote work service delivery through hypothesis testing.

3.4 Research Purpose

A research design is the researcher's strategy for answering the research question using empirical data, and it varies depending on the research purpose. According to Al-Ababneh, (2020), there are four main research designs, namely exploratory, descriptive, explanatory, and emancipatory studies. Exploratory research, which evaluates the feasibility of a comprehensive study, involves probing and gaining fresh perspectives. This is often conducted through literature review, expert interviews, and focus groups (Sheppard, 2020). Descriptive studies on the other hand, aim to define a phenomenon, utilizing flexible or fixed designs to provide a detailed understanding of variables, and they serve as a precursor to exploratory studies (Al-Ababneh, 2020; Sheppard, 2020). Explanatory studies answer "why" questions by explaining patterns connected to an issue without necessarily demonstrating causal linkages (Al-Ababneh, 2020; Sheppard, 2020). Emancipatory studies empower marginalized groups, promoting social change and self-determination through active participant involvement (Al-Ababneh, 2020). This study adopts an explanatory approach, as its objective is to explain the impact of ICT infrastructure on remote work service delivery for South African administrators in SMEs.

3.5 Research Approach

According to Streefkerk, (2023) the research approach can be divided into two types: deductive and inductive. The deductive approach, rooted in positivist philosophy, focuses on developing theory and hypotheses, while the inductive approach, influenced by interpretivist philosophy, aims to develop a theory from specific observations (Al-Ababneh, 2020).

This study took a deductive approach, as it used existing theories to generate and test hypothesis as well as develop a conceptual model to explain the impact of ICT infrastructure on remote work service delivery for South African administrators in SMEs.

3.6 Research Strategy

According to Al-Ababneh, (2020), the research strategy outlines a broad approach to addressing research questions, encompassing defining research objectives, identifying data sources, and consider research limitations. Research strategies encompass options such as experiments, surveys, case studies, grounded theory, ethnography, action research, and archival

research. The choice of strategy depends on the research questions, objectives, philosophical considerations, and existing knowledge base.

Maree, (2007) and Al-Ababneh, (2020) highlight the importance of the survey strategy in social research, which is a deductive approach that involves questionnaires or interviews to gather data pertaining to status, opinions, beliefs, and attitudes. The survey strategy allows for descriptive and analytical data collection, enabling quantitative analysis through descriptive statistics (Taherdoost, 2022).

This study adopted a quantitative approach and utilized an online survey- sent to public administrators, to collect research data which was descriptively analysed to explain the association between ICT infrastructure and remote work service delivery for South African administrators in SMEs.

3.7 Research Time Frame

According to Bryman, & Bell, (2014), a research time frame can either be cross sectional or longitudinal. A cross-sectional study collects data only once and over a short period of time, whereas longitudinal study gathers data multiple times at different time points over a longer period of time, and from the same sample study participants (Al-Ababneh, 2020).

This study is cross-sectional in nature, as data was collected just once over a short period of time. This is because the nature of the study was neither time to an event study nor the assessment of an intervention effect over a period of time kind of study. Furthermore, due to limited time, for the research to be completed within the Masters' Program time frame, and limited budget, the researcher had to do a cross-sectional study.

3.8 Pilot Studies

A pilot study is a smaller-scale research protocol that assesses feasibility and feasibility of a full-scale study. It is crucial for improving the quality and efficiency of the main study, as it helps in planning and modifying the data collection method (In, 2017). For the above purpose, this study conducted a pilot study for the survey. A preliminary version of the survey was distributed to three respondents. The online survey was facilitated through Microsoft Forms. To safeguard respondents' confidentiality and anonymity, these principles were prominently emphasized on the cover page of the survey, and the purpose of the research clearly stated on both the survey and the questionnaire. Additionally, an estimated completion time for the survey was suggested, informed by insights from the pilot study.

Prior to the main distribution, the preliminary version of the survey was distributed and completed by three individuals. Feedback from the survey participants indicated clarity in the questions. However, two respondents proposed providing guidance on ranking answers, specifying actions such as 'Use the right-side arrows by clicking to rank from highest to lowest,' which was implemented. Another participant noted a duplication in the 'video conference' option for question 20, which was corrected. Overall, one respondent commended the form, acknowledging its relevance to the study. Furthermore, a recommendation was made to include an 'unsure' response option for question 27, resulting in the addition of a 'maybe' option. Lastly, a respondent sought clarification on 'Administrative roles,' prompting an explanation in the questionnaire specifying that it encompasses roles such as Personal Assistant, Bookkeeper, Accounts Clerk, Finance Administration, Executive Assistant, and any other role that conducts administrative duties.

3.9 Data collection and process

This section outlines the research's target population, sampling method, data collection method, data analysis, and how the study's research instrument for data collection was designed.

3.9.1 Target Population and Sample

According to Martínez-Mesa, González-Chica, Duquia, Bonamigo, & Bastos, (2016), it is crucial that researchers make the important decision, in the research planning phase, to determine whether to conduct the study on the entire population or a sample. It is sometimes impossible to study the entire population as it may be too large. Campbell, Greenwood, Prior, Campbell, et al., (2020) cite that the approach for participant selection should be integrated into the overall logic of any study (Punch, 2004), and the rationale for sample selection needs to be aligned from an ontological, epistemological, and axiological standpoint with the study's ultimate goals, to ensure the validity and generalizability of research findings (Martínez-Mesa, González-Chica, Bastos, Bonamigo, & Duquia, 2014).

According to Martínez-Mesa, et al., (2014), the population refers to a group of individuals who have a similar trait and are limited to a geographical area such as a suburb, city, country, continent, or specific institutions such as churches, hospitals, and schools. The target population is a subset of this broader population, comprising of individuals who share qualities that the researcher considers relevant to the study. The study population, on the other hand,

consists of the study's representative individuals who are evaluated in the study and from whose conclusions about the target population can be derived.

Martínez-Mesa, et al., (2016) describes sampling as selecting study participants or units from a sample frame, following a predetermined strategy so to achieve the study objectives, as well as to minimize bias. Sampling can either be probabilistic or non-probabilistic. Non-probabilistic sampling doesn't offer a chance for all individuals in the target population to be selected, resulting in non-representative samples and limited generalizability of observed results to the target population. Non-probability sampling techniques include convenience sampling, quota sampling, purposeful sampling, and "snowball" sampling. Convenience sampling selects participants based on accessibility, whereas quota sampling categorizes the population based on characteristics such as age and gender. Purposive sampling necessitates a diversified samples or expert opinion in a specific area of interest, so to better match the sample to the study aims and objectives thereby enhancing the rigor, reliability of the study data and results (Campbell, et al., 2020). Snowball sampling involves selecting an initial set of participants who in turn recommend other potential members with similar characteristics to participate in the study. In contrast, probability sampling methods on the other hand include simple random sampling, systematic random sampling, stratified sampling, cluster sampling, and complex or multi-stage sampling. Simple random sampling involves randomly selecting participants from a list of participants, while systematic sampling selects participants from fixed intervals previously defined from a ranked list of participants. Stratified sampling divides the target population into separate strata then simply or systematically selecting samples within each stratum, whereas cluster sampling samples groups such as health facilities or schools, and complex sampling combines different sample strategies (GHR, & Aithal, 2022; Martínez-Mesa, et al., 2016).

This study sought to explain the association between ICT infrastructure and remote work service delivery, the target population being the South African remote working Administrators in the SMEs sector. South Africa was selected for this study because the challenges associated with the adopting of ICT infrastructure for remote work are particularly prominent in developing countries such as South Africa (Eybers & Mvundla, 2022). This is mostly due to the digital divide, which emanates from insufficient technology skills and limited financial resources for establishing adequate ICT infrastructure to support remote working (Kondo, Oosterwyk, & Van Belle, 2022). In addition, most of these challenges are more prevalent in SME companies in developing countries like South Africa, hence the selection of SMEs as the

target population. The challenges experienced in the South African SMEs ultimately affect service delivery, specifically administrative services (Aruleba & Jere, 2022), as evidenced by numerous administrative service delivery protests across the nation (Sebola, 2021). For this reason, the administrative roles were selected as the study's target population. Stratified, simple random sampling was utilized to select and distribute online surveys to remote work public administrators via LinkedIn, emails, and WhatsApp. A total of 100 surveys were distributed and 76 (76%) responded to the survey. The sampling process involved identifying the study population on LinkedIn based on characteristics, such as profession and location, then randomly selecting participants from these groups and engaging with them via LinkedIn, email and WhatsApp before sending them the survey for data collection. This technique was chosen because it is the best for reviewing data from each stratum, namely administrators, working for a South African SME organization, and working remotely. Furthermore, the sampling technique was the best for obtaining a sample population that accurately represents the total population being investigated, minimized bias, and was cost effective.

Table 3.1: Population and Sampling

Quantitative Study	
Population	South African SMEs
Unit of Analysis	Remote work Administrators
Sampling Technique	Stratified Sampling
Sample Size	76

3.9.2 Data Collection Methods and Research Design

Sharma, (2022) defines two categories of data collection: primary and secondary, based on how the data is sourced (Streefkerk, 2019). Secondary data is data that has been collected and made available for use by other organizations, government agencies, independent research institutions, or individuals. It includes published census data, published records, newspaper biographies, data archives, scholarly articles, and a variety of databases, among other sources of information (Streefkerk, 2019). Primary data is information acquired directly from those who experienced an event or circumstance firsthand. It is more trustworthy and reliable because it is founded on actual study. Primary data can be collected using either qualitative or quantitative methods (Streefkerk, 2019). According to Streefkerk, (2019), qualitative data collection entails acquiring information through the use of words, with a focus on concepts,

ideas, and memories to facilitate deeper understanding and analysis. This approach allows for an extensive examination of poorly understood phenomena, using techniques such as in-depth interviews, observations, and literary evaluations. Quantitative data gathering on the other hand, illustrates information graphically or statistically with the goal of validating hypotheses. This method collects data through experiments, numerical observations, and programmed response surveys. Both approaches can be combined to provide useful insights into various aspects of a study, providing complementary viewpoints for thorough investigation and comprehension of complex phenomena, and proving useful in addressing difficult research phenomena, as it covers the benefits of both approaches, or when one method is insufficient for a study (Taherdoost, 2022). To validate hypotheses pertaining to the impact of ICT infrastructure on remote work service delivery for Administrators in South African SMEs, this study collected quantitative data through an online survey to public Administrators primarily via LinkedIn.

Data can be classified into two categories, namely categorical-used in qualitative data, or measurement or numeric-used in quantitative data. These categories can be further divided into subgroups, with measurement data subdivided into interval and ratio, and categorical data subdivided into nominal, ordinal, and binary (Maree,2007).

Maree, (2007) further state that nominal data -also called categoric scales, is used to measure categorical variables that do not have a quantitative value or ranking, such as gender, colors and names. Ordinal scales on the other hand measure numeric data that were grouped into classes, or is rank-ordered data, such as the size of a raincoat, which can be small, medium, large, or extra-large. Binary scales are for specific type of nominal data with only two categories or levels, such as agree/disagree, yes/no and true/false. Binary questions are quicker to respond (Dolnicar, Grün, & Leisch, 2011).

This study developed and utilized a quantitative research instrument, namely a survey featuring demographic questions (such as age range), Likert scale, multiple-choice questions and ranking questions, to gather data from respondents. The survey consists of 25 questions, structured to address all constructs of the study conceptual model. The first section captures demographic variables such as gender, age range, and job industry. The subsequent sections focus on role expectations, remote work service delivery, and from questions 16 to 24, the Comprehensive ICT Infrastructure construct. The final question (Question 25) is a multiple-choice question, aimed at gathering feedback on the challenges that the Administrators encountered while

working remotely. During coding, these challenges were categorized into two categories namely cybersecurity and non-cybersecurity issues. This was to enable the researcher to compare the prominence of cyber security issues encountered by respondents against other issues s and Team Communication breakdown. The research instrument is included as Appendix A, while the survey was accompanied by a cover letter for respondents, also attached in Appendix B. This cover letter's purpose served to introduce the researcher, inform the purpose of the research, provide estimated time required to complete the survey, and outlines ethical considerations.

3.9.3 Data Analysis

Data analysis should be reproducible to allow for technical validation and regeneration of results on the original, or at times even new data set (Mölder, Jablonski, Letcher, Hall, Tomkins-Tinch, Sochat, ... & Köster, 2021). Data analysis is classified as qualitative or quantitative, with each category subdivided into several techniques such as content analysis, discourse analysis, and grounded theory for qualitative analysis, and statistical analysis for qualitative analysis. Ochoa and Merceron (2018) and Lacey, & Luff, (2001) agree that quantitative data analysis employs statistical methods to identify patterns and relationships in numerical data, whereas qualitative data analysis summarizes words from interviews or observations with the aim of understanding relationships between themes, respondent characteristics, and policy or practice implications, as well as interpreting findings and developing theories using advanced analytical techniques.

Analysis for qualitative and quantitative data sets can be linked while retaining the numerical and textual integrity of each set. Alternatively, various datasets can be combined, with qualitative information converted into quantitative data and vice versa. The connection between qualitative and quantitative analysis outputs requires applying the appropriate analytical approaches to each dataset—qualitative methods for qualitative data and quantitative methods for quantitative data. The findings from the qualitative analysis of qualitative data and the quantitative analysis of quantitative data are then merged at the interpretive level of research, although each data set remains analytically distinct from the other (Sandelowski, 2000).

This study employs a quantitative approach to examine the association between variables. The data was descriptively analysed using proportions and frequencies. Linear regression was used to model the relationship between remote work service delivery and Administrator Role

expectation, Comprehensive ICT Infrastructure, Administrator Remote work Satisfaction, Cyber security issues and other issue, and participants demographics, namely age, gender, and job industry. Statistical analysis was conducted using Statistica software.

3.10 Resources and Plan

This study utilized minimum resources as it was primarily conducted virtually. The survey was administered virtually hence there were minimum travelling costs. The following resources were utilized: internet data and airtime for communication with participants and a laptop with relevant data analysis software.

Table 3.2: Planned Research Schedule

Period	Activity	Status
March 2022	Research Proposal Presentation	Completed
April 2022	Management Assignment	Completed
May 2022	Literature Review	Completed
June 2022	High Level Dissertation Proposal	Completed
July- August 2022	Work-in progress paper publication	Completed
September - December 2023	Research planning and logistics	Completed
January 2023	Ethical clearance	Completed
February - October 2023	Data collection	Completed
November 2023	Data preparation and cleaning	Completed
December 2023 - February 2024	Data Analysis	Completed
March - September 2024	Data Analysis Corrections	Completed
September - October 2024	Finalize Chapters	Completed
November 2024-January 2025	Thesis Submission	Completed

3.11 Ethics Considerations

The study adheres to all the University of Cape Town's ethical considerations and procedures. Prior to data collection, a research project approval letter to conduct the research was obtained from the university. The online survey to administrators was anonymous, however adhered to all ethical considerations, namely participants were informed that they were giving their consent by completing the online survey.

In addition, participants were informed that their participation in the research was voluntary and that they were under no obligation to participate in the study. Participants were also informed of their right to withdraw from the study at any time if they felt to doing so, without having to give a reason, and that their identity would be anonymous hence their responses could not be connected to them. Finally, the participants were informed that the study results would be used solely for academic purposes and may be published in an academic journal or presented

at an academic conference. Overall, due to data being collected via digital platforms, the study adhered to the South African Protection of Personal Information Act (POPIA) to ensure privacy rights protection of any individuals and to ensure that their personal information is collected, stored, used, and shared in a manner that respects these privacy rights.

3.12 Research Design Summary

Diagram 3.1: Saunders' Research Onion

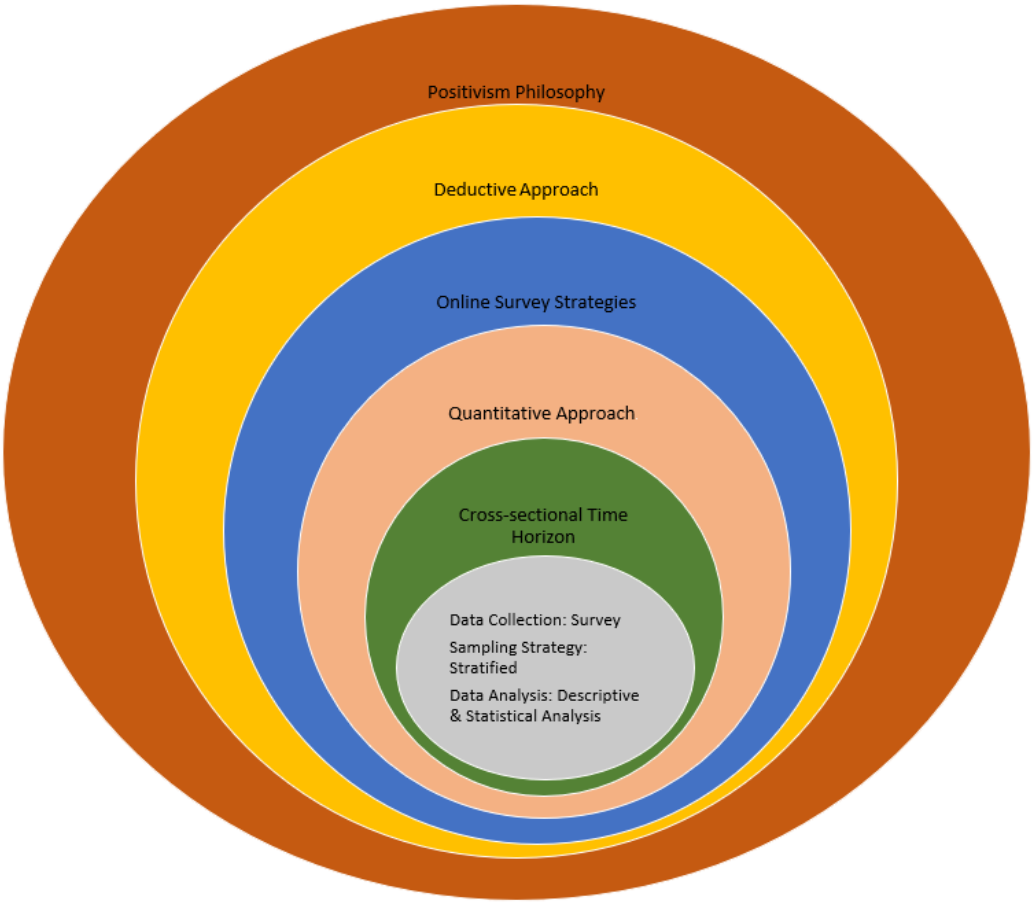


Diagram 3.1 above depicts a full overview of the study design, which is based on positivist philosophy of research. This philosophical approach is consistent with use of a deductive method of research, which allowed for the formulation and testing of the study's eight hypotheses to develop the proposed conceptual model that addresses the research question: 'What is the impact of information and communication technologies (ICT) infrastructure on

remote work service delivery for Administrators in South African SMEs?' The study employed a quantitative approach as the acquired data is in numerical form, thereby allowing a statistical and descriptive analysis to be conducted to determine the relationships between the constructs, thereby informing the study's findings, which in turn led to the formulation of the research's conclusions and future recommendations.

The research strategy for obtaining primary data involved conducting an anonymous online survey to South African public Administrators in SMEs. The study participants were selected using a stratified probability sampling methodology as the study was only interested in administrative remote work participants in South African SMEs. The research was designed in a cross-sectional time frame so to collect the data at a single point of time, as the researcher was required to align with the University's Masters' program duration.

CHAPTER 4: DATA ANALYSIS AND DISCUSSION

4.1. Introduction

This chapter analyses the research data from a demographic and descriptive standpoint to provide findings that answer the study research questions. Linear regression analysis is used in the study. The chapter then proceeds to discuss the study findings, makes recommendations for further research, and ultimately concludes the study.

4.2. Data Cleaning

Data cleaning, also known as data cleansing or scrubbing, is a critical procedure that identifies and eliminates errors and inconsistencies in data to enhance its overall quality (Rahm & Do, 2000). This method, which involves the manual use of data wrangling tools or automated computer systems for error detection and elimination, is an essential first step in the data analysis process. Despite efforts, real-world data is rarely flawless due to factors such as manual curation errors or flaws in automatic data collection, which can lead to challenges such as misleading information, missing data, or inaccuracies (Lee, Alzamil, Doskenov, & Termehchy, (2021). Chai, (2020) emphasizes the importance of using analytical insights to effectively clean up data.

For this study, data cleaning was performed using Microsoft Excel. While not many outliers were identified in the data as it fell within normal ranges, there were instances of missing values. Specifically, the first five participants lacked 'Company Size' values because the question was added to the survey after these respondents had completed their surveys. To address this, the values were adjusted to 'code 2,' representing Small and Medium Enterprises (SMEs), as the initial companies approached were SMEs. Adjustments were also made for some of the 'Highest Qualification' variable data sets. Two participants who selected the 'other' option but then typed 'Master's degree', were changed to University degree (code 4).

4.3. Response Rate

The response rate (RR) is the percentage of valid responses obtained from a survey or email. According to Wu, Zhao, & Fils-Aime, (2022), the average online survey response rate is 35.5%, and increasing the number of participants does not always increase response rates. Researchers have typically relied on response-rate criteria, however there is no guarantee that a high response rate correlates with sample validity. While higher response rates are often associated with better outcomes, the assumption that a low response rate suggests low-quality research is disputed (Wu et al., 2022). Relying merely on response rate as an indicator of study

quality is problematic, as a low response rate does not always indicate poor research quality. Holtom, Baruch, Aguinis, & Ballinger, (2022) suggest that in addition to reporting response rates, researchers should provide additional evidence to justify sample appropriateness and signal a study's validity deservingness. In addition, Wu et al., (2022) suggests using other types of data sources and collection methods in conjunction with online survey.

This study achieved a fair response rate of 76% of the distributed surveys. Due to the survey's anonymity, the researcher was unable to contact the remaining 24% of respondents who did not complete the online questionnaire. This study conducted validity and reliability, (Cronbach's alpha of 0.70), tests to guarantee that the study results are reliable and significant, offering a strong basis for conclusion drawing and decision-making.

Table 4.1 Response Rate

Data Type	Distributed Questionnaires/Surveys	Successful Respondents	Response Rate
Quantitative-Online Survey	100	76	76%

4.4. Demographic Analysis

The diagrams below depict the demographic and descriptive data

Diagram 4.1: Age Range

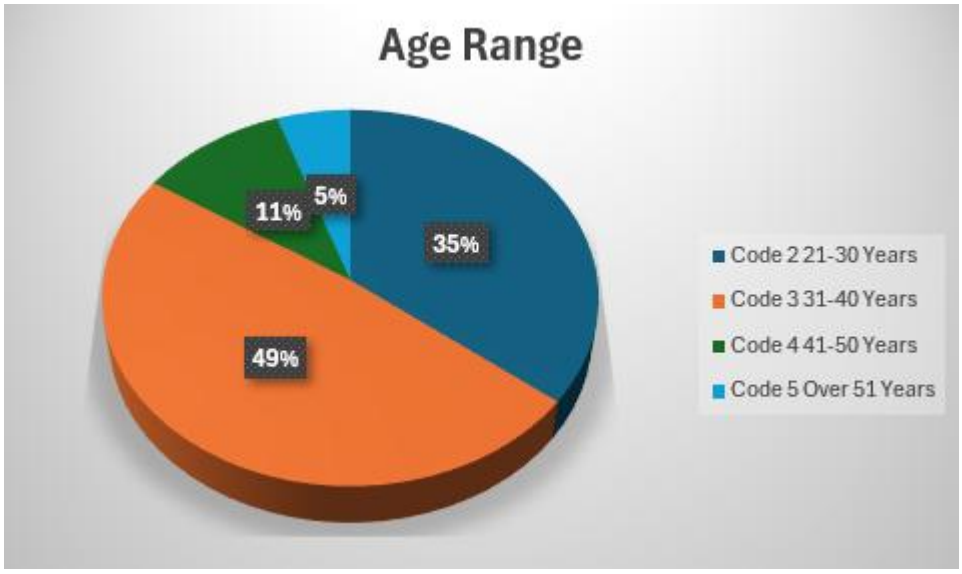


Diagram 4.1 depicts the age categories that the study respondents fall into. Category 31-40 years is the highest age range with 49 % (37 respondents), followed by the 21-30 years category, accounting for 35% of the respondents (27 respondents). The lowest categories were age ranges 41-50 years and over 50 years categories, accounting 11 % and 5% of the respondents respectively.

Diagram 4.2: Gender

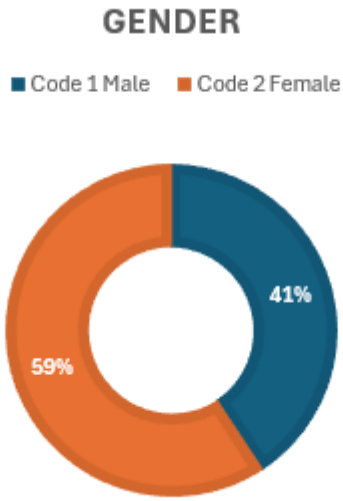


Diagram 4.2 shows the study participants' age distribution. Females were the majority respondents, accounting for 59% of the respondents (45 respondents), while the 41% of the respondents (31 respondents) were male.

Diagram 4.3: Geographic Location

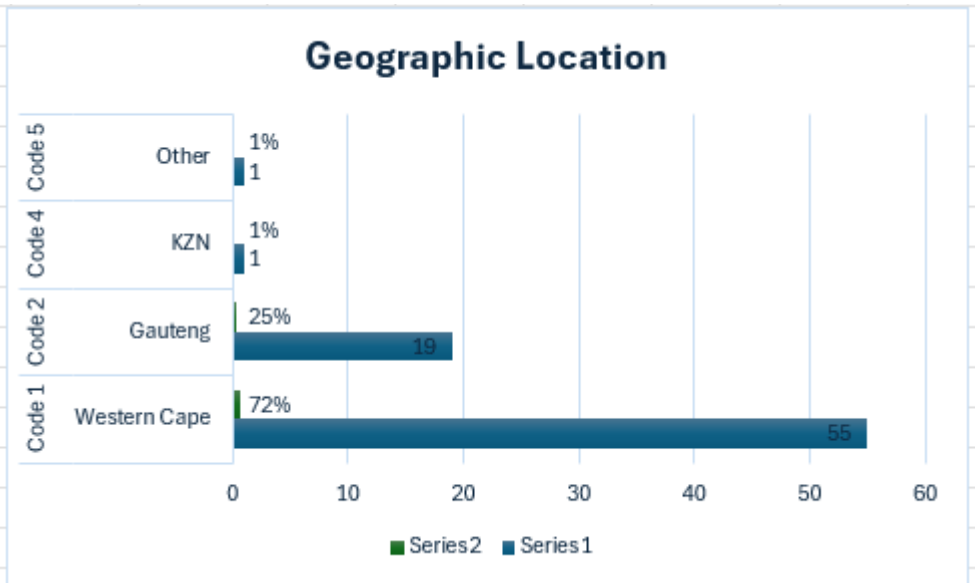


Diagram 4.3 above depicts the geographic location of the study's participants. The Western Cape accounts for a substantial amount of the respondents, 72 % (55 respondents), followed by Gauteng accounting for 25% of the respondents (19 respondents) and lastly KwaZulu-Natal (KZN) and 'Other' provinces accounting for 1% each (1 respondent each. The Limpopo province (code 3) was excluded from the analysis as there were no respondents who completed the questionnaire captured from this the province.

Diagram 4.4: Highest Level of Education

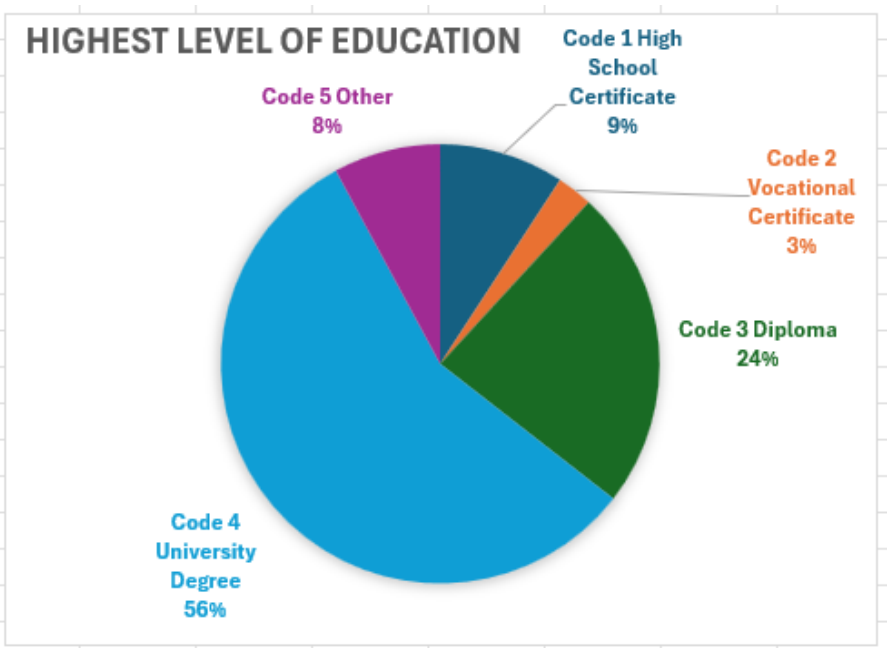


Diagram 4.4 above illustrates the participants' highest level of education. The data shows that 56% of the respondents (43 respondents) hold a university degree, making up most of the population, implying that the population places a high value on higher education. The second highest level of highest education was 'diploma' accounting for 24% (18 respondents). Participants with the greatest level of education of a high school certificate and 'other' followed closely behind, accounting for 9% (7 respondents) and 8% (6 respondents), respectively. The least number of respondents (2 respondents) possess vocational certificates, accounting for 3% of the total respondents.

Diagram 4.5: Job Industry

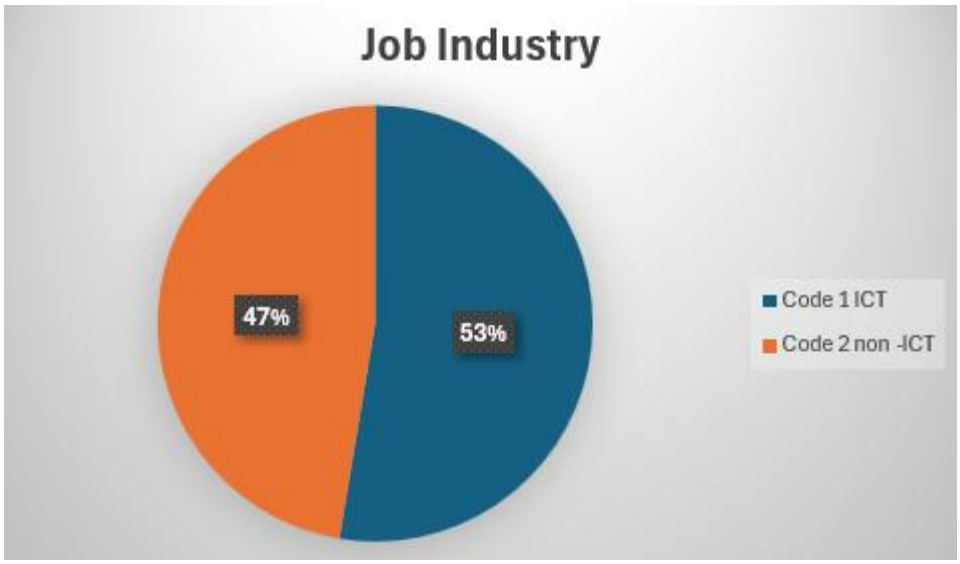
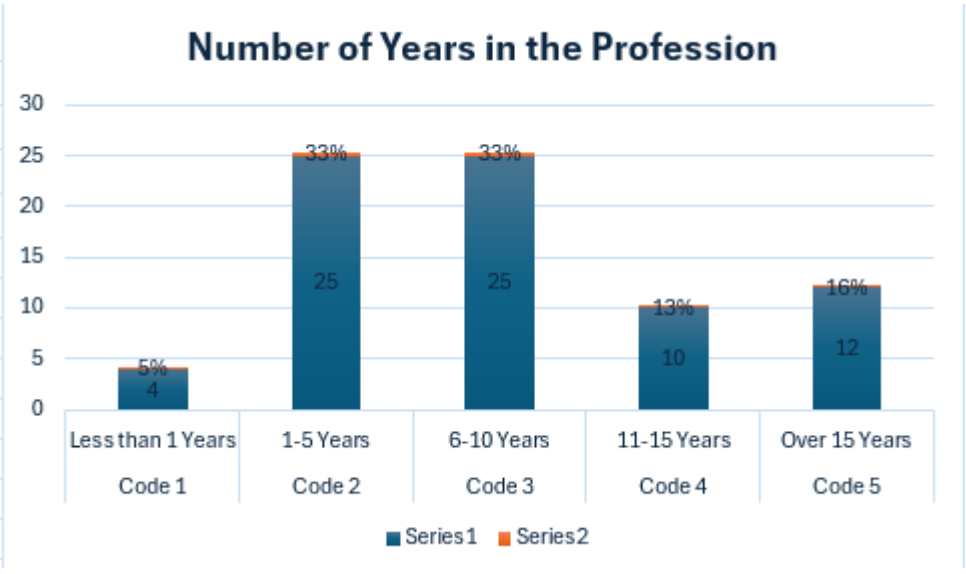


Diagram 4.5 above shows the respondents job industries. Two job industries were presented, namely the ICT sector and the non -ICT sector. The ICT sector accounts for a slight majority of the respondents with 53% (40 respondents), while non-ICT sectors accounted for 47% (36 respondents).

Diagram 4.6: Number of Years in the Profession



As depicted in Diagram 4.6 above, the distribution of number of years in the respondents' profession is split throughout different brackets, with the majority being a tie between 1-5 years and 6-10 years of work experience, accounting of the respondents for 25% each (25 respondents each).The third and for the categories of the number of years in the profession are the 'over 15 years' and '11-15 years' categories accounting for 16% (12 respondents) and

13%(10 respondents) respectively. The lease number of respondents (4 respondents) have less than 1 year in the profession they work in, accounting for 5% of the respondents.

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Diagram 4.7: Role Category

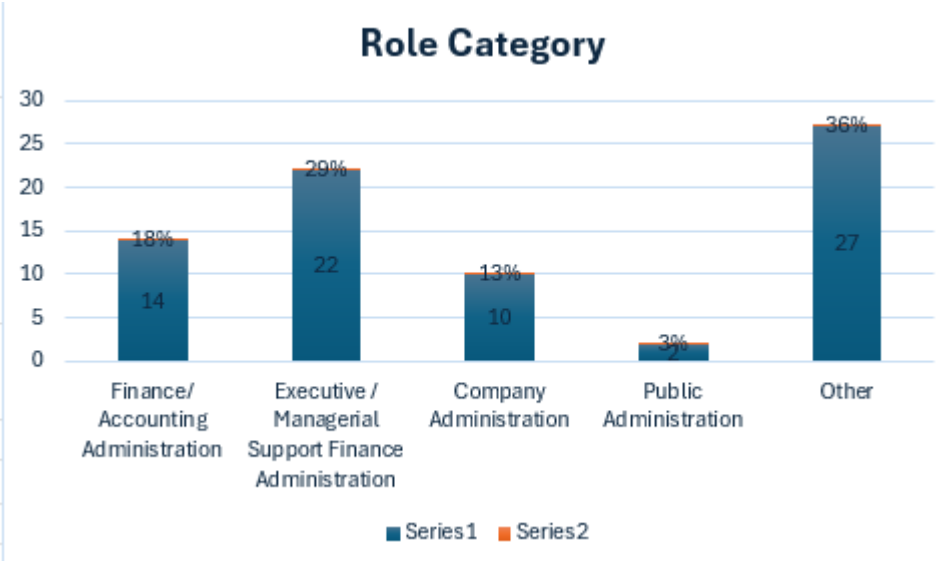


Diagram 4.7 above depicts the role categories into which the questionnaire's respondents fall in. Most respondents constituting of 36% (27 respondents) work in 'other' administrative roles. Second, at 29% of the respondents (22 respondents) is the 'executive/managerial support finance administration', followed by the 'finance/accounting administration' accounting for 18% of the respondents (14 respondents, and 'company administration' accounting 13% of the respondents (10 respondents). 3% of the respondents, who happen to be the least category of the respondents (2 respondents) work in the 'public administration' role category

Table 4.2 Reliability

Variable	Summary for scale: Mean=12,7105 Std.Dv.=2,12801 Valid N:76 (Coded Data July in RW Data set) Cronbach alpha: ,696536 Standardized alpha: ,687071 Average inter-item corr.: ,443279				
	Mean if	**Var. if**	**StDv. if**	**Itm-Totl**	**Alpha if deleted**
Remote Work Efficiency (RWEff)	8,37	2,02	1,42	0,62	0,45
Remote Work Service Delivery (RWSD)	8,54	1,85	1,36	0,62	0,45
Remote Work Satisfaction (TLSSAT)	8,51	2,99	1,73	0,33	0,80

To measure the study research instrument's reliability, the study conducted a Cronbach's Alpha test on all the model constructs measured on a Likert scale, namely Remote Work Efficiency, Remote Work Service Delivery, and Remote Work Satisfaction. The instrument demonstrated reliability, with a Cronbach's Alpha of 0.70. This occurred after excluding Role Expectation, which had the lowest total correlation, implying that it was not as closely correlated with the overall scale as the other variables.

4.5. Descriptive Data

Table 4.3 Study Variables Descriptives

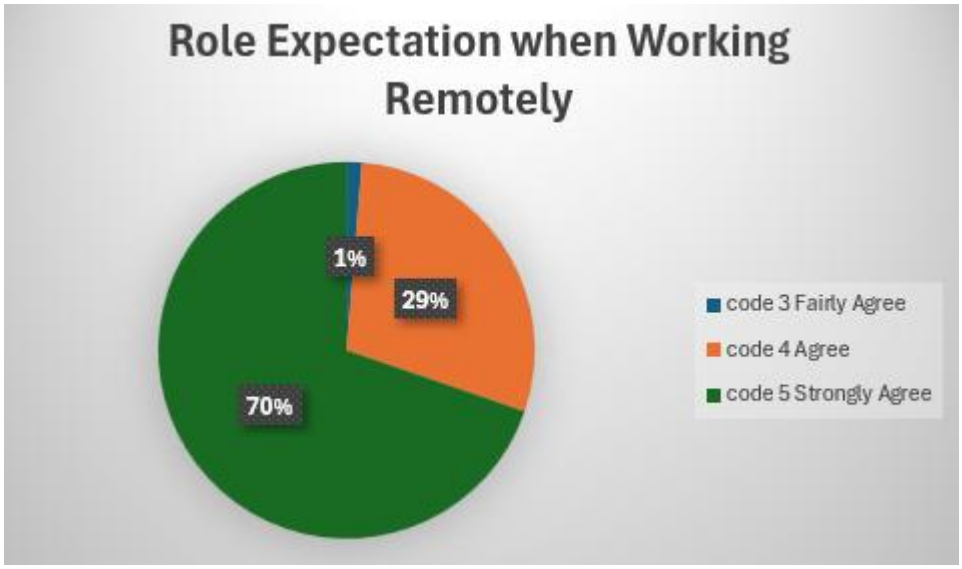
Variable	Descriptive Statistics (Coded Data July in ICT Impact on RW Data)				
	Valid N	**Mean**	**Minimum**	**Maximum**	**Std.Dev**
Comprehensive ICT Infrastructure	76	1,39	1,00	2,00	0,492
Role Expectation	76	4,68	3,00	5,00	0,496
Remote Work Service Delivery	76	4,17	2,00	5,00	0,985
Remote Work Satisfaction	76	4,20	2,00	5,00	0,783

Table 4.3 summarizes descriptive statistics for four elements of remote work service delivery, namely 'Remote Work role expectation', 'comprehensive ICT infrastructure' 'remote work service delivery' and 'remote work efficiency', which are variables that comprises the study's construct. The Comprehensive ICT Infrastructure variable has a mean score of 1.39 and a standard deviation of 0.492, indicating that respondents ranked the infrastructure on the higher end (code 1 being the use of comprehensive ICT infrastructure, while code 2 being the no use of it) with little variation. This therefore shows that respondents highlighted a comprehensive ICT infrastructure as essential for remote work service delivery. In addition, the Remote work Role Expectation variable has a high mean score of 4.68 and a standard deviation of 0.496, showing that respondents consistently were aware of what is expected of their roles while working remotely.

Additionally, the Remote work Service Delivery variable has a mean of 4.17 and a standard deviation of 0.985, indicating that perceptions are generally positive but can vary greatly. This variation suggests that, while many respondents are satisfied with the service delivery, there is a significant proportion with diverse experiences. Finally, the Remote work Satisfaction variable has a mean score of 4.20 and a standard deviation of 0.783, demonstrating a positive overall sentiment about remote work, however with varying individual experiences. Overall, the table demonstrates an optimistic but varying perception of the use of ICT infrastructure to enhance remote work service delivery across the study variables.

4.5.1 Role Expectation

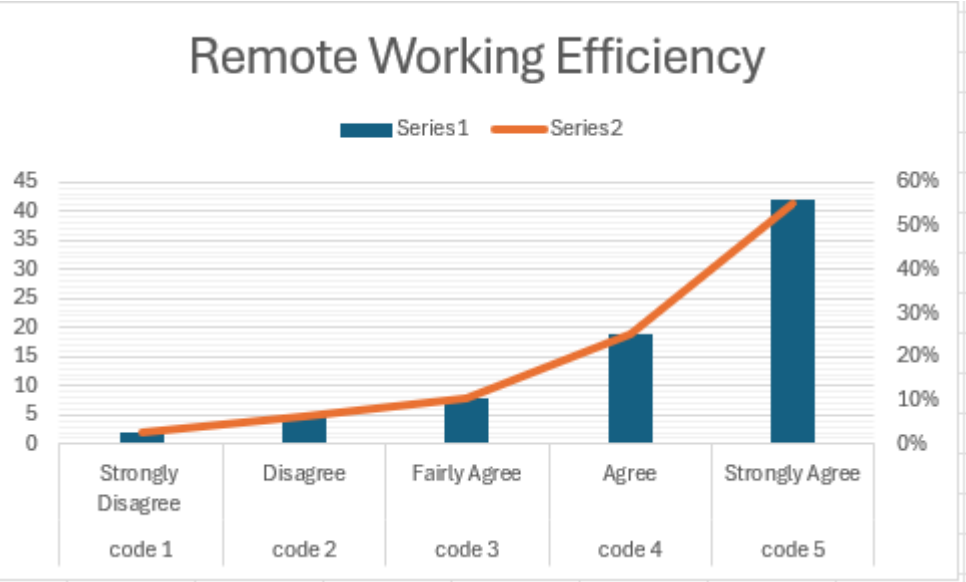
Diagram 4.8: Role Expectation when working remotely



Most respondents (70%) strongly agree that they understand what is expected of them when working remotely, demonstrating a high degree of clarity regarding their role expectations. Secondly 29% of the respondents agree to knowing what is expected of them while working remotely, while 1% 'fairly agree', also adding to a general good sense about understanding their role expectations amid remote work. The lowest categories, namely code 1 and 2 (disagree and strongly disagree) were excluded in the analysis as there were no participants that disagreed to knowing their role expectation while working remotely.

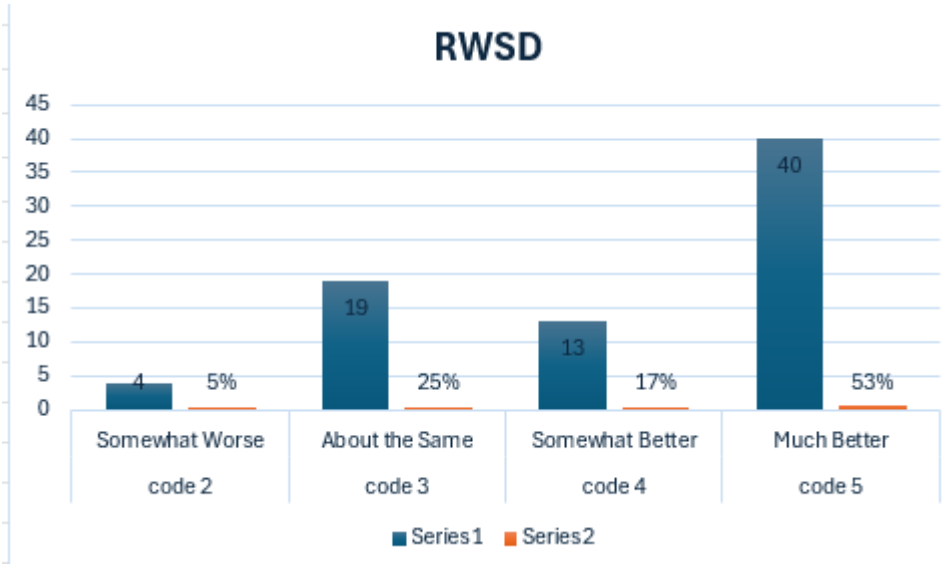
4.5.2 Remote work & Service Delivery -Efficiency

Diagram 4.9: Remote Work Efficiency



The data in Diagram 4.9 above generally demonstrates a positive perception of enhanced efficiency in remote work, with a significant majority accounting for 55% of the respondents, strongly agreeing to being efficient while working remotely, and an additional 25% of the respondents also agreeing, making a total of 80% of respondents who reported increased efficiency when working remotely. Furthermore, 11% of respondents fairly agree, while on the contrary 7% disagree, and 3% strongly disagree. This distribution demonstrates a strong consensus that remote work improves efficiency for a large proportion of respondents.

Diagram 4.10: Remote Work Service Delivery Rating



When requested to rate their service delivery while working remotely as opposed to in-office, the majority amounting, to 40 respondents (53%), reported 'much better' service delivery and an additional 13 respondents (17%) reported 'somewhat better' service delivery suggesting a perceived increase in service delivery quality when working remotely as opposed to when working in the office. 25% (19 respondents) believe that their service delivery is the 'about the same' either working remotely or in the office, suggesting that there is no significant impact from the changes of working conditions. On the contrary, the least number of respondents-4, accounting for 5% rated their remote work service delivery negatively – 'somewhat worse'. None of the respondents rated the remote service delivery as 'much worse'. The results generally depict that most of the respondents (total of 70% of respondents) positively rated their remote work service delivery.

Table 4.4 Team Communication

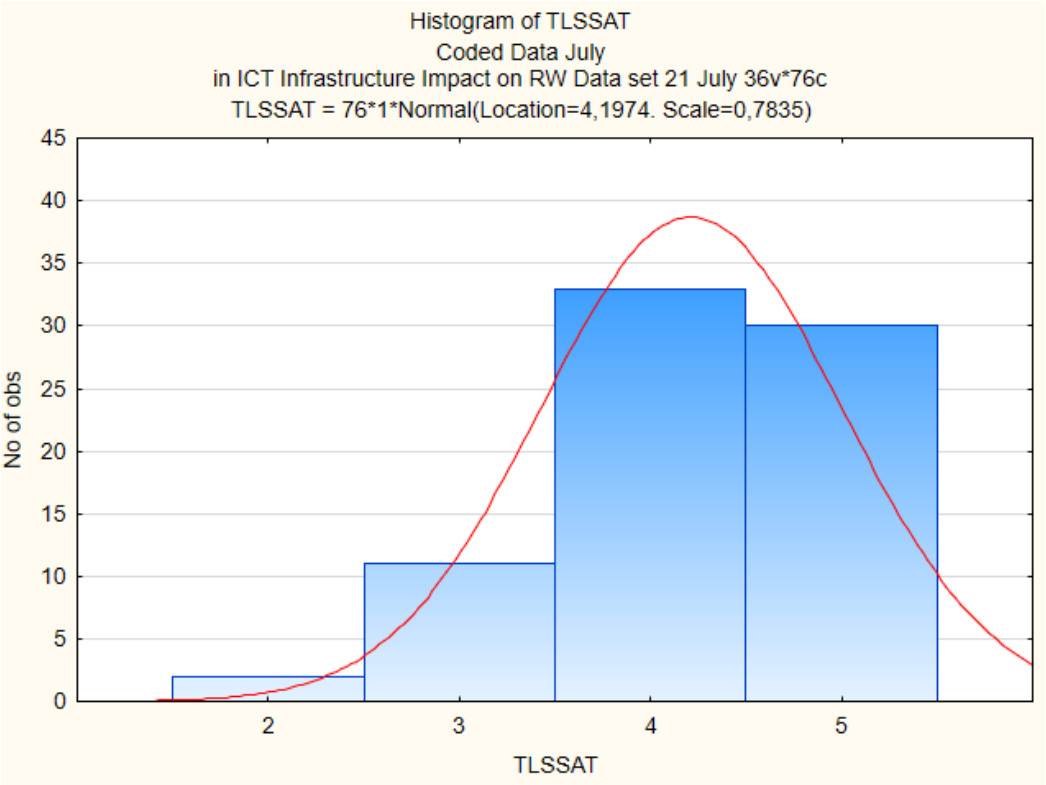
Variable	Descriptive Statistics (Coded Data July in ICT Impact on RW)				
	Valid N	Mean	Minimum	Maximum	Std.Dev.
Communication Platforms	76	3,50	1,00	5,00	0,792
Instant Messaging Tools	76	2,05	1,00	4,00	0,781
Collaboration Tools	76	2,83	1,00	4,00	1,136

Table 4.4 depict descriptive statistics for the Team Communication variable comprising of the following three types of tools used by respondents amid remote work: team communication tools-such as emails and telephone call, instant messaging tools- such as WhatsApp and Microsoft Teams, and collaboration tools- such as File Sharing Tools and Cloud Storage tools. Team communication tools have a high and consistent mean rating of 3.35, with scores ranging from 1 to 5 and a standard deviation of 0.79, suggesting that participants generally rate their usage of these tools quite high and consistently, with moderate variability around the mean.

In contrast, instant messaging tools have a lower mean rating of 2.05, with scores between 1 and 4 and a standard deviation of 0.78. This suggests that participants use instant messaging tools less frequently compared to team communication tools. The usage is more consistent among participants but still shows moderate variability. Collaboration tools on the other hand show the greatest variability in usage patterns, with a mean rating of 2.83, a wide score range from 1 to 4, and a high standard deviation of 1.14, suggesting that while some participants may rely heavily on collaboration tools, others may use them sparingly or not at all.

Overall, participants' use of team communication tools varies, with communication tools such as emails being consistently and frequently used, instant messaging tools like WhatsApp and Microsoft Teams being moderately used, and collaboration tools such as file sharing tools and cloud storage having the widest range of usage depending on team objectives.

Diagram 4.11: Remote Work Tools Satisfaction



The TLSSAT (Remote Work Tools Satisfaction), histogram, Diagram 4.11, depicts a distribution centred around the mean satisfaction score of 4.20, as would be expected from a normal distribution with a standard deviation of 0.78. It shows that most respondents rate their level of remote work tools satisfaction at this mean, indicating a consistent perspective. However, there aren't many cases when results deviate significantly from the mean, suggesting that overall customer satisfaction is consistent. The graph, which shows the concentration of satisfaction values around the mean with little variability, validates the descriptive statistics concerning remote work tools satisfaction.

Table 4.5 Remote Work Tools that Enhance Service Delivery

	Frequency table: TLSSDE1 -Laptop (Sheet2 in Select all tools that enhance your service delivery efficiency TLSSDE)			
Category	Count	Cumulative	Percent	Cumulative
1	69	69	90,79	90,79
Missing	7	76	9,21	100,00

	Frequency table: TLSSDE2-Extra Screen (Sheet2 in Select all tools that enhance your service delivery efficiency TLSSDE)			
Category	Count	Cumulative	Percent	Cumulative
1	56	56	73,68	73,68
Missing	20	76	26,32	100,00

	Frequency table: TLSSDE3-VPN (Sheet2 in Select all tools that enhance your service delivery efficiency TLSSDE)			
Category	Count	Cumulative	Percent	Cumulative
1	44	44	57,89	57,89
Missing	32	76	42,11	100,00

	Frequency table: TLSSDE4-Internet (Sheet2 in Select all tools that enhance your service delivery efficiency TLSSDE)			
Category	Count	Cumulative	Percent	Cumulative
1	73	73	96,05	96,05
Missing	3	76	3,95	100,00

	Frequency table: TLSSDE5-Other (Sheet2 in Select all tools that enhance your service delivery efficiency TLSSDE)			
Category	Count	Cumulative	Percent	Cumulative
1	6	6	7,89	7,89
Missing	70	76	92,11	100,00

Table 4.5 depict descriptive statistics for or the variable TLSRSD (Tools that Enhance Remote Work Service Delivery). Laptops are the most selected tool, with 69 out of 76 respondents, accounting for 90.79%, suggesting their critical role. Extra screens are also widely used, with 56 respondents, (accounting for 73.68% of the respondents) finding them beneficial for enhancing remote work service delivery. VPNs were cumulatively selected by 44 respondents, accounting for 57.89% of the respondents. The internet is the most crucial tool, with 73 respondents (96.05%) recognising it as essential to enhance remote work service delivery. TLSRSD5 which represents any ‘other’ tools that enhance remote work service delivery, besides the internet, VPN, extra screen and laptop, was the least selected, with 6 respondents (accounting for 7.89%). Overall, the data highlights the major reliance on laptops, extra

screens, VPNs, and, most significantly, the internet to improve service delivery efficiency in a remote work environment.

Table 4.6 Ranking of ICT Tools use for remote work

Category	Frequency table: TLSUSE1 (Coded Data July in ICT Impact on RW)			
	Count	Cumulative	Percent	Cumulative
Collaboration	10	10	13,2	13,2
Communication	53	63	69,7	82,9
File Sharing	7	70	9,2	92,1
Meetings	6	76	7,9	100,0
Missing	0	76	0,0	100,0

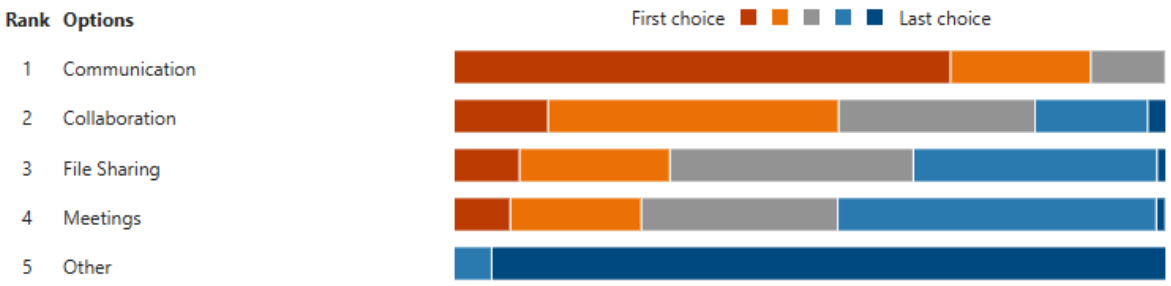
Category	Frequency table: TLSUSE2 (Coded Data July in ICT Impact on RW)			
	Count	Cumulative	Percent	Cumulative
Collaboration	31	31	40,8	40,8
Communication	15	46	19,7	60,5
File Sharing	16	62	21,1	81,6
Meetings	14	76	18,4	100,0
Missing	0	76	0,0	100,0

Category	Frequency table: TLSUSE3 (Coded Data July in ICT Impact on RW)			
	Count	Cumulative	Percent	Cumulative
Collaboration	21	21	27,6	27,6
Communication	8	29	10,5	38,2
File Sharing	26	55	34,2	72,4
Meetings	21	76	27,6	100,0
Missing	0	76	0,0	100,0

Category	Frequency table: TLSUSE4 (Coded Data July in ICT Impact on RW)			
	Count	Cumulative	Percent	Cumulative
Collaboration	12	12	15,8	15,8
Communication	26	38	34,2	50,0
Meetings	34	72	44,7	94,7
Other	4	76	5,3	100,0
Missing	0	76	0,0	100,0

Category	Frequency table: TLSUSE5 (Coded Data July in ICT Impact on RW)			
	Count	Cumulative	Percent	Cumulative
Collaboration	2	2	2,6	2,6
File Sharing	1	3	1,3	3,9
Meetings	1	4	1,3	5,3
Other	72	76	94,7	100,0
Missing	0	76	0,0	100,0

Diagram 4.12: Ranking of ICT Tools use for remote work



The frequency tables in Table 4.6 and diagram 4.12, show how respondents ranked different uses of ICT tools according to their value for remote work. The overall trend depicts that ‘communication’, use of ICT tools for remote work, is highly valued, with 69.7% of respondents ranking it the most valued use for remote work ICT tools, followed by collaboration’ which was ranked second by 40.8% of the respondents. ‘File sharing’ was ranked on third place by 34.2% of the respondents while ‘meetings’ was ranked forth by 44.7%

of the respondents. Finally, 'other' uses of remote work ICT tools was ranked last by 94.7% of the respondents.

Table 4.7 Descriptive Table for Challenges associated with the use of ICT Tools for remote work

Variable	Descriptive Statistics (Coded Data in ICT Impact on RW)				
	Valid N	Mean	Minimum	Maximum	Std.Dev.
CybSec	76	1,895	1,00	2,00	0,309

Diagram 4.13: Challenges associated with the use of ICT Tools for remote work

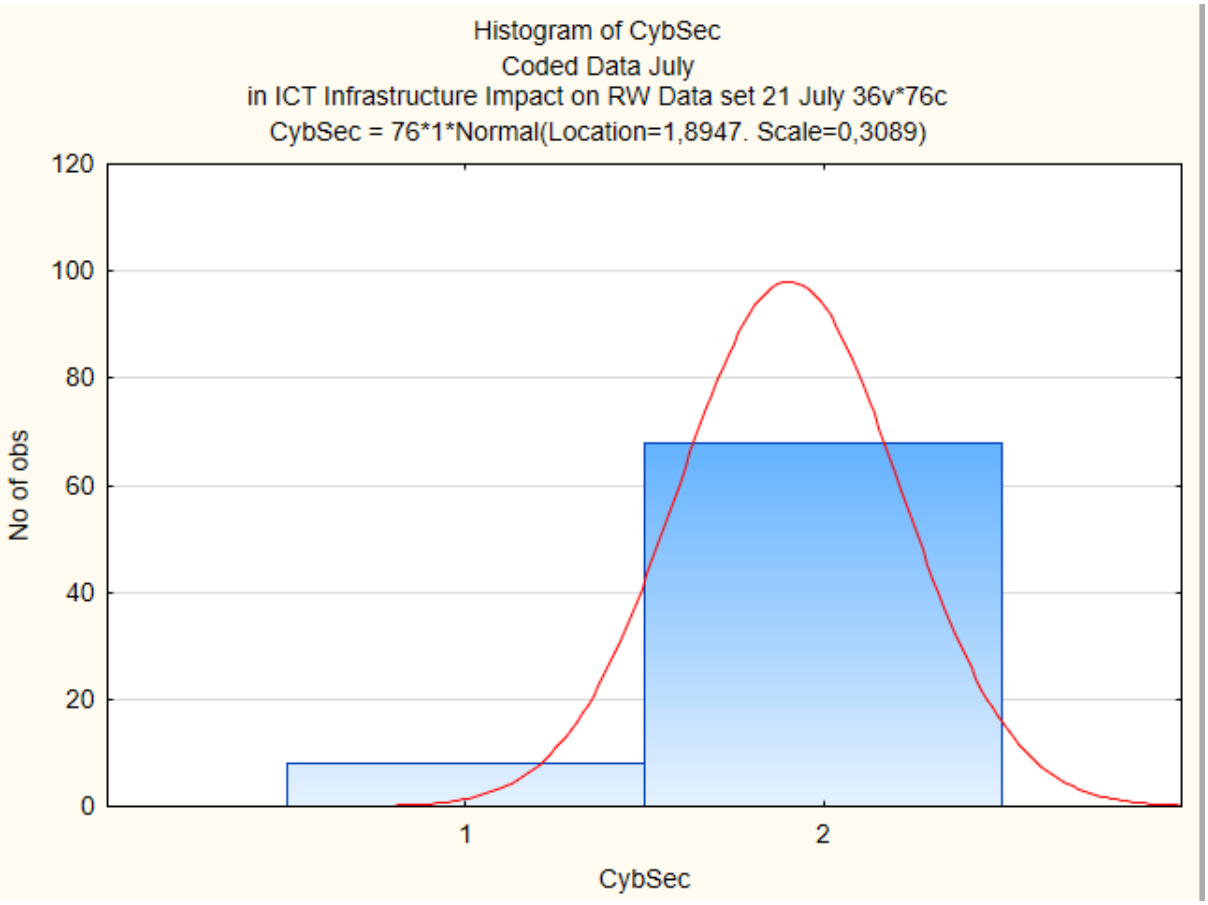


Diagram 4.14: Other challenges (Non cyber security issues)

Tables 4.7 and Diagrams 4.13 respectively show frequency tables and a histogram for a multi-response question where participants were asked to list challenges that they faced that are associated with the usage of ICT tools for the purpose of remote work.

The study classifies two primary challenges in remote work, namely cyber security issues (coded 1) and other non-cyber security issues (coded 2). Non-cyber security issues include connectivity, team communication breakdown, inadequate team collaboration and none (implying the absence of challenges encountered). The mean value (1.89) implies that most of the responses are inclined toward ‘2’, which represents non-cyber security issues. This indicates that respondents consider other challenges to be slightly more significant than cyber security issues, yet both are crucial. The standard deviation of 0.31 signifies low variability in the responses. The most common challenge in the 'other' category is 'connectivity' accounting 46% of the respondents, affecting nearly half of the respondents, followed by 'team communication breakdown' accounting 32% of the respondents. More than a quarter (28%) of respondents in the 'other' or 'non-cyber related issues' category struggle with team communication. On the contrary, 40% of respondents in the 'other' category, don't face any of the issues.

Table 4.8 Linear regression analysis of Administrator remote work service delivery against each independent variable

N=76	Regression Summary for Dependent Variable: RWSD (Coded Data July in ICT Impact on RWSD Dataset Final) R= ,75481379 R²= ,56974386 Adjusted R²= ,52545278 F(7,68)=12,864 p<,00000 Std.Error of estimate: ,67858					
	b*	Std.Err.	b	Std.Err.	t(68)	p-value
Intercept			0,4176	1,2346	0,3382	0,7362
AgeRange	0,0370	0,0857	0,0449	0,1040	0,4319	0,6672
Gender	-0,1887	0,0872	-0,3758	0,1735	-2,1656	0,0339
JobIndustry	-0,1511	0,0837	-0,2962	0,1640	-1,8062	0,0753
ROLEXP3	-0,1855	0,0847	-0,4307	0,1966	-2,1914	0,0318
RWSD3	0,6450	0,0811	1,1925	0,1499	7,9566	0,0000
TLS2123	0,1967	0,0829	0,3108	0,1309	2,3738	0,0204
CybSec	0,1151	0,0817	0,3670	0,2604	1,4093	0,1633

Table 4.8 above depicts a linear regression analysis for all seven variables of the proposed study model, namely Age Range, Gender, Job Industry, Role Expectation (ROLEXP3), Remote work satisfaction (RWSD3), Comprehensive ICT Infrastructure (TLS2123), and Cyber Security Issues (CybSec) against the dependant variable RWSD (Remote Work Service Delivery). The analysis shows that the overall model is statistically significant and has a strong fit as reflected by an R-squared value of 0.570 and as evidenced by a p-value less than 0.0000. This therefore means that about 57.00% of the variance in Remote work Service Delivery is explained by the model and that the independent variables have a significant impact on RWSD.

In addition, the R-squared valued of 0.570, implies that the proposed study model captures over half (55.7%) of the variability in the dependant variable (RWSD), based on the predictors utilised in the study model. RWSD3 (Remote work satisfaction) has the most significant positive impact on RWSD, with a standardized coefficient (b∗) of 0.6450 and a highly significant p-value ($p < 0.0000$), confirming that it is a vital factor in enhancing remote work service delivery. The study analysis therefore leads us to accept Hypothesis 5 that states that: 'Remote Work Satisfaction positively impact on Service Delivery for Administrators in South African SMEs'. The results are supported by Ilag, (2021) and Prasad, Mangipudi, Vaidya, & Muralidhar, (2020) study findings that remote work satisfaction subsequently leads to a better service delivery. Kyobe (2011) and Urbaniec et al. (2022), also concur with this study findings- that higher satisfaction with remote work conditions correlates with enhanced service delivery.

Secondly, TLS2123 (Comprehensive ICT Infrastructure) also positively influences RWSD (Remote Work Service Delivery), with a standardized coefficient (b∗) of 0.1967 and a significant p-value of 0.0204, suggesting that a Comprehensive ICT Infrastructure is an important predictor of RWSD (Remote Work Service Delivery). The above study analysis subsequently leads the researcher to accept Hypothesis 1, which states that: 'A Comprehensive ICT Infrastructure positively impact on remote work Service Delivery for Administrators in South African SMEs'. The study results are supported by Bick et al. (2020) and Ilag (2021) study results that cite that implementing a comprehensive ICT infrastructure for remote work is crucial for remote work service delivery and, Rachmawati, et al., (2021) study findings that advanced ICT Infrastructure technologies will make remote work more effective, thereby enhancing remote work service delivery.

On the contrary, Gender has a significant negative impact on RWSD, with a standardized coefficient (b∗) of −0.1887 and p-value of 0.0339, suggesting that gender-related factors might negatively affect remote work service delivery. In addition, Role Expectation (ROLEXP3) also negatively impacts RWSD with a standardized coefficient (b∗) of −0.1855 and a p-value of 0.0318. On the other hand, Job Industry reveals a negative trend, with a standardized coefficient (b∗) of -0.151 and a p-value of 0.075, close to significant but not meeting the standard threshold. This suggests that the industry in which the administrators work may have a negative impact on RWSD (Remote Work Service Delivery). In addition, although age range has a minor positive effect with a standardized coefficient (b∗) of 0.0370 and a high p-value of 0.6672, it has no significant impact on RWSD, whereas CybSec has a positive standardized coefficient (b∗) of 0.115, though it is not a significant predictor of RWSD (Remote work Service Delivery) as indicated by its p-value of 0.1633.

Table 4.9 Linear regression analysis of Administrator remote work service delivery against each independent variable excluding moderating variables

N=76	Regression Summary for Dependent Variable: RWSD (Coded Data July in Dataset August) R= ,70326426 R²= ,49458062 Adjusted R²= ,46610629 F(4,71)=17,369 p<,00000 Std.Error of estimate: ,71977					
	b*	Std.Err.	b	Std.Err.	t(71)	p-value
Intercept			-0,6477	1,1470	-0,5647	0,5741
TLS2123	0,2156	0,0871	0,3405	0,1377	2,4736	0,0158
RWSD3	0,6562	0,0848	1,2131	0,1569	7,7340	0,0000
ROLEXP3	-0,1100	0,0861	-0,2554	0,1998	-1,2784	0,2053
AgeRange	-0,0509	0,0860	-0,0618	0,1044	-0,5919	0,5558

Table 4.9 above shows a linear regression analysis of the four variables of the study model against the dependent variable RWSD (Remote Work Service Delivery) excluding all moderating variables. The model variables included are, Role Expectation (ROLEXP3), Remote Work Satisfaction (RWSD3), and Comprehensive ICT Infrastructure (TLS2123) and Age Range (AgeRange). The R-squared value of 0.4946 indicates that the four independent variables in the model account for approximately 49.46% of the variance in Remote Work Service Delivery (RWSD). The adjusted R-squared is slightly lower at 0.4661. The analysis depicts that RWSD3 (Remote Work Satisfaction) is the strongest predictor of RWSD (Remote Work Service Delivery), with a positive and significant standard coefficient (b∗) of 0.656 and p-value of 0.0000. This therefore emphasizes its importance in enhancing remote work service delivery. In addition, TLS2123 (Comprehensive ICT Infrastructure) also has a positive and statistically significant influence on RWSD with a standard coefficient (b∗) of 0.216 and a p-value = 0.016, indicating its importance in enhancing remote work service delivery. ROLEXP3 (Role Expectation) has a negative but not statistically significant influence on RWSD, with a standard coefficient (b∗) of -0.110 and p-value of 0.205. This implies that, in this study model, Role Expectations is not a determining factor in remote work service delivery. Similarly, AgeRange has a negative but not statistically significant influence on RWSD. The standard coefficient (b∗) of -0.051 and p-value of 0.556 depict that it is not a determining factor in remote work service delivery.

Table 4.10 Linear regression analysis of Administrator remote work service delivery against independent variables that directly impact it

N=76	Regression Summary for Dependent Variable: RWSD (Coded Data July in Dataset August) R= ,69254290 R²= ,47961566 Adjusted R²= ,46535856 F(2,73)=33,640 p<,00000 Std.Error of estimate: ,72027					
	b*	Std.Err.	b	Std.Err.	t(73)	p-value
Intercept			-1,788	0,804	-2,222	0,029
TLS2123	0,187	0,085	0,296	0,134	2,209	0,030
RWSD3	0,650	0,085	1,202	0,157	7,669	0,000

Table 4.10 above is depicting a linear regression analysis of the two variables of the study model that directly impact the dependent variable RWSD (Remote work Service Delivery) namely Remote work Satisfaction (RWSD3) and Comprehensive ICT Infrastructure (TLS2123).

The above stated two independent variables in the model account for approximately 47.97% of the variance in Remote work Service Delivery (RWSD) as depicted by the R-squared value of 0.4796. The adjusted R-squared value of 0.4653 is slightly lower than the R-squared value. After having removed all other moderating variables, the analysis reveals that RWSD3 (Remote Work Satisfaction) still maintains its status of being the strongest predictor of RWSD (Remote work Service Delivery), with still a positive and significant standard coefficient (b∗) of 0.650 and p-value of 0.0000. Likewise, TLS2123 (Comprehensive ICT Infrastructure) also continue to positively and statistically significantly influence on Remote work Service Delivery (RWSD) as depicted by a standard coefficient (b∗) of 0.187 and a p-value = 0.030. The analysis therefore confirms that the two above analysed variables continue to positively impact the dependent variable despite other moderating and mediating variables.

Table 4.11 Linear regression analysis of Administrator remote work service delivery against independent variables that directly impact it and all moderating variables

N=76	Regression Summary for Dependent Variable: RWSD (Coded Data July in Dataset August) R= ,73434324 R^2= ,53925999 Adjusted R^2= ,50634999 F(5,70)=16,386 p<,00000 Std.Error of estimate: ,69211					
	b*	Std.Err.	b	Std.Err.	t(70)	p-value
Intercept			-1,198	1,000	-1,197	0,235
TLS2123	0,171	0,082	0,270	0,129	2,088	0,040
RWSD3	0,641	0,083	1,186	0,153	7,763	0,000
CybSec	0,077	0,081	0,247	0,259	0,950	0,345
JobIndustry	-0,137	0,085	-0,268	0,167	-1,611	0,112
Gender	-0,154	0,084	-0,307	0,168	-1,827	0,072

Table 4.11 above shows a linear regression analysis of the Remote Work Service Delivery (RWSD) dependent variable against all the two independent variables that directly impact it, namely Remote Work satisfaction (RWSD3) and Comprehensive ICT Infrastructure (TLS2123), and incorporating the three moderating variables, namely Gender, Job Industry and Cybersecurity issues (CybSec).

When comparing the regression analysis results of the two Tables, Table 4.9 with all five variables, it is generally stronger in explaining variance and is a better fit as depicted by the R-squared value of 0.539 (54%) as compared to Table 4.8 with only the two variables which only explains 48% (R-squared value of 0.480). However, the analysis in Table 4.9 depict that all the added moderating variables are not significant predictors of the outcome variable Remote work Service Delivery (RWSD). Notably, both Remote work satisfaction (RWSD3) and Comprehensive ICT Infrastructure (TLS2123) remains statistically significant as depicted by their p-values that are below the 0.05 threshold, despite the inclusion of the moderating variables. This is reflected in the slight p-values change from 0.030 to 0.040 for Comprehensive ICT Infrastructure (TLS2123), while the p-value for Remote Work satisfaction (RWSD3) remain constant. Overall, the moderating variables reduces the model's ability to explain Remote Work satisfaction (RWSD3).

Table 4.12 Linear regression analysis of Administrator remote work service delivery against independent variables that directly impact it and all moderating variables except cyber security

N=76	Regression Summary for Dependent Variable: RWSD (Coded Data July in Dataset August) R= ,73028640 R²= ,53331823 Adjusted R²= ,50702630 F(4,71)=20,284 p<,00000 Std.Error of estimate: ,69163					
	b*	Std.Err.	b	Std.Err.	t(71)	p-value
Intercept			-0,720	0,864	-0,833	0,408
JobIndustry	-0,138	0,085	-0,270	0,166	-1,622	0,109
RWSD3	0,645	0,082	1,193	0,152	7,826	0,000
TLS2123	0,167	0,082	0,263	0,129	2,038	0,045
Gender	-0,156	0,084	-0,311	0,168	-1,854	0,068

Table 4.12 above shows a linear regression analysis of the Remote work Service Delivery (RWSD) dependent variable against all the two independent variables that directly impact it, namely Remote work satisfaction (RWSD3) and Comprehensive ICT Infrastructure (TLS2123), and incorporating the three moderating variables, namely Gender and Job Industry however excluding the Cyber security issues variable (CybSec).

Excluding the Cyber security issues variable has minimum impact on the significance of the other predictors and the overall model fit as reflected by the slight change of the R-squared value from 0.540 in the model including Cyber security issues, to 0.533 in the model that excludes Cyber security issues.

Table 4.13 Linear regression analysis of Administrator remote work service delivery against independent variables that directly impact it and all moderating variables except Job Industry

N=76	Regression Summary for Dependent Variable: RWSD (Coded Data July in Dataset August) R= ,72261833 R²= ,52217725 Adjusted R²= ,49525765 F(4,71)=19,398 p<,00000 Std.Error of estimate: ,69984					
	b*	Std.Err.	b	Std.Err.	t(71)	p-value
Intercept			-1,687	0,964	-1,750	0,084
CybSec	0,079	0,082	0,251	0,262	0,955	0,343
Gender	-0,189	0,082	-0,377	0,164	-2,297	0,025
TLS2123	0,180	0,083	0,285	0,131	2,182	0,032
RWSD3	0,660	0,083	1,220	0,153	7,980	0,000

Table 4.13 depicts a linear regression analysis of the Remote Work Service Delivery (RWSD) dependent variable against all the two independent variables that directly impact it, namely Remote Work satisfaction (RWSD3) and Comprehensive ICT Infrastructure (TLS2123). Additionally, two moderating variables are included: Gender and Cyber security issues (CybSec) and excluding the Job Industry variable.

Though the model still explains a significant portion of the variance in the outcome variable - Remote work Service Delivery, the exclusion of Job Industry from the model results in a slight reduction in the model fit, as depicted by the slight decrease in the R-squared value from 0.540 to 0.522, which translates to a 0.18% decrease. Moreover, Remote Work Satisfaction (RWSD3) remains highly significant with a p-value of 0.000, while the Cyber security issues variable remains not significant, with a p-value of 0.343. Notably, the exclusion of the Job Industry results in Gender showing a reliable but negative impact on the outcome variable -RWSD, as revealed by the p-value of 0.025 which is less than the 0.05 p-value threshold. The results therefore reveal that Job Industry is not a significant predictor for explaining Remote Work Service Delivery outcome variable.

Table 4.14 Linear regression analysis of Administrator remote work service delivery against independent variables that directly impact it and all moderating variables except Gender.

	Regression Summary for Dependent Variable: RWSD (Coded Data July in Dataset August) R= ,71922166 R²= ,51727979 Adjusted R²= ,49008429 F(4,71)=19,021 p<,00000 Std.Error of estimate: ,70342					
N=76	b*	Std.Err.	b	Std.Err.	t(71)	p-value
Intercept			-1,518	1,001	-1,516	0,134
JobIndustry	-0,177	0,083	-0,347	0,163	-2,122	0,037
CybSec	0,081	0,083	0,259	0,264	0,982	0,329
TLS2123	0,177	0,083	0,280	0,131	2,130	0,037
RWSD3	0,625	0,083	1,156	0,154	7,488	0,000

The regression analysis in Table 4.14 above shows the exclusion of the Gender variable from the model for the dependent variable of Remote Work Service Delivery (RWSD). The results reveal a slight reduction in the model's ability to explain the variance in RWSD, as indicated by the decrease in the R-square value from 0.540 to 0.517.

Furthermore, the Remote work satisfaction (RWSD3) and Comprehensive ICT Infrastructure (TLS2123) maintains their significance, as depicted by their p-values that are below the 0.05 threshold 0.000 and 0.037 respectively. In addition, the exclusion of Gender in the model enables Job Industry to statistically significantly and negatively impact the outcome variable-Remote Work Service Delivery, with ap-value of 0.037 and a negative standard coefficient (b∗) of -0.177.

Table 4.15 Linear regression analysis of Administrator remote work satisfaction against independent variables including the Gender variable.

	Regression Summary for Dependent Variable: RWSD3 = Remote Work Satisfaction (Coded Data July in Dataset August) R= ,11568902 R²= ,01338395 Adjusted R²= ----- F(2,73)=,49514 p<,61152 Std.Error of estimate: ,53644					
N=76	b*	Std.Err.	b	Std.Err.	t(73)	p-value
Intercept			3,435	0,484	7,099	0,000
TLS2123	0,094	0,116	0,080	0,099	0,806	0,423
Gender	0,073	0,116	0,078	0,125	0,626	0,533

Table 4.15 above shows the linear regression analysis two variables: Comprehensive ICT Infrastructure (TLS2123) and Gender, against the Remote Work satisfaction (RWSD3) variable. The results depict a weak model fit model as depicted by an R-squared value of 0.0134 meaning that the model explains only 1.34% of the variance in RWSD3 variable. Furthermore, the results indicate that neither the Comprehensive ICT Infrastructure and Gender variables are statistically significant predictors of Remote Work satisfaction (RWSD3), as indicated by the standard coefficient (b∗) of 0.094 and 0.073 respectively, and the p-values that are above the 0.05 threshold: 0.423 and 0.533 respectively.

Table 4.16 Linear regression analysis of Administrator remote work satisfaction against independent variables excluding the Gender variable.

	Regression Summary for Dependent Variable: RWSD3 = Remote Work Satisfaction (Coded Data July in Dataset August) R= ,08993365 R²= ,00808806 Adjusted R²= ----- F(1,74)=,60340 p<,43976 Std.Error of estimate: ,53424					
N=76	b*	Std.Err.	b	Std.Err.	t(74)	p-value
Intercept			3,574	0,428	8,350	0,000
TLS2123	0,090	0,116	0,077	0,099	0,777	0,440

Table 4.16 above displays the linear regression analysis of one variable, namely Comprehensive ICT Infrastructure (TLS2123), excluding and the Gender variable, against the Remote Work Satisfaction (RWSD3) variable. Based on the analysis, the exclusion of the Gender variable further reduces the model's power to explain the variance in the Remote Work Satisfaction variable as revealed by the reduction in the R-squared values from 0.013 (0.1%) to 0.008 (0.08%) respectively. Furthermore, removing Gender from the model shows that Comprehensive ICT Infrastructure will remain statistically a non-significant predictor to Remote work satisfaction as revealed with a standard coefficient (b∗) of 0.090. The results thereby conclude that Comprehensive CT Infrastructure has no statistical impact on Remote Work satisfaction (RWSD3). These results have therefore led to the rejection of the study's hypotheses 4 and 8, that state that, 'The administrator gender moderates the relationship between the use of Comprehensive ICT Infrastructure and Remote Work Satisfaction' and 'A Comprehensive ICT Infrastructure positively impact on remote work satisfaction for administrators in South African SMEs', respectively.

Table 4.17 Linear regression analysis of Administrator remote work service delivery against independent variables including the Gender variable.

N=76	Regression Summary for Dependent Variable: RWSD (Coded Data July in Dataset August) R= ,71835599 R^2= ,51603533 Adjusted R^2= ,49587014 F(3,72)=25,590 p<,00000 Std.Error of estimate: ,69942					
	b*	Std.Err.	b	Std.Err.	t(72)	p-value
Intercept			-1,204	0,820	-1,468	0,147
TLS2123	0,176	0,082	0,278	0,130	2,132	0,036
Gender	-0,192	0,082	-0,382	0,164	-2,328	0,023
RWSD3	0,664	0,083	1,228	0,153	8,046	0,000

The above Table 4.17 shows the linear regression analysis of three variables, Gender, Remote Work Satisfaction (RWSD3) and Comprehensive ICT Infrastructure (TLS2123), against the dependant variable Remote Work Service Delivery (RWSD). The analysis R-square value of 0.516 indicates that approximately 51.6% of the variance in Remote Work Service Delivery is explained by the model's independent variables, which is a strong correlation. Furthermore, the model's p-value of less than 0.00001 reveals that that the model is statistically significant.

All three independent variables: Comprehensive ICT Infrastructure, Gender and Remote Work Satisfaction are significant predicators of the dependent variable- Remote Work Service Delivery. However, Gender has a negative effect. Specifically Comprehensive ICT Infrastructure has a p-value of 0.036 and a standard coefficient (b∗) of 0.176, revealing a positive impact. Moreover, Remote Work satisfaction, with a p-values of 0.001 and a standard coefficient (b∗) of 0.664, also reveals a positive impact to the outcome variable. On the contrary, Gender, with a p-value of- 0.192 and a standard coefficient (b∗) of -0.382 indicates a negative impact on Remote work Service Delivery.

The results therefore reveal that Remote work Service Delivery (RWSD) improves as the Comprehensive ICT Tools or Infrastructure is enhanced, thereby supporting the acceptance of hypothesis 1 that's state that: The ICT Infrastructure positively impact on remote work serviced delivery for administrators in South African SMEs. Moreover, enhanced Remote Work Satisfaction contributes to enhanced Remote Work Service Delivery, thereby leading the study's acceptance of hypothesis 7 that states that: Remote work satisfaction positively impacts on remote work service delivery for administrators in South African SMEs.

Table 4.18 Linear regression analysis of Administrator remote work service delivery against independent variables excluding the Gender variable.

N=76	Regression Summary for Dependent Variable: RWSD (Coded Data July in Dataset August) R= ,69254290 R^2= ,47961566 Adjusted R^2= ,46535856 F(2,73)=33,640 p<,00000 Std.Error of estimate: ,72027					
	b*	Std.Err.	b	Std.Err.	t(73)	p-value
Intercept			-1,788	0,804	-2,222	0,029
TLS2123	0,187	0,085	0,296	0,134	2,209	0,030
RWSD3	0,650	0,085	1,202	0,157	7,669	0,000

To determine the impact of gender, the Gender variable is excluded in Table 4.18 above that presents the linear regression analysis of two variable: Comprehensive ICT Infrastructure (TLS2123) and Remote Work Satisfaction (RWSD3), against the outcome variable of Remote Work Service Delivery (RWSD). The exclusion of gender in the model resulted in a slight decrease in the R-square value from 0.5160 (52%) to 0.4796 (48%) indicating a decrease in the model's power to explain the outcome variable.

The results therefore demonstrates that Gender has a negative impact on Remote Work Service Delivery (RWSD). The Genger variable was coded as 1 being male and 2 being female. This therefore means that the females (coded 2) are associated with a reduction in Remote Work Service Delivery as compared to the males (coded 1), suggestion that females experience lower Remote Work Service Delivery as compared to males. These study findings are supported by, Pass & Ridgway, (2022) study results that claim that females' remote work is negatively impacted since they have to spend more time and energy caring for others and managing the home.

Table 4.19 T-test analysis of Administrator remote work satisfaction against Gender Groups

Variable	T-tests; Grouping: Gender (Coded Data July in Dataset August) Group 1: 2 Group 2: 1										
	Mean	Mean	t-value	df	p	Valid N	Valid N	Std.Dev.	Std.Dev.	F-ratio	p
RWSD3	3,933	3,860	0,585	74,000	0,560	45,000	31,000	0,544	0,522	1,086	0,823

To determine the means of each of the two gender groups (male and female) with the aim of comparing the effect of each gender group on the dependent variable RWSD3 (Remote Work Satisfaction), a t-test analysis was conducted as presented in Table 4.19 above. Group 1 is coded as 2 (females), while Group 2 is coded as 1 (males). Group 1 (females) had 45 respondents, whereas group 2 (males) had 31 respondents. Females (Group 1) have a mean score of 3.93, whereas males (Group 2) have a mean score of 3.86. The study results show that the means are close together, and the t-value of 0.585, which is close to '0', all indicating that the two gender groups differ only marginally. The study's p-value of 0.560 exceeds the generally significant threshold of 0.05, hence it is not significant. This shows that the difference in means between the two gender groups is not statistically significant. Furthermore, the standard deviations for groups 1 (females) and 2 (males) are nearly identical, indicating that the variability within each group is comparable.

The analysis reveals no statistically significant difference in the means of the two groups (coded as 1 for males and 2 for females) for the RWSD3 variable. As a result of the analysis, gender does not have an impact on Remote Work Satisfaction. The study therefore rejects Hypothesis 4 that states that 'The administrator gender moderates the relationship between the use of a Comprehensive ICT Infrastructure and Remote Work Satisfaction'.

Table 4.20 Analysis of Variance (ANOVA) analysis of Administrator remote work satisfaction against Age Range Groups

Variable	Analysis of Variance (Coded Data July in Dataset August) Marked effects are significant at p < ,05000							
	SS	df	MS	SS	Df	MS	F	p
RWSD3	0,320	3,000	0,107	20,972	72,000	0,291	0,367	0,777

Table 4.20 depicts the Analysis of Variance (ANOVA) results used to establish the means of each of the five Age Range groups: 21-30 years, coded 2, 31-40 years, coded 3, 41-50 years, coded 4, and over 51 years, coded 5. The study's p-value of 0.777, which is substantially higher

than the 0.05 threshold, indicates that there are no significant differences in RWSD3 (Remote Work Satisfaction) across the age range groups analyzed. The results therefore depict that Age Range has no significant impact on Remote Work Satisfaction.

Table 4.21 Analysis of Variance (ANOVA) analysis of Administrator remote work service delivery against Age Range Groups

	Analysis of Variance (Coded Data July in Dataset August) Marked effects are significant at p < ,05000							
Variable	SS	df	MS	SS	Df	MS	F	p
RWSD	0,339	3,000	0,113	72,437	72,000	1,006	0,112	0,953

Table 4.21 shows the Analysis of Variance (ANOVA) results used to establish the means of each of the five Age Range groups: 21-30 years, coded 2, 31-40 years, coded 3, 41-50 years, coded 4, and over 51 years, coded 5. The table presents the study's p-value of 0.953, which is substantially higher than the 0.05 threshold, indicating that the effect of Age Range groups on RWSD (Remote work Service Delivery) is not statistically significant.

Table 4.22 T-test analysis of Administrator remote work service delivery against Job Industry Groups

	T-tests; Grouping: JobIndustry (Coded Data July in Dataset August) Group 1: 2 Group 2: 1										
Variable	Mean	Mean	t-value	df	P	Valid N	Valid N	Std.Dev.	Std.Dev.	F-ratio	p
RWSD	3,889	4,425	-2,446	74,000	0,017	36,000	40,000	1,063	0,844	1,587	0,162

To determine the means of each of the two Job Industry groups under study, namely Group 1 (coded as 2) representing the 'non Information and Communications Technology (ICT)' industry and Group 2 (coded as 1) representing the 'Information and Communications Technology (ICT)' industry, with the aim of comparing the effect of each Job Industry group on the dependent variable RWSD (Remote Work Service Delivery), a t-test analysis was conducted, as shown in Table 4.22. Group 1 had 36 participants, while Group 2 had 40 respondents. The mean difference between the two groups is significant, namely, 0,536, with Group 2 having a higher mean of 4.425 while Group 1 with a lower mean of 3.889. The standard deviations indicated slightly more variability in Remote Work Service Delivery

(RWSD) scores between the two groups, namely 1.063 and 0.844 for Group 1 and Group 2 respectively. The negative t-value of -2.446 reveals a statistically significant difference in effect on RWSD between the two job industry groups, suggests that Group 1 namely non-ICT Job Industry (with the lower mean) is compared against Group 2 namely ICT Job Industry (with the higher mean). In addition, the p-value of 0.017 is statistically significant.

Overall, based on the analysis, Group 2 (coded as 1) representing the ICT Job Industry has a more substantial effect on the outcome variable RWSD, meaning that the ICT Job industry has more impact on enhancing remote work service delivery as compared to non-ICT Job industries. The administrator job industry they work in moderates the relationship between the use of comprehensive ICT infrastructure and remote working service delivery. The result of this study accepts the hypothesis as the Job Industry variable moderate she relationship between Comprehensive ICT infrastructure and Remote work Service Delivery. This result is line with Pass and Ridgway (2022), who cite that leading companies in the ICT Job Industry, such as Apple, Facebook, Microsoft, and Amazon, declared strong revenue increase due to enhanced remote work service delivery.

Table 4.24 Summary of Hypotheses Outcome

Hypothesis Number	Hypothesis	Outcome
1	A Comprehensive ICT Infrastructure positively impact on remote work service delivery for administrators in South African SMEs.	Accepted
2	Cybersecurity issues moderate the relationship between the use of comprehensive ICT infrastructure and remote work service delivery.	Rejected
3	The administrator job industry they work in moderates the relationship between the use of comprehensive ICT infrastructure and remote work service delivery.	Accepted
4	The administrator gender moderates the relationship between the use of comprehensive ICT infrastructure and remote work satisfaction.	Rejected
5	The administrator remote work satisfaction is impacted by their age range while working remotely.	Accepted
6	The administrator remote work satisfaction is impacted by their role expectation while working remotely.	Rejected
7	Remote work satisfaction positively impacts on remote work service delivery for administrators in South African SMEs.	Accepted
8	A Comprehensive ICT Infrastructure positively impact on remote work satisfaction for administrators in South African SMEs.	Rejected

4.6. Summary

The study found that remote work satisfaction enhances service delivery for administrators in South African SMEs. This finding is supported by the research findings of Ilag (2021) and Prasad et al. (2020), who found that employee satisfaction with remote work leads to enhanced service delivery. Kyobe (2011) and Urbaniec et al. (2022) agree that increased satisfaction with remote work conditions is associated with improved service delivery. Furthermore, the study found that the use of Comprehensive ICT Infrastructure for remote work is a strong predictor of Remote Work Service Delivery. This is consistent with the findings of Bick et al. (2020) and Ilag (2021), who underline the significance of establishing a Comprehensive ICT Infrastructure for effective remote work service delivery. Furthermore, Rachmawati et al. (2021) reported that modern ICT Infrastructure technologies promote more effective remote work, which enhances service delivery.

However, the study found that the Administrators' role expectations have no substantial impact on their remote work service delivery, which contradicts the findings of Carraher-Wolverton (2022), who stated that role expectations influence service delivery in a remote work situation. Additionally, the study found that having a Comprehensive ICT Infrastructure has no impact on remote work satisfaction for administrators in South African SMEs. This contradicts Davies, (2021) study findings that the use of a comprehensive ICT for remote working can improve their work-life balance, thereby contributing to their remote work satisfaction. Only the job industry moderated the association between Comprehensive ICT Infrastructure and Remote Work Service Delivery, out of the three demographic variables studied. This suggests that the ICT job industry is critical to improving service delivery, as supported by Pass and Ridgway (2022), who reported significant revenue increases among leading ICT companies such as Apple, Facebook, Microsoft, and Amazon as a result of enhanced remote work service delivery.

Finally, the study reveals that cyber security has no substantial impact on the relationship between Comprehensive ICT Infrastructure and Remote Work Service Delivery. This contradicts Nwankpa and Datta's (2023) results, which claim that increased ICT infrastructure use has led to an increase in cyber security risks, particularly in remote work environments. It also contradicts the findings of Ghelani (2022), Lallie et al. (2021), Weil and Murugesan (2020), and Matsikidze (2022), who argue that advances in ICT infrastructure, particularly those that support remote work such as Cloud Computing, have exacerbated cyber-attacks, a trend accelerated by the COVID-19 pandemic.

CHAPTER 5: CONCLUSION AND RECOMMENDATION

The previous chapter-Chapter 4, focused on the study analysis, findings and discussion. Whereas this fifth and concluding chapter of this study entails the dissertation's overview of the study results and study findings, an explanation of the study's limitations, and highlights the study's contributions to the body of knowledge, as well as recommendations for further research.

5.1. Introduction

The study had a sufficient sample size, a high response rate, and the collected data proved to be reliable and valid, thereby yielding valid and significant insights into the phenomenon under study. Following a rigorous data analysis, the following study findings were obtained for each mentioned research objective.

5.2. Summary of findings

- The study found that a comprehensive ICT infrastructure is critical in enhancing remote work service delivery.
- Furthermore, the study found that non cyber security challenges impacted remote work service delivery more than did cyber security issues.
- Moreover, the study also found that remote work satisfaction also positively influenced their remote work service delivery, in addition to the Comprehensive ICT Infrastructure.
- Finally, the study also revealed that administrators who work in ICT Job Industries have an increased chance of enhancing their remote work service delivery by utilizing a Comprehensive ICT infrastructure than those who work in non-ICT Job Industries.

5.3. Research Objectives and findings

The initial objective of this research was to explain the various types of ICT infrastructures that impact remote work service delivery for Administrators in South African SMEs. The study found that a comprehensive ICT infrastructure enhances remote work service delivery for South African administrators in SMEs, with a standardized coefficient (b$*$) of 0.1967 and a significant p-value of 0.0204. Furthermore, the study discovered that the various forms of a comprehensive ICT infrastructure that enhanced remote work service delivery included a combination of the following ICT tools: a mobile phone, a laptop, an extra screen, a Virtual

Private Network (VPN), and the internet. Moreover, the study established the key uses of the ICT tools they utilized for enhancing remote work service delivery. In addition, the general study trend shows that 'communication', with 69.7% of respondents, was selected the most valuable use of remote work ICT tools, followed by 'collaboration', which was ranked second by 40.8% of respondents. 'File sharing' was placed third by 34.2% of respondents, and 'meetings' was ranked fourth by 44.7%. The above study findings on the impact of a comprehensive ICT infrastructure to improve service delivery are supported by The Conceptual Framework of IT Infrastructure for Improved MIS Practices, which demonstrates how organizations can leverage a combination of several diverse ICT infrastructures to improve overall company efficiency and, as a result, service delivery, rather than relying on a single infrastructure in isolation. The approach focuses on the holistic integration of various ICT components to support and optimize operational processes, as well as management information systems to support business operations, particularly remote work in this study. This is consistent with previous literature findings that implementing a comprehensive ICT infrastructure for remote work is critical for remote work service delivery, and that advanced ICT Infrastructure technologies will increase the effectiveness of remote work, thereby enhancing remote work service delivery.

The study's second objective was to profile the challenges that are associated with the use of ICT infrastructure for remote work for Administrators in South African SMEs. The study classified the challenges into two categories, namely cyber security issues, and the second being 'other' challenges which are non cyber related. The study findings established that remote working South African Administrators working in SMES experienced non cyber security related challenges that include connectivity issues, team communication breakdown and inadequate team collaboration, more than they encountered cyber security issues. The most common challenge in the non cyber related challenges category is 'connectivity' accounting 46% of the respondents, affecting nearly half of the respondents, followed by 'team communication breakdown' accounting 32% of the respondents. The mean value (1.89) implies that most of the responses are inclined toward '2', which represents non-cyber security issues. Interestingly, this indicates that respondents consider other challenges to be slightly more significant than cyber security issues, yet both are crucial.

Moreover, the study reveals that cyber security has no substantial impact on the relationship between Comprehensive ICT Infrastructure and Remote Work Service Delivery, as depicted by its p-value of 0.305, which is not statistically significant. These findings contradict Nwankpa

and Datta's (2023) results, which claim that increased ICT infrastructure use has led to an increase in cyber security risks, particularly in remote work environments. In addition, the study results contradict to the study findings of Ghelani (2022), Lallie et al. (2021), Weil and Murugesan (2020), and Matsikidze (2022), who argue that advances in ICT infrastructure, particularly those that support remote work such as Cloud Computing, have exacerbated cyber-attacks, a trend accelerated by the COVID-19 pandemic. Moreover, the study also revealed that, of the three demographic variables, namely Age Range, Gender and Job Industry, only the job industry moderates the relationship between Comprehensive ICT infrastructure and Remote Work Service Delivery. According to the study findings, administrators who work in ICT Job Industries have an increased chance of enhancing their remote work service delivery by utilizing a Comprehensive ICT infrastructure than those who work in non-ICT Job Industries. This finding is consistent with Pass and Ridgway (2022), who state that prominent companies in the ICT Job Industry, such as Apple, Facebook, Microsoft, and Amazon, have reported significant revenue increases as a result of enhanced remote work service delivery.

5.4. Practical Implications

The study significantly contributes to the body of knowledge by developing the Conceptual Model: The ICT Infrastructure Impact on Remote Work Service Delivery, which can be utilised by future researchers. The study findings that a comprehensive ICT infrastructure is critical in enhancing remote work service delivery align with the current United Nations's Sustainable Development Goals and the South African National Development Plan 2030, both of which aim to enhance technological and innovation growth for productive service delivery through the investments in comprehensive and integrated ICT infrastructure, particularly in developing economies like South Africa (National Planning Commission, 2012 and SDG Document: United Nations, 2015). This is evidenced by the United Nations Sustainable Development Goals 8 and 17, that promote sustainable growth, productive employment, technological and innovation enhancement, with emphasis on SMEs, especially in developing economies such as South Africa, and the South African National Development Plan 2030 aim to invest in ICT infrastructure that supports the economy growth, as well as to develop a more comprehensive and integrated e-strategy that depicts the interconnectedness of the ICT sector in the country.

In addition, the study findings also complement South Africa's numerous technological endeavours, also ahead of its hosting of the G20 summit in November 2025. As lauded by President Cyril Ramaphosa, Microsoft, one of the world's technological companies, will invest

R5.4 billion to enhance South Africa's cloud computing and AI infrastructure, all of which are technology infrastructure that enhance remote working service delivery, namely Azure cloud computing infrastructure (SA News.gov.za, 2025, March 6). Despite the study revealing that SMEs remote working administrators in South Africa face primarily non-cyber security challenges, such as connectivity issues, cyber security issues remain significant, due to ICT infrastructure innovations (Matsikidze, 2022) and inadequate cyber security investments (Scott & Kyobe ,2021), and are more destructive in SMEs (Eybers & Mvundla, 2022 and Murphy, et al., 2022). Additionally, Microsoft's Azure infrastructure investment in South Africa will curb the cyber threats challenge by providing identity and security services such as Azure Active Directory (AAD), which manages users access through multi-factor authentication among other services.

Because mandatory work, or remote work on a larger and unprecedented scale, did not begin until after the Covid-19 outbreak in 2019 (Wang et al., 2021), there is currently limited research on the phenomenon (Matli, 2020), and in some remote roles, such as the administrative roles, remote working was only accelerated by the pandemic mandated lockdown (Wang et al., 2021). Furthermore, as stated by Matli (2020), it is still too early to find evidence in the literature on study that explored remote work service delivery and the impact that ICT infrastructure has on the phenomenon. Furthermore, because ICT infrastructure, particularly for remote work, is rapidly evolving, prior studies may no longer be reliable, necessitating additional research into the phenomena. Specifically, there has been a recent increase in the adoption of cloud computing Microsoft Azure, the expansion of collaborating and communication technologies such as Microsoft Teams and Zoom, VPN, remote desk support, remote desk protocol (RDP), and cyber security such as Multi-Factor Authentication (MFA). Additionally, the existing literature has limitations because it lacks extensive research on ICT infrastructure and remote work service delivery in developing economies such as South Africa (Statssa, 2020), where digital divide is more pronounced, due to a lake of technology skills and financial barriers to the adoption of adequate ICT infrastructure to support remote work (Kondo, et al., 2022).This study aims to fill the identified gaps and make recommendations for future studies, ICT investing firms such as Microsoft, government and international policymakers, and South African and other developing economies SMEs that intent to implement ICT infrastructure to enhance remote working service delivery, as SMEs contribute significantly to the country's economic growth and job creation (SA News.gov.za, 2025, March 11).

5.5. Conclusion

In conclusion, the study highlights the critical role of a Comprehensive ICT infrastructure in enhancing remote work service delivery for Administrators in South African SMEs. The study findings reveal that a Comprehensive ICT Infrastructure, including mobile phones, laptops, extra screens, Virtual Private Networks (VPNs), and internet connectivity, all enhance the remote work service delivery for these Administrators. Furthermore, the study discovered that the Administrators' remote work satisfaction positively impacts on their remote work service delivery. In addition, the study found that administrators who work in ICT Job Industries have an increased chance of enhancing their remote work service delivery by utilizing a Comprehensive ICT infrastructure than those who work in non-ICT Job Industries. Notably, communication emerged as the most valuable use of these technologies, with 69.7% of respondents emphasizing its importance, followed by collaboration, file sharing, and meetings.

However, the study reveals major non-cyber security challenges that Administrators encounter when working remotely, that include connectivity issues due to loadshedding, accounting for 46% of respondents, and team communication breakdowns, accounting for 32% of the respondents. These challenges were reported more frequently than cyber security concerns, which were discovered to have no significant impact on the relationship between Comprehensive ICT Infrastructure and Remote Work Service Delivery. Additionally, among the demographic variables analysed: age range, gender, and job industry- only job industry was found to significantly impact the relationship between Comprehensive ICT Infrastructure and Remote Work Service Delivery. Therefore, Administrators in ICT organizations are more likely to experience enhanced remote work service delivery through the use of a Comprehensive ICT Infrastructure than their counterparts in non-ICT job industries.

5.6. Research Contributions

Based on the study findings and the reviewed literature, the researcher provides the following recommendations for enhancing remote work service delivery for administrators in South African SMEs. Small and medium-sized enterprises (SMEs) should prioritize investing in a robust ICT infrastructure that includes key tools such as mobile phones, laptops, extra screens, Virtual Private Networks (VPNs), and a reliable internet connectivity. These technologies are critical for enhancing communication, collaboration, file sharing, and meetings, which are the most important parts of remote work.

Since connectivity issues were the most common challenge faced by remote work administrators, SMEs should focus on improving internet reliability and speed. This could include partnering with internet service providers to ensure stable and high-speed connections or providing employees with mobile data packages to mitigate connectivity issues. In addition, to ensure connectivity during electrical power loadshedding, it is recommended that SMEs invest in adequate power backup resources such as UPS and solar systems.

Although this study indicated that cyber security issues did not have a substantial influence on remote work service delivery, SMEs should continue to provide cyber security awareness and training. Training employees on best practices for using ICT tools securely will assist to reduce possible hazards, especially as ICT infrastructure evolves, specifically in remote work environments. By implementing these recommendations, SMEs may enhance the effectiveness of remote work for administrators, resulting in improved service delivery.

This study aims to contribute significantly to the understanding of the role that ICT infrastructure plays in impacting remote work service delivery for administrative employees in South African SMEs. With the increased adoption of remote work, particularly following the Covid-19 outbreaks in 2019, facilitated by technological advancements, this study provides an analysis of the various ICT tools that impact remote work service delivery SMEs Administrators in South Africa. In addition, the study contributes to highlighting other factors that impact remote work service delivery, such as remote work satisfaction, as well as profile challenges encountered during remote work so that organizations that intent to adopt remote work for their employees can be proactive in handling these issues.

5.7. Study Limitations.

The study phenomenon is still relatively new, particularly for South African administrators in SMEs, because remote work was only accelerated by the Covid-19 outbreak that began in 2019. Another limitation of this study is that the study used stratified sampling methods, hence the study's findings may not be generalizable to non-administrative remote working employees working in non-SME companies.

5.8. Areas for further study

This study examined the impact of Information and Communication Technology (ICT) infrastructure on remote work service delivery for Administrators in South African SMEs. The researcher recommends that future studies on the same topic be conducted in the near future when remote work for Administrators has increased, as this study was conducted shortly after most companies had only recently adopted remote work, as the phenomenon was only accelerated by Covid19's mandatory lockdown in 2020. Additionally, for cyber security issues, the researcher proposes that, in addition to surveying the employees regarding cyber security issues, the employer also be surveyed as they are more likely to be aware of the problems than the employees.

Furthermore, the researcher suggests that future studies take a mixed technique approach in order to record qualitative responses to allow probing of the respondents for a deeper understanding of the phenomenon and for triangulation purposes. In addition, a longitudinal study can be undertaken in the future so to record the outcomes of the research across time, as technology evolves, so will the phenomenon's results.

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APPENDICES

Appendix A: Research Instrument

Online Survey: To be completed by Administrators.

University of Cape Town

Department of Information Systems

Leslie Commerce Building

Upper Campus

Private Bag X3 - Rondebosch – 7701

Cape Town

Tel: +27 (0) 21 650 2261 Fax: +27 (0) 21650 228

Remote work is work that is carried out outside of an employer's office and is supported by ICT technology infrastructure (Urbaniec, Małkowska, & Włodarkiewicz-Klimek, 2022). IT infrastructure is the combined components required for the operation and management of an organization's IT services and IT environments (IBM,n.d). Adopting ICT infrastructures is a double-edged sword which might be crucial for business sustainability, but it also has detrimental drawbacks in developing countries due to limited ICT infrastructure resources. This leads to challenges like cyber risks and ultimately affects administrative service delivery, particularly in remote work situations. This study aims to explain the impact of information and communication technologies (ICT) infrastructure on remote work service delivery for Administrators in South African SMEs.

Your participation is important to explain the impact that ICT Infrastructure has on remote work service delivery for Administrators in South African SMEs.

Please see information below:

Facilitator: Melinda Nyaradzo Chakurira (CHKMEL003)

1. Information obtained through this questionnaire will be confidential, used only for academic purposes, and will comply with the POPIA.
2. Please note that participation is completely voluntary, and you are welcome to discontinue participation should you required to.
3. The questionnaire will take approximately 10-15 minutes to complete.

4. On completion of the questionnaire, please click “submit”, and your responses will be forwarded to the facilitator. Thank you.

Demographic Information						
1. Age Range	18 -20 Years	21-30 Years	31-40 Years	41-50 Years	Over 51 Years	
2. Gender	Male	Female			Prefer Not to Say	
3. Geographic Location	Western Cape	Gauteng	Limpopo	KZN	Other	
4. Role Category	Finance/ Accounting Administration	Executive / Managerial Support Finance Administration	Company Administration	Public Administration	Other	
5. Highest Level of Education	High School Certificate	Vocational Certificate	Diploma	University Degree	Other	
6. Job Industry	IT		Non-IT			
7. Number of Years in the Profession	Less than 1 Years	1-5 Years	6-10 Years	10-15 Years	Over 15 Years	
8. Rate Your IT Skills	Basic	Average	Good	Excellent		
Role Expectation						
9. I know what is expected of my role when working in the office	Strongly Disagree	Disagree	Fairly Agree	Agree	Strongly Agree	
10. I know what is expected of my role when working remotely	Strongly Disagree	Disagree	Fairly Agree	Agree	Strongly Agree	
11. My clients expect the same service delivery from me while either working remotely or in office	Strongly Disagree	Disagree	Fairly Agree	Agree	Strongly Agree	
Remote Work & Service Delivery						
12. Working Conditions	In-office	Remote	Hybrid (both in-office & remote)			
13. I am more efficient when	Strongly Disagree	Disagree	Fairly Agree	Agree	Strongly Agree	

working remotely					
14. I am more efficient when working in the office	Strongly Disagree	Disagree	Fairly Agree	Agree	Strongly Agree

15. Rate your service delivery while working remotely (compared to in-office)	Much Worse	Some what Worse	About the Same	Some what Better	Much Better

Comprehensive ICT Infrastructure					
16. Select the Tools you use when working remotely	Mobile Phone	Mobile Phone & Laptop	Mobile Phone, Laptop & Extra Screen	Mobile Phone, Laptop, Extra Screen & Virtual Private Network (VPN)	Mobile Phone, Laptop, Extra Screen, VPN & Internet
17. Team Communication Platforms Used (Can select multiple options)	Email	Instant Messaging	Telephone Call	Video Conferencing	Other
18. Team Instant Messaging Tools Used (Can select multiple options)	WhatsApp	Google Chat	Microsoft Teams	Skype for Business	Other
19. Team Collaboration Tools Used (Can select multiple options)	File Sharing Tools	Document Synchronisation	Cloud Storage	Video Conferencing	None of the Above

20. What Platform do you mostly use to conduct meetings when working remotely	Audio Call	Video Conferencing	None-meetings are only conducted when in the office

21. I am satisfied with the ICT tools that I use to support my remote work	Not at all satisfied	Slightly satisfied	Moderately Satisfied	Very Satisfied	Extremely satisfied
22. What Extra Tools would enhance your service delivery efficiency	Laptop	Extra Screen	Virtual Private Network (VPN)	Internet	Other
23. ICT Tools generally impact my role service	Strongly Disagree	Disagree	Fairly Agree	Agree	Strongly Agree

delivery when working remotely					
24. What use of ICT Technology do you value most for remote work	Collaboration	Communication	File Sharing	Meetings	Other
Cyber Security Issues & other issues					
25. Which of the following challenges do you encounter while working remotely (Can select multiple options).	Connectivity	Cyber Security Issues	Team Communication Breakdown	Inadequate team collaboration	None

Appendix B: Survey Cover Letter

Department of Information Systems
Leslie Commerce Building
Engineering Mall, Upper Campus
OR
Private Bag X3 - Rondebosch - 7701
Tel: +27 (0) 21 650 2261 Fax: +27 (0) 21650 2280
Internet: http://www.commerce.uct.ac.za/informationsystems/

16 April 2023

Request for your participation in completing research online survey.

Dear Sir/Madam,

My name is **Melinda Nyaradzo Chakurira,** and I am a Masters' of Commerce Student (majoring in Information systems) at the University of Cape Town. My study is titled **The impact of information and communication technologies (ICT) infrastructure on remote working service delivery for Administrators in South African SMEs.**

As part of this project, I would like to invite you to take part in answering the following **anonymous** online survey. The information collected will be used to explain the role of IT infrastructure in the effectiveness of remote working for South African Administrative roles in SMEs.

The survey is **multiple choice** questions and will take **10-15 minutes** to complete.

By continuing with the survey, you are granting consent to participating in the study. Please take note the following:

Your participation in this research is voluntary and you are under no obligation to participate.

You have the right to withdraw your participation at any time, without having to give a reason.

Your identity will be anonymous, and no one will be able to connect you to your responses.

The study results will be used solely for academic purposes and may be published in an academic journal or presented at an academic conference. Upon request, we will provide you with a summary of the study findings.

Thank you for your time and support, which is much appreciated. To complete the survey, please click on the below link.

https://forms.office.com/r/EfdZUnvrrP

Melinda Nyaradzo Chakurira

Researcher \ M.Com Student, (UCT)
Department of Information Systems
University of Cape Town
Email: chkmel003@myuct.ac.za

Appendix C: Ethics Clearance Form

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA · UNIVERSITEIT VAN KAAPSTAD

2023/02/05

COM/02066/2023

RE: Research Ethics Committee Project Approval Letter

Dear Melinda Chakurira,

Your application for ethics review of your project titled

What role does information technology infrastructure play in ensuring effective remote working for Administrators in South African Small and Medium Enterprises?

has been reviewed and evaluated by the

Dept. of Information Systems Research Ethics Committee (REC).

Based on the information supplied your application has been successful and is approved.

You may proceed with your research project titled:

What role does information technology infrastructure play in ensuring effective remote working for Administrators in South African Small and Medium Enterprises?

Please note that should:

(i) any serious or adverse effects to participants occur and/or,

(ii) aspect(s) of your current project change and/or

(iii) any unforeseen events that might affect continued ethical acceptability of the project occur then you should immediately report this to the approving REC. You may be required to submit an amendment to this application, in order to determine whether the changed aspects increase the ethical risks of your project.

Please note the following additional conditions associated with this approval:

(i)

Regards,

Dept. of Information Systems

Research Ethics Committee