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Antecedents of blockchain adoption by South African listed companies

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management in Entrepreneurship and New Venture Creation

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Date: 30 September 2022

Abstract

Blockchain technology is not a new concept, it was first introduced in 1991 by Stuart Haber and Scott Stornetta and made popular more than a decade ago by Satoshi Nakamoto (a name not yet verified if a real person or pseudonym) as a crypto trading platform. However, the technology has not enjoyed much success in the corporate environment. This study seeks to gain a deeper understanding of the failure of South African corporates to embrace this technology by studying the "Antecedents of blockchain adoption by South African listed companies". Although the technology has been around for decades, one argues that it is not a revolutionary or disruptive technology as it finds very limited adoption in the corporate space. Due to its high degree of scientific and technical novelty, it is considered radical technological innovation.
Therefore, the sub-objective of the study was to investigate to what extent organisational context, individual context and innovation context influence a decision to adopt blockchain technology.

This was a cross-sectional study that adopted a comprehensive theoretical framework; Technology-Organisation-Environment (TOE), Technology-Acceptance-Model (TAM) and Diffusion-Of-Innovation (DOI) to unpack blockchain adoption and followed a quantitative approach. Organisational context which is part of TOE was measured by top management support and technology readiness, while individual context which is part of TAM was measured by perceived ease of use and perceived usefulness and lastly, innovation context which is part of DOI was measured by relative advantage. Due to the highly technical nature of the technology, the study focused on the general opinions of employees who work in South African listed companies, specifically decision-makers (managers, senior managers, executives) and subject matter experts (IT professionals).

The primary data was from a sample size of 71 which was collected using self-administered questionnaire adopted from scholarly papers. Many statistical analyses such as Pearson's correlation, regression, ANOVA, and t-tests were conducted.

The study noted that the null hypotheses predicting that organisational context and individual context will positively influence the adoption of blockchain technology were rejected. Moreover,

because the hypotheses were rejected and therefore the relation was of no significance. The extent of the influence of organisational and individual context and the interpretation of the variables in the equation could not be explained. However, the study failed to reject the null hypothesis which predicted that the innovation context will positively influence the adoption of blockchain technology. This finding can be attributed to the distinct features of the blockchain technology providing relative advantage such as data transparency, efficiency and security.

Keywords: Technology, innovation, blockchain, cryptocurrencies, adoption

DECLARATION

I, Luyanda Mbeki, declare that this research report titled "Antecedents of blockchain adoption by South African listed companies" is my own original work, apart from acknowledgement as indicated in the text and references. It is submitted in partial fulfilment of the requirements for the Master of Management in Entrepreneurship and New Venture Creation degree at the Wits Business School, Johannesburg, South Africa. It has not been submitted before, in whole or in part, at any university or tertiary institution.

I further declare that the ethical clearance to conduct this research was obtained from ethics committee at Wits Business School, Johannesburg, South Africa

---

Luyanda Mbeki

Signed _____ at _ __Allensnek, Roodepoort_____

On the ___30_____ day of__September_____2022

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This is to acknowledge my supervisor, Professor Boris Urban for his patience and assistance throughout my studies. His approach of not spoon-feeding students forced me to apply myself and make sure I understand what I am doing. He is always available to provide guidance and expects high-quality work.

I also thank all the Wits Business School lecturers who went out of their way to impart entrepreneurial knowledge. The course has challenged me and proved my cynicism wrong as I thought entrepreneurs are born not taught.

Special thanks to all the participants who responded, this would have never been possible without your assistance. Furthermore, I thank my family for all the support and encouragement provided during my studies. I would like to thank myself for putting in the effort and enduring sleepless nights.

Last but certainly not least, I would like to thank God of Mt Zion for guidance.

Dedication

This report is dedicated to my late parents (Robert Mtibazi & Nomonde Mbeki) who emphasized the importance of education early on in my life, to my colleagues for continuous encouragement, my partner for her support and my children (Alakhe & Akhile Mbeki) who are the reason for all this work. My dad always says, “a person should continue to study for as long as the eyes still permit”.

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CHAPTER 1

1 STUDY OVERVIEW

1 INTRODUCTION

Every country's economic growth and development can largely be attributable to technological advancements. Technology is defined as a process of finding new ways of advancing people's lives using scientific knowledge (Mark, 2019). Technologies used by financial institutions to create new businesses, applications processes, products, and services resulting in material impact are referred to as FinTech (Manasov & Ivanovska, 2020). Blockchain technology is among such technologies and has received massive interest from entrepreneurs, corporates, and governments. Pisano (2015) provides various categorisation of technological innovations; routine innovation is described as innovations that build on existing technological competences and business model; disruptive innovation challenges business model but does not require technological breakthrough per se; Radical innovation challenges technological competencies and finally, architectural innovation disrupts the business model and technological competences.

Contrary to popular beliefs the blockchain technology concept was introduced in 1991 by Stuart Haber and Scott Stornetta (Bhardwaj et al., 2021). It was later made popular by Satoshi Nakamoto (a name not verified if a real person or pseudonym according to Lemieux, 2013) when it was adopted as a trading platform for cryptocurrencies (Lee et al., 2019; Reddick et al., 2019). This study focuses on the adoption of blockchain technology, seeking to gain a deeper understanding of why the technology has not received massive adoption by corporates. Adoption of blockchain technologies by the listed companies will result in efficiencies in the business; automation of manual processes and reduction of human errors (Lee et al, 2019); Early adoption will build the skills of the future whilst enhancing the company's competitive advantage.

1.1 Context of the study

According to the 2020 Global Entrepreneurship Monitor (GEM) report, South Africa has poor entrepreneurial attitudes and perceptions, ranked 37 out of 50 in terms of entrepreneurial intentions. There is a massive opportunity for corporates in South Africa to explore the early adoption of innovative solutions such as blockchain technology. Shane & Venkataraman (2000) outlines that innovation is one of the key enablers of entrepreneurship. Therefore, technological innovation is paramount to any corporate entrepreneurship. This study investigates the antecedents of blockchain adoption from a listed South African perspective

discussing the behavioural factors, drivers, risks, and barriers of adoption. Various studies that have explored different blockchain use-cases that are apply to corporates such as exploring the relationship between blockchain application and corporate performance (Li & Wan, 2021); blockchain use-cases in the supply chain (Gomathi et al., 2021; Angelis & da Silva, 2018; Queiroz & Wamba, 2018); use-case as record management in global human resource (Kim et al., 2020); use-case in the freight logistics industry (Orji et al., 2020); use-case in healthcare (Balasubramanian et al., 2021), use-case in banking sector (Almahirah, 2021; Schuetz & Venkatesh, 2020) etc. However, there are certain inherent limitations and potential concerns such as the lack of regulatory frameworks (Lee et el., 2019); complex system integration and standardisation (Prewett et al., 2019) etc. It is estimated in the World Economic Forum article published in 2018 that 10% of the world economy will be using blockchain by the year 2025. Furthermore, it is estimated that blockchain adoption will generate US$3 trillion per year by 2030 (Bhardwaj et al, 2021).

1.2 Theoretical framework

Technological innovation has impacted many aspects of the organisation from growth, profitability, performance, productivity, and efficiencies (Clohessy, 2020). Therefore, Technology-Organisation-Environment (TOE) theory will be used to unpack the antecedents of blockchain adoption which effectively highlights that the intention to adopt technology is influenced by the customer's readiness at an enterprise level (Giampietri & Trestin, 2020). This theory will be combined with the technology acceptance model (TAM) and diffusion of innovation (DOI). TAM interrogates the individual's behaviour towards the acceptance of new technology innovation and has two constructs of perceived usefulness and ease of use influencing intention to use the technology (Buabeng-Andoh, 2018). DOI examines the adoption rate of new technology by the user focusing on attributes of relative advantage, technology compatibility, complexity, observability and trialability (Bhardwaj et al., 2021). Therefore, a comprehensive theoretical framework TOE-TAM-DOI will be used in the study.

1.3 Motivation for the study and problem statement

Blockchain technology still lacks adoption amongst corporates due to the inflexibility of corporates reporting systems and understanding of the technology (Almahirah, 2021). Therefore, a deeper understanding of this emerging blockchain innovation is paramount to

South African listed companies. This study seeks to examine the failure of South African listed companies and by extension multi-national companies in the global sphere to adopt blockchain technology. To my knowledge, ABSA is the only financial institution in South Africa and by extension global south that has explored the use of blockchain technology (https://www.absa.africa/media-centre/media-statements/2016/absa-leading-the-charge-to explore-blockchain-technology-in-afri/).

While blockchain technology has many unique benefits of decentralization and improves efficiency but the storage requirements are massive and have not been solved. Furthermore, there is a balancing act that needs to be maintained in keeping transparency and the client's confidentiality (Uddin et al., 2021). These challenges will remain hindrances to corporates adopting the technology.

Importantly, this study will assist in raising awareness of blockchain technology amongst South African listed companies. As the participants will be forced in a way to consider blockchain use in a corporate environment. Many researchers have studied the drivers and barriers of blockchain adoption (Prewett et al., 2019; Lee et al., 2019; Angelis and da Silva, 2019; Saurabh and Dey, 2021) and blockchain risks/security and mitigations have been investigated (Malhotra, 2021; Gomathi et al., 2021). Several potential use-cases that have not been brought to fruition by corporates in more than a decade since the blockchain technology was made popular (Pawczuk et al. 2018). There is very little primary data collected (if any) detailing how corporates perceive blockchain technology at least from a South African perspective and no concrete evidence reflecting management's awareness of the potential blockchain use-cases that can be applied to their businesses (Walsh et al., 2020).

1.4 Purpose, research question and objective of the research

The study seeks to further contribute to the existing body of knowledge by investigating antecedents of blockchain adoption by companies in South Africa that are listed on the Johannesburg Stock Exchange in 2021. The antecedents are analysed from organisational, individual and innovation contexts. In this study, organisational context was measured by top management support and technology readiness; the individual context was measured by perceived ease of use and perceived usefulness and lastly, innovation context was measured by relative advantage. A detailed review of the literature was undertaken looking into use cases of blockchain in different industries while outlining antecedents of blockchain adoption. Due to

the highly technical nature of blockchain technology and complex integration into general finance ERP systems, the study focused on the general opinions of decision-makers in a listed company i.e., managers, senior managers, executives, and subject matter experts which are information technology personnel (IT professionals). Whilst the decision to embark on the blockchain adoption journey rests with senior management with board approval, junior/middle managers and IT professionals will be the solders on the ground implementing it. Therefore, making their views on the subject critical.

Blockchain technology has transformed the lives of entrepreneurs in the digital currency market i.e., entrepreneurs who have embraced this innovation early. On 22 November 2021, the Coin Market Cap website indicated a $2,57 trillion market capitalisation of cryptocurrencies which uses the underlying blockchain technology for trading (https://coinmarketcap.com).

1.4.1 *Research objectives*

The main objective is seeking to understand the antecedents that influence blockchain adoption by South African listed companies. The failure by South African companies to adopt blockchain technology was explored from various constructs which are termed in this study as organisational context that was measured by top management support and technology readiness; secondly, the individual context which was measured by perceived ease of use and perceived usefulness; lastly, innovation context measured by relative advantage. The influence of all these variables is measured individually on blockchain adoption.

1.4.2 *Therefore, sub-objectives are framed as:*

- Ascertain organisational context that influences the adoption of blockchain technology.
- Examine individual context that influences the adoption of blockchain technology
- Investigate the innovation context that influences the adoption of blockchain technology

1.4.3 *The research questions are framed as:*

1. To what extent does the organisational context influence the adoption of blockchain technology?
2. To what extent does the individual context influence the adoption of blockchain technology?

3. To what extent does the innovation context influence the adoption of blockchain technology?

1.5 Conceptual definition of terms

Bhardwaj (2021) defines blockchain as a peer-to-peer transaction network that uses decentralised, transparent, and immutable distributed ledger network to record information and is capable of setting rules (smart contract feature) on how information can be updated.
Technological innovation is explained as mechanism or a process of generating new products or simplifying processes addressing market needs which is successful in commercialisation (Barreira et al., 2011: p8).

1.6 Contribution of the study

The study contributes empirical findings to under-researched antecedents of blockchain adoption in South Africa. The empirical findings are based on companies listed on the JSE in 2021. This research also contributes by providing awareness of different use-cases of blockchain technology as the interest is growing in this area. A comprehensive framework for adopting blockchain technology TOE-TAM-DOI was adopted, and this was achieved by reviewing literature for influential factors that affected adoption of blockchain technology in an organisation.

1.7 Delimitations of the study

This study is based on South African companies that are listed on the JSE in 2021. Moreover, the study is exploring the general use of blockchain technology in any aspect of the business such as supply chain; payments, human resource management; digital records, financial reporting, the internet of things and voting. Other aspects that are important which are not covered by this research such as environmental context (vendor support, government policy and regulation) and innovation characteristics (compatibility, observability and trialability) are outside the scope of this research. Future researchers are encouraged to investigate these factors.

1.8 Assumptions

Leedy and Ormrod, (2010) argue that assumptions are basic such that without them, research problem could not exist. The assumption used in this research was that participants applied general technology adoption principles when in doubt as to where and how exactly blockchain technology can be adopted by corporates. Supported by the fact that participants in the organisation from junior/middle management to senior management should be exposed to some form of project management (either implementing a new ERP system or considering a new application that will be suitable for a certain function of the organisation and or are familiar with applying design thinking techniques, participants don't have to be a blockchain expert). The study did not consider technical aspects of blockchain such as compatibility with existing ERP systems, storage space (servers needed) and types of blockchain used (private, public and consortium). The most important assumption is that participants were honest and had an impartial view. Since participants had to consent to the study, confirming that the research was not undertaken under any duress. Participants had an option to withdraw at any time. Lastly, the assumption that participants understood that the data collected was confidential. This was corroborated by the fact that no personal data was collected that could be traced back to the person or organisation for fear of victimisation or discrimination (demographic data was limited to industry, occupation, gender, education, and age).

1.9 Chapter layout

The layout of the chapters in this report is as follows:

Chapter 1: Introduction

This section provides an overview of the study focusing on the objectives and rationale for the research.

Chapter 2: Literature review

The chapter outlines a comprehensive review of the literature on blockchain adoption. Research constructs are conceptualised, and a road map is provided for organisations considering the blockchain journey. Lastly, hypotheses are formulated.

Chapter 3: Research methodology

This chapter discusses the research design and methodology used in this study. The chapter further provides an overview of the sample, discussing the measuring instrument and the method used to collect data. It details the research paradigm and philosophy underpinning the study.

Chapter 4: Results presentation

The chapter summarises and presents the study findings, starting with the sample characteristics of data, screening of data and lastly statistical procedures performed on the data.

Chapter 5: Discussion

The statistical results are analysed, integrated, and interpreted. The empirical research findings are discussed in relation to reviewed literature.

Chapter 6: Conclusions and recommendations

The section provides the conclusion noted in the study and future research recommendations.

CHAPTER 2

2 LITERATURE REVIEW

2.1 Introduction

This section focused on reviewing literature that explored drivers, perceptions, barriers, risks, intentions of blockchain adoption and different use-cases of blockchain technology for corporates (Bhardwaj et al., 2021; Lee et al., 2019; Lin et al., 2021; Prewett et al., 2019; Angelis and da Silva, 2019). Key constructs on the topic were defined, relevant theories were explored, and hypotheses were developed.

2.2 Theoretical underpinnings blockchain adoption

A multi-theory approach was followed when unpacking the empirical theories of adopting blockchain theory. Literature has explored technology using a theory of reasoned action (TRA); technology, organisations, and environment (TOE), diffusion of innovation (DOI), technology acceptance model (TAM), and Theory of planned behaviour (TPB) (Lin et al., 2021, Almahirah, 2021, Li & Wan, 2021, Lui et al., 2021). The theories identified have explained technological innovations and acceptance. Below, each theory will be highlighted and synthesized in relation to the study.

2.2.1 *Technology organisation environment (TOE) theory*

TOE is explained as a method which proposes generic factors that outline and predict the likelihood of technology adoption, focusing on three enterprise contexts which are technology development, organisational conditions and reconfigurations that influence the adoption (Awa et al, 2016). This theory focuses on three features (technology, organisation, environment context) of an enterprise influencing the adoption of technology (Bharward, Garj & Gajpal, 2021).

2.2.2 *Technology acceptance (TAM) theory*

The theory was developed in 1989 by Fred Davis in essence, suggesting that user's motivation to accept a new system considers perceived ease of use and perceived usefulness which informs attitude toward using the new system (Chuttur, 2009; Lui et al, 2021). This theory explains and predicts the system use (Lui et al., 2021). Bharward, Garj & Gajpal (2021), states that technology adoption can be seen as the intention of users or organisation to select a technology that will be beneficial.

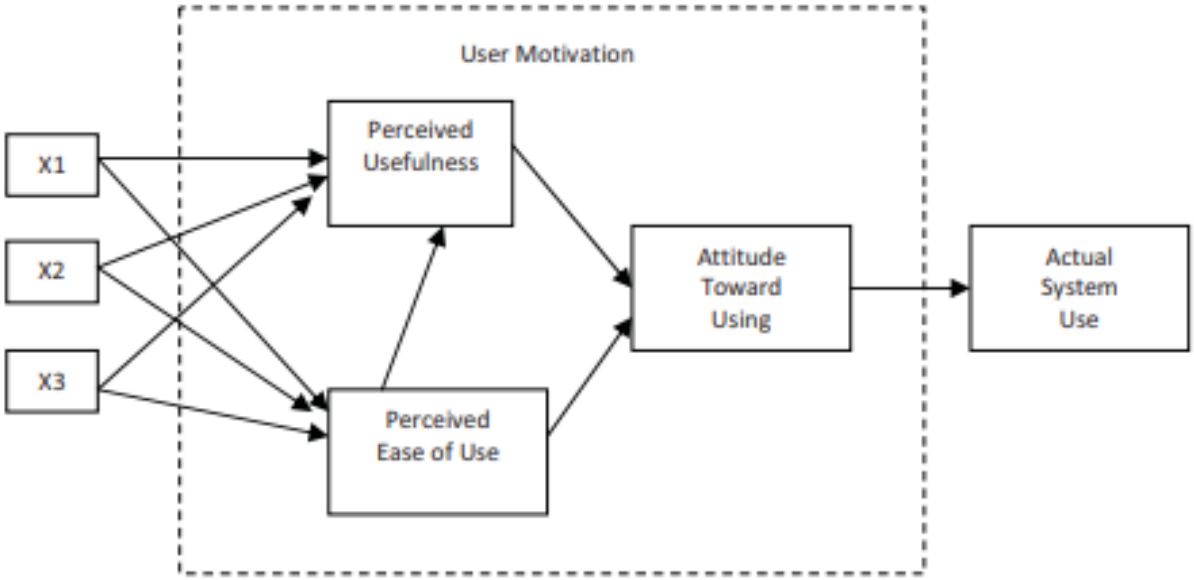

Figure 1: User motivation towards accepting actual system (Chuttur, 2009)

2.2.3 *Diffusion of innovation (DOI) theory*

Everett Rogers developed a DOI theory in 1962 that is commonly used in literature, and it originates from communication, explaining how a product or idea eventually gains acceptance through the social system (Trahan, 2019). In essence, people will adopt a new idea or behaviour or product as part of the social system.

DOI focuses on five attributes which are relative advantage, technology compatibility, complexity, observability and trialability (Bhardwaj et al., 2021). According to Trahan, (2019), DOI theory outlines the processes of adopting innovation through the lens of change, explaining why and how quickly change occurs. The adoption rate varies in each life cycle of the technology; Innovators constitutes 2.5%, early adopters 13,5%, early majority 34%, late majority 34% and laggards 16% according to Reddick, Cid & Ganapati, (2019). One argues that blockchain technology is still in the innovator's stage amongst the corporates due to a lack of adoption

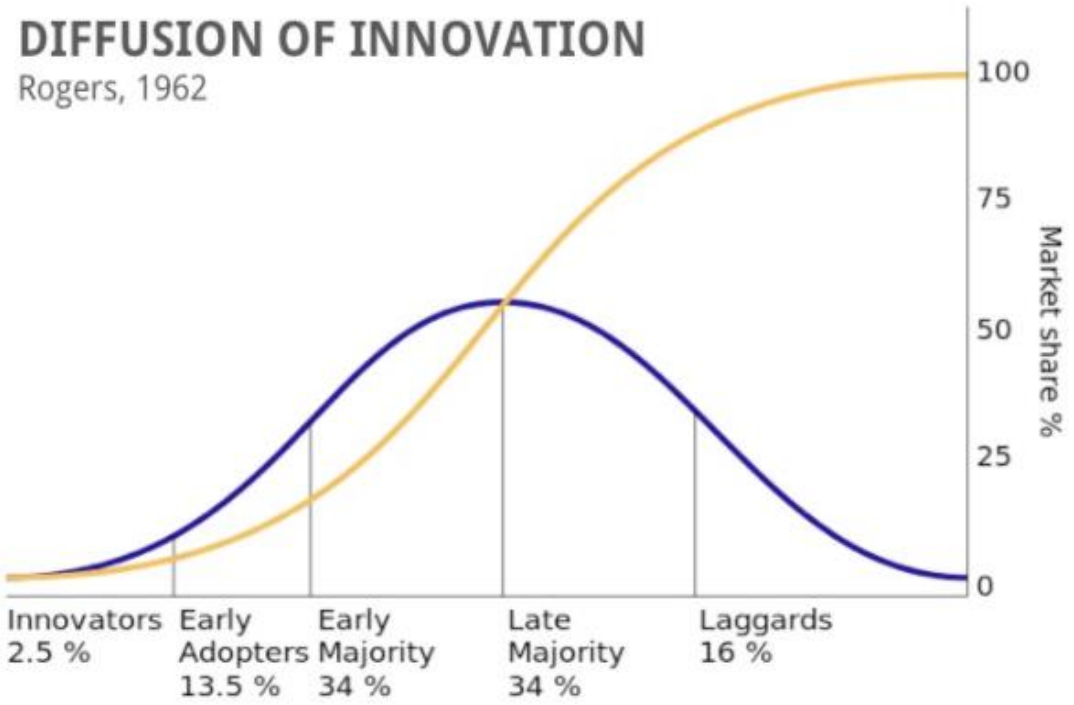

Figure 2: Stages of adopting new technology (adapted from Trahan 2019)

2.2.4 *Theory of planned behaviour*

In literature, a theory of planned behaviour is used to examine consumer's intention to adopt blockchain technology focusing on the core attributes of attitude, subjective norms, and perceived behaviour of control (Lin at el., 2020).

2.2.5 *Adopted theoretical framework (TOE-TAM-DOI)*

Adopting a Technology-Organisation-Environment (TOE), Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI) framework provides a comprehensive approach to this research supported by reviewed literature. TOE focuses at an enterprise level of technology adoption, while TAM explores end-user behaviour of technology adoption and DOI evaluates the actual innovation attributes of the technology (Bhardwaj et al., 2021). In this study, organisational context as postulated by TOE theory evaluates top management support and technology readiness influencing the intention to adopt blockchain technology. Individual characteristics mentioned in TAM theory focuses on the intentions influencing blockchain

adoption which are perceived ease of use and perceived usefulness. Finally, DOI theory examine the attribute of relative advantage.

2.3 Background of blockchain technology and corporate use-cases

In layman's term blockchain is a transaction-based online ledger (White et al, 2019). A formal definition is that blockchain is a distributed ledger technology (DLT) that combines computer science, cryptography and economics, underpinned by five unique principles of decentralisation, peer-to-peer (P2P) transmission, transparency, and immutability (Toufaily et al., 2021). Blockchain can either be public meaning no permission is required to participate in the blockchain activity or can be private which requires special permission to participate in validating transactions and accessing transaction history. Another important feature of blockchain technology is a smart contract, which is a computer program that independently controls the enforcement of an agreement using a predefined set of rules that are agreed upon by two or more parties (Li et al, 2021).

There is a lot of hype about the blockchains in the market and decision-makers need to sift through sometimes misleading and inaccurate claims about its potential. Organisations need to establish where and how blockchain can be used. A study by Deloitte titled Global 2018 Blockchain Survey conducted seven potential use-cases which are supply chain, internet of things (IoT), digital identity, digital records, digital currency, payments, and voting (see Figure 1).

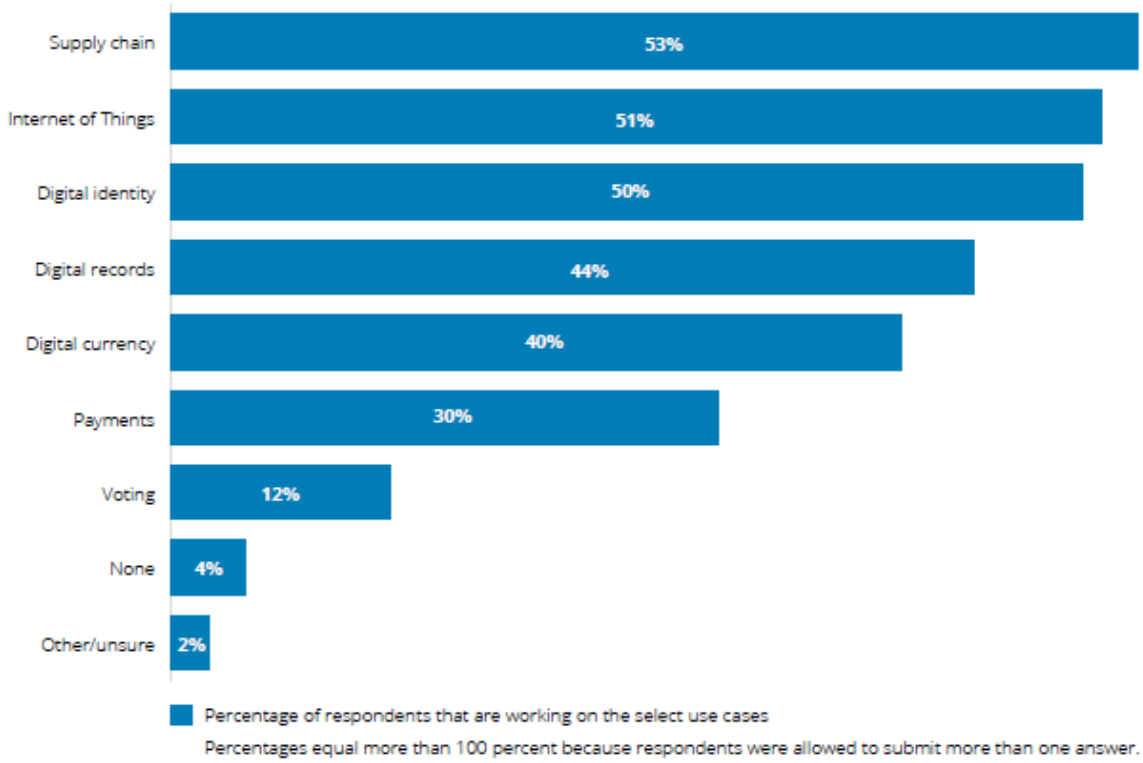

Figure 3: Potential blockchain use-cases for corporates (adapted from Pawczuk et al. 2018)

Notably, the potential use cases mentioned in the preceding paragraphs should be assessed for viability. It is important for organisations to fully comprehend the benefits or values that blockchain poses. A report conducted by the World Economic Forum surveying 550 industry experts, private sector CEOs and analysed 79 blockchain projects proposed a Blockchain Value Framework with three over-arching value dimensions which are: improving productivity and quality, increasing transparency among parties and reinventing products and processes. The value framework showed capabilities and value drivers in each of the three dimensions (see Figure 2). Management could use the value framework as the start to determine whether it is beneficial for the organisation to consider blockchain technology. Moreover, the report showed results of the blockchain's top advantages that were further broken down per industry (see Figure 3). This will provide further guidelines to management when exploring blockchain journey. The benefits/values analysis of blockchain is important but equally important is an analysis of risks and barriers.

Like any other technology, blockchain faces many risks that management should be aware of and have mitigating processes in place to address the risks. Some of the risks are technology risks, data security risks, interoperability risks, third party vendor risks, architecture and design risks, storage risks, and compliance risks (white et al, 2019; Prewett et al, 2019). In addition to the risks noted above, there are fundamental barriers to blockchain adoption, which are scalability, system integration, lack of standardisation, complexity, regulatory uncertainty, and lack of in-house skills (Prewett et al, 2019). Organisations should bear in mind the main objectives for adopting blockchain, therefore, analysing benefits, risks, and barriers appropriately. It is worth noting that the technology is in its infancy stage, and some of the risks discussed above are being addressed by later upgrades such as Ethereum blockchain (Bogner et al, 2016). Other shortcomings will be addressed by future developments; therefore, management should apply caution when analysing current challenges.

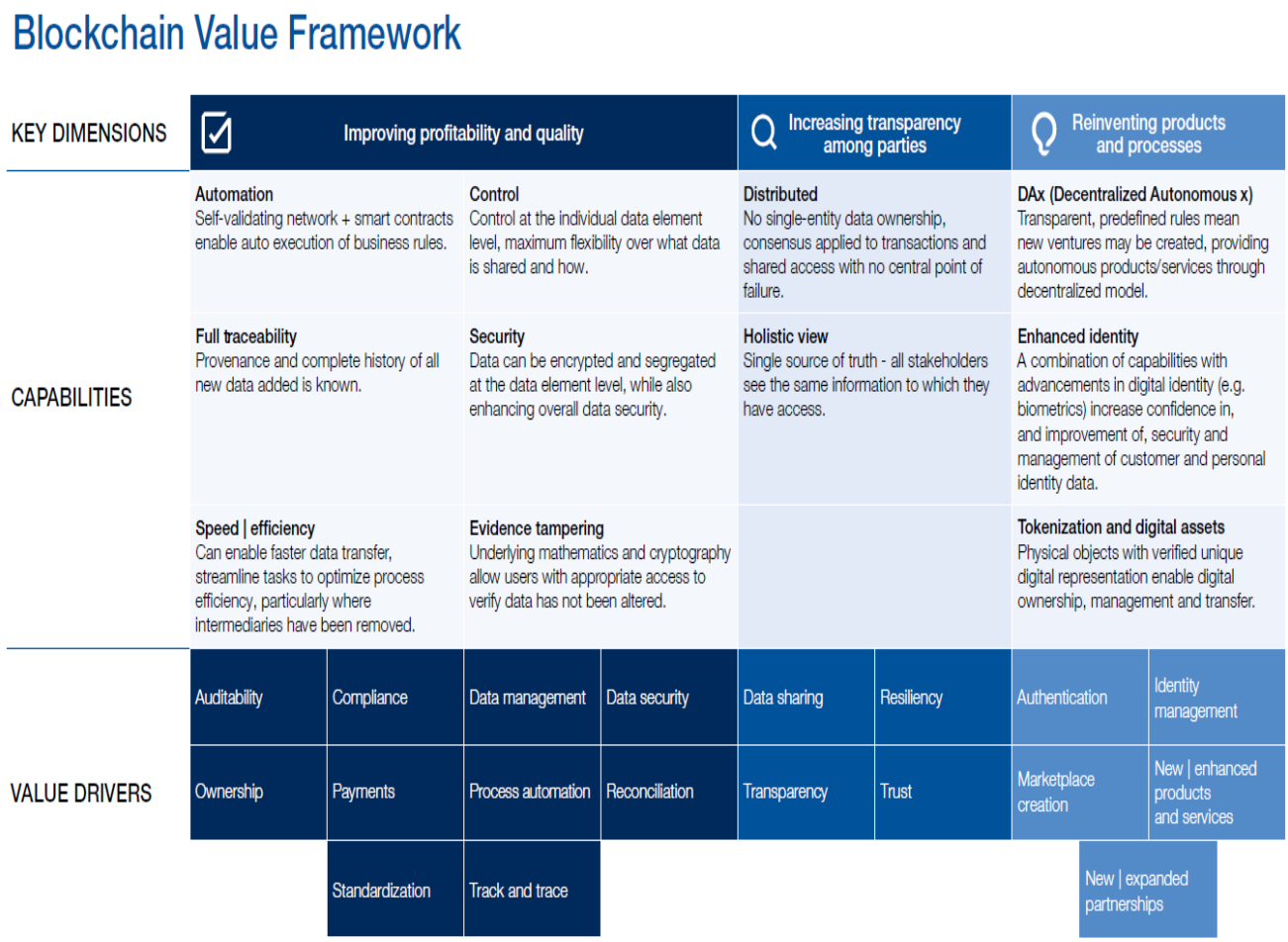

Figure 4: *Blockchain value framework capturing key dimension, capabilities and value drivers (adapted from Warren and Treat, 2019)*

Top advantages per industry



		Automotive	Banking	Comms & media	Consumer goods & services	Energy	Healthcare	High tech	Insurance	Public service	Retail	Software & platforms	Travel	Utilities
1	Full traceability of any information on the blockchain	7	2	4	3	1	1	3	1	3	1	6	1	4
2	Ability to ensure data has not been tampered with	4	1	1	3	4	2	1	2	1	5	2	2	4
3	Distributed nature of the technology	8	4	5	1	8	4	3	3	4	6	4	3	6
4	Smart contracts and automation	2	3	2	2	5	5	6	4	6	3	3	6	3
5	Increased speed and efficiency	3	6	2	5	3	7	7	7	2	4	5	5	1
6	Increased security	1	6	7	7	2	3	1	5	4	2	1	3	2
7	A holistic view with transparency for all appropriate parties	5	5	6	6	5	6	5	5	6	7	7	7	7
8	New business products or services	6	8	8	8	7	8	8	8	8	7	7	8	8

Figure 5: *Top advantages per industry (adapted from Warren and Treat 2019)*

It is common knowledge that the cryptography used in blockchain ensures well-established protection of data integrity, reliability, and security (White et al, 2019). However, Dobrovnik et al (2018) state that details are limited of where and how blockchain can provide significant improvement in the business and there is very limited information on where and how blockchain can be applied in business. Furthermore, management has very little knowledge about blockchain and where to start implementing this technology. The companies should start building organisational capabilities for the successful adoption of blockchain-based technologies (Dobrovnik et al.,2018). Koens et al (2020) confirm that recently there has been a big interest in blockchain technology, however, the drivers behind the adoption of the technology are not fully understood. Furthermore, blockchain technology is not appropriate for all scenarios from a technical standpoint. Akram et al (2020) highlight interoperability and governance as the main challenges of blockchain technology that potential users, researchers, and professionals should be aware of.

Management maybe familiar with blockchain risks and benefits but the practicalities remain of where does an organisation start with the blockchain adoption journey? Below is the framework designed by World Economic Forum that guides organisations to determine if blockchain will be suitable. The framework consists of 11 questions that will assist the

organisation in making an initial assessment of whether blockchain is suitable and what type of DLT the organisation can use.

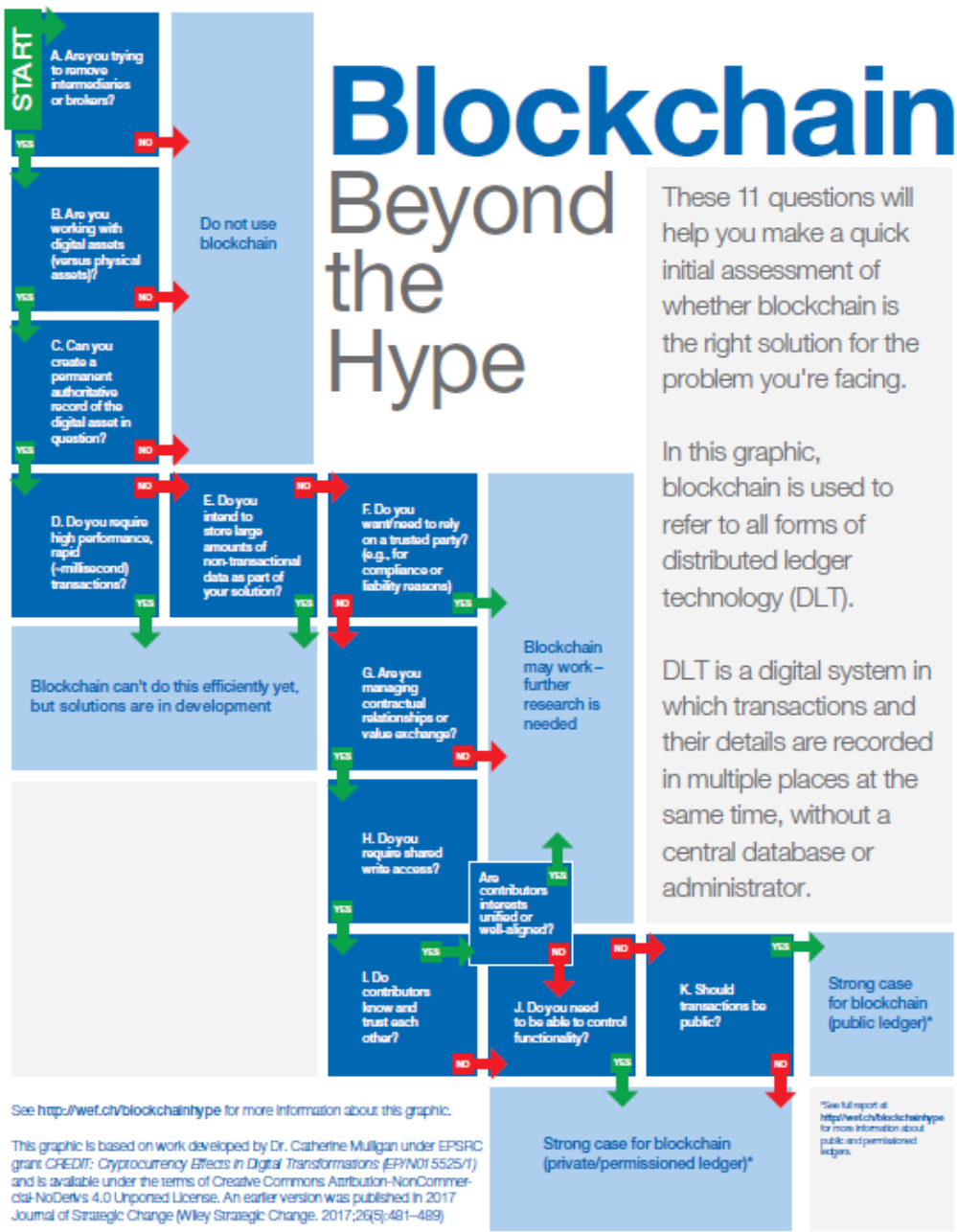

Figure 6: Organisation's assessment of blockchain's suitability (Mulligan 2018)

The framework stated in Figure 4 will provide a clear roadmap for organisations considering blockchain adoption and will address some of the concerns stated in the literature.

2.4 Development of hypotheses

Blockchain adoption focused on the opinions of decisions-makers and IT professionals working for South African listed companies. The literature argues that organisational factors such as top management support, cost concerns, security concerns and technology readiness are important variables that influences a decision to adopt technology (Lin et al., 2021; Almahirah et al., 2021; Li & Wan, 2021). Top management support is the extent to which senior management comprehends the importance of new technology and their involvement in the adoption process (Bhardwaj et al., 2021). Resource allocations such as human, financial and infrastructure by top management play a significant role in the adoption of new technology. Related to resource allocation is the cost concern. Resource allocation will have a cost factor impacting the adoption of blockchain technology. The initial investments of obtaining required hardware, software and implementation costs can be expensive which might hinder blockchain adoption. However, blockchain technology reduces record-keeping costs and ensures that transactions are processed real-time (Reddick, Cid & Ganapati, 2019). Therefore, organisations should consider a costs-benefits analyses before a decision to undertake blockchain journey is taken. In terms of technology readiness, organisations will adopt a technology when required resources (hardware, software, and technical skills) are available to operate it efficiently and such technology is compactable with legacy systems (Reddick, Cid & Ganapati, 2019). Security concerns remain a risk to any technology involved. Bhardwaj et al., 2021 echo this sentiment by stating that privacy and security remain key risks resulting in data vulnerability regarding distributed ledgers. Organisational context as articulated in the TOE theory posits that top management support, security and privacy concerns and costs concerns influences the blockchain adoption intention. Therefore, organisations will adopt blockchain technology when it is beneficial to the business in terms of costs, security and privacy, and top management support is in place. However, in this study only top management support (TMS) and technology readiness (TR) form part of the organisational context.

H1 – The *Organisational context will positively influence the adoption of blockchain technology*

There is a rebuttable presumption that individuals will likely adopt technology that improves their job performance. Seamless ease of use increases the likelihood of technology being adopted. Furthermore, ease of use is linked to the simplicity and understandability of the

technology (Lui et al., 2021, Bhardwaj et al., 2021). One of the values attached to adopting blockchain technology is the improvement of legacy systems (Lee et al., 2019). Perceived ease of use and perceived usefulness are related in the sense that users will likely adopt a technology that is easy to use, similarly a technology that improves the user performance will likely be adopted i.e., usefulness (Lui et al., 2021; Lee, Kriscenski & Lim, 2019). Therefore, individual context measured by perceived ease of use (PEOU) and perceived usefulness (PU) influences the adoption of blockchain technology.

H2 – The individual context will positively influence the adoption of blockchain technology

Blockchain technology offers five distinctive features transparency, authenticity, traceability, immutability, and verifiability (Reddick, Cid & Ganapati, 2019; Prewett, Prescott & Phillips, 2019). Relative advantage according to the diffusion of innovation theory suggests that for the new technology to be accepted, the perceived benefits must be better than the existing technology (Bhardwaj et al., 2021). Blockchain technology securely stores digital transactions without central authority effectively removing traditional governance systems (Reddick, Cid & Ganapati, 2019). Cyber security is one of the key risks facing organisations and cryptography act as encrypting and decrypting data in blockchain technology (Prewett, Prescott & Phillips, 2019). In a blockchain technology, information is processed and stored real-time, and it is immutable i.e., no one person can change the data. The adoption of new technology will be slow if advantages or benefits are not clearly defined. The five features of blockchain are clear advantage over the legacy ERP systems and would be an influential factor in a decision to adopt the technology. Therefore, innovation context measured by relative advantage (RA) influences blockchain adoption.

H3 – The Innovation context will positively influence the adoption of blockchain technology

Therefore, the hypotheses for this study are shown below:

H_1: *The Organisational context will positively influence the adoption of blockchain technology*

H_2: *The individual context will positively influence the adoption of blockchain technology*

H_3: *The Innovation context will positively influence the adoption of blockchain technology*

Table 1: Summary of reviewed literature on blockchain adoption in South Africa

Author(s)	**Focal Entrepreneurial Phenomenon**	**Locus of entrepreneurship**	**Relationship between Entrepreneurship phenomenon and technology adoption**
Bhardwaj et al., 2021; Lee et al., 2019; Lin et al., 2021; Prewett et al., 2019; Angelis and da Silva, 2019	Blockchain adoption and corporate use-case	Organizational members	Technology innovation impacting organization

Author(s)	Focal Entrepreneurial Phenomenon	Locus of entrepreneurship	Relationship between Entrepreneurship phenomenon and technology adoption
Chuttur. (2009), Lin et al., (2020), Bhardwaj et al., (2021), Prewett et al., (2019); Angelis and da Silva, (2019), Lui et al., (2021)	Perceived ease of use and perceived usefulness (subjective norms)	Individual intentions	Technology adoption
Bhardwaj et al., (2021), Awa et al., (2016), Lin at el., (2021)	Technology, organizations, and environment	Organizations	Innovation – improvement of legacy systems
Dobrovnik et al (2018), Reddick, Cid & Ganapati, 2019	Innovative solutions	Management	Organizational capabilities
Koens et al (2020)	Drivers of adoption not fully understood	Not specified	Not specified
Gomathi et al. (2021)	Adoption in freight logistic industry	Not specified	Innovation
White et al, (2019), Toufaily at el., (2021), Li at el., (2021)	Technology innovation	Not specified	Innovation
Akram et al (2020)	Challenges with blockchain technology – not interoperable	Not specified	Not specified
Bhardwaj et al (2021)	Relative and complexity of the technology	Innovation context	Technology innovation characteristics

Source: Adapted from Ireland, Covin and Kuratko (2009:22).

2.5 Conceptual Model of the study

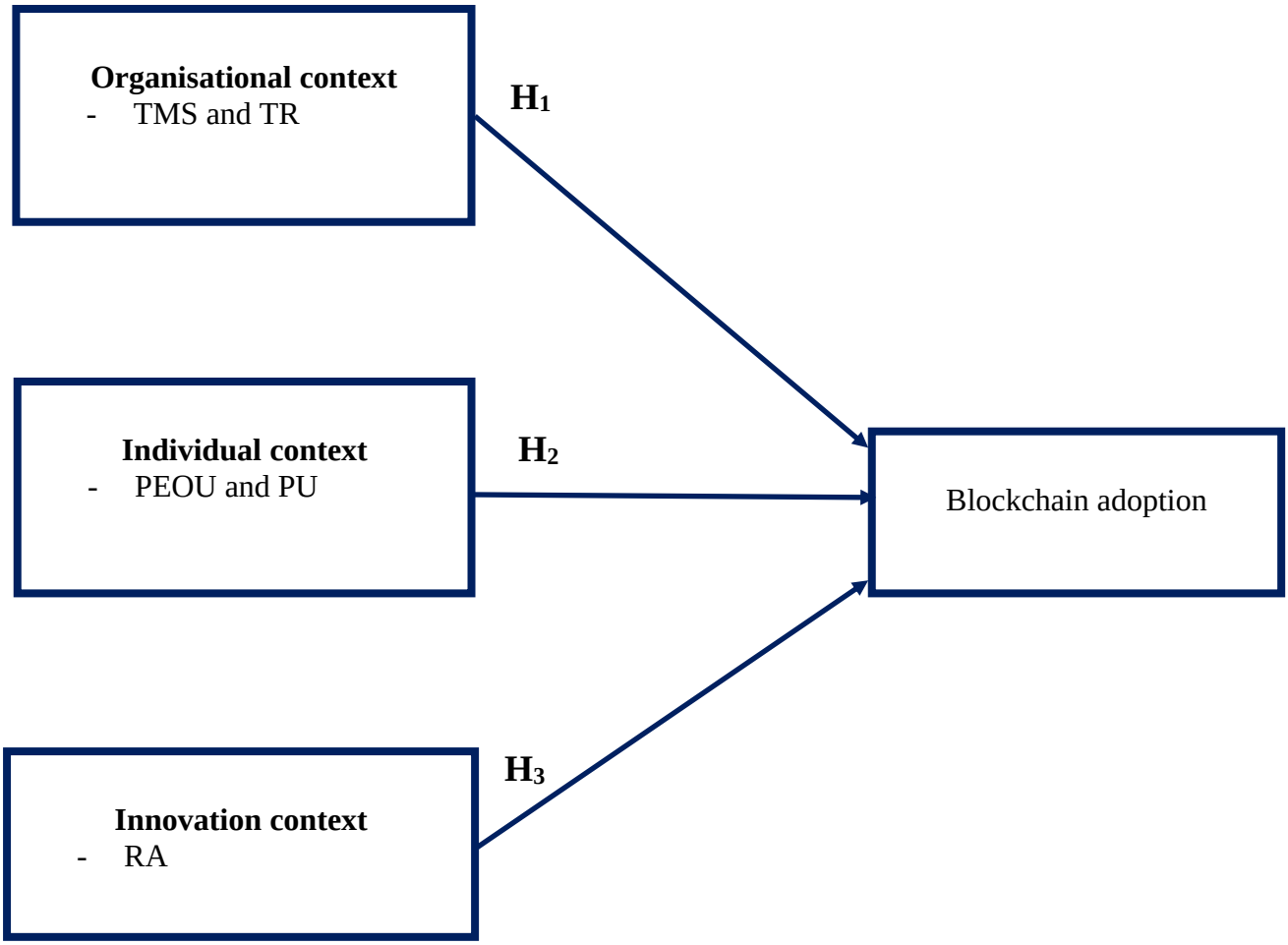

*Figure 7**:** Organisational, individual and innovation context positively influences blockchain adoption* ***(Conceptual model)***

CHAPTER 3

3 METHODOLOGY

3.1 Introduction

This section provides explanation of how the study fits within the prevailing paradigm. Research design, size of the research population with the relevant sample, and the sampling procedure were then presented and discussed. Difficulties relating to data collection, reliability, and validity were examined, as well as the scale measures and statistical procedures utilized to evaluate each hypothesis. The section concludes by discussion ethical considerations and issues related to this study.

3.2 Research paradigm

Research paradigm can be thought of as a point of view, a world view, or assumptions about how the universe operates in general. This research followed a post-positivist approach that is scientific in nature and used a quantitative approach (Creswell, 2012). Where the researcher is independent in mind and follows science-based research that is rooted in objective verification, benefiting from hypothetical-deductive procedures (Velez-Solic, 2008). According to Bahari (2010), ontology is the nature of social realities, and post positivism follows an ontological view known as authenticity, whereas axiology in research paradigms refers to what researchers believe is significant and ethical (Killiam, 2013). The purpose of arranging the paradigm in the literature on the research is to legitimate the methodology used in the research, which was based on previous studies.

The quantitative approach used in this study falls under the post positivist theoretical perspectives where relationships amongst variables are analysed (Velez-Solic 2008; Galawe, 2017; Nabatanzi-Muyimba, 2014; Bak, 2004). Moreover, this study will employ a deductive approach, drawing on well-known theories such as technology organisation environment theory, technology acceptance theory, and diffusion of innovation theory to better understand antecedents of blockchain adoption in South Africa, using multiple regression analysis (Lawal, 2009).

3.3 Research design

Kothari (2004) argues that research design is the blueprint for research that influences the formulation of hypotheses, data collecting, and analysis to improve the research's importance. Galawe (2017) states that the design enables scholars to test relationships as hypothesized in the conceptual framework. In this regard, literature posits five types of research design, according to Nabatanzi-Muyimba, 2014) which are: experimental design, case study design, cross-sectional design, comparative design, and longitudinal design. Survey methods are widely used for quantitative studies as they are considered cost effective ways of collecting data and have a wider population reach (Field, 2009). This study used an online questionnaire. There is a risk of common method variance (CMV) when using electronic questionnaire as all scales are measured on a single questionnaire at once i.e., the prospects that the tested relationship amongst variables might be distorted thereby jeopardizing the validity of the research is high (Rodriguez-Ardura & Meseguer-Artola, 2020). Measurement error as result of CMV may cause higher correlations amongst variables if the same method is used for the predictor and explanatory variables (Conway & Lance, 2010). The possibility of CMV should be prevented during research design phase and this was addressed by having reasonable short questionnaire which was on average 10 minutes long and there were two reverse or negative question testing to identify dis-engaged participants (random selection).

3.4 Data collection and sampling

3.4.1 *Population*

Population can be defined as an overall group of people where a researcher draws insights and finding (Cooper & Schindler, 2014; Moloi, 2020). Nkhi et al. (2021) points out that in South Africa, the demographic characteristics and population of every single employee in the labour market are not well understood. However, according to the Department of Statistics South Africa (stats SA, 2021), in their 2021 annual report estimated that the South African labour market has 14.3 million individuals formally employed. Given that the study aimed at obtaining general opinions of decision makers; managers; senior managers; executives and subject experts (IT professionals). The number of employed individuals provided by the Department

of Statistics South Africa (stats SA, 2021) included participants who work in small-medium size companies that may lack resources and expertise.

Furthermore, to tailor the population to fit the study, the study used companies listed in Johannesburg stock exchange (JSE) in the financial year 2021. This was designed to eliminate bias from participants who work in small-medium size companies that may lack resources and expertise to implement blockchain technology (Nkhi et al., 2021). Implementing blockchain technology is expensive and requires large resources hence the study only focused on listed companies that have adequate financial muscle and skills to a large extent to undertake this project. As blockchain technology is a relatively new concept for corporates, the study focused on the opinions of decision makers and IT professionals to provide valuable insights as they are familiar with legacy systems and technology adoption concepts such as ERP systems. According to JSE (2021), there were 325 listed companies as of November 2021 with an estimated hundreds and thousands of employees working in each company (Nkhi et al., 2021). For this research, given the lack of precises measurement concerning the specific number of managers, senior managers, executives from country perspective. The study adopts JES's proximation of 100 000 employees as the study’s population.

3.4.1 *Sample size estimation*

In terms of the sample size, the challenge generally faced in finding an efficient sample size that is fully representative of an unknown population (exact total number employees who works as a manager, senior manager, executive and or IT professionals in South African listed company). As indicated the study tailored the study's population on only companies in the JES in the 2021 financial year. According to Nkhi et al., (2021) hundreds and thousands of employees were found working in the listed companies and thus used as the study's population. Various equations have been offered by various scholars, some of which are difficult. Yamane (1967) proposed a new formula for calculating sample sizes. Yamane's (1967) formula was used to determine the sample size for this survey see table 2:

Table 2:Yamane's formular

YAMANE'S FORMULA

N= 100 000

$e_2 = 0.05^2$

$$n = N / \{1 + N (e^2)\}$$

Therefore

$n = 100\ 000 / \{1 + 100\ 000(0.05^2)\}$

$n = 398$

According to Yamane's (1967) calculation, 398 people working in JSE-listed businesses were expected to be given questionnaires to obtain meaningful results. However, because of the present pandemic and the university allowed the sample limited to 150 employees. The table 3 below contains a summary table with a description of the research participants' biographical information, such as age, sexual orientation, language, most notable intellectual skill, and so on...

Table 3: Summary of the sample

Number to be sampled	150 individuals
Description of respondent type	Employee working on any company listed on the JSE
Age	18 years old and above
Gender	Any gender
Language	English
Highest academic qualification	At least high school

3.4.2 *Sampling method*

This study applied a non-random sampling strategy called convenient, in which participants were chosen depending on their availability and closeness to the researcher. The approach has several advantages, including being efficient and cost-effective. However, this sampling strategy has the disadvantage of a higher risk of testing error during data collection (sampling error), as well as a higher chance of bias. Field (2009) advocate increasing the sample size first to lessen technique disadvantages. This is because as the sample size grows, it gets closer to the population. As a result, there are more opportunities to collect correct data. Additionally, to ensure that the sample appropriately represents the population (across age, education, and occupation), the rate at which age, education, and occupation are represented in the population must be mirrored roughly in the sample. Furthermore, due to the sample procedure, no overall conclusion can be derived from this study (Field, 2009).

3.5 Procedure for Data collection



Figure 8: social media platforms utilised to collect data

The participants were reached by social media (see figure 8) platforms such as LinkedIn, Instagram, and Facebook, as well as direct mail. Notably, no sensitive company information was retrieved, and there was no need for access to company data. Furthermore, as previously stated, the study employed a practical sampling technique (non-probability). This is because the study did not have a sampling frame of all employees working for JSE-listed businesses, and given the lockdown laws, most employees continue to work from home, hence emails and social, media inbox were deemed to be more efficient. The instrument explained the study's purpose while also assuring participants of confidentiality. It also provided a choice for people to withdraw working on the research instrument at any time. After the surveys are completed, the responses will be entered into the data set and will be ready for analysis.

3.5.1 *Primary and secondary data*

Depending on the type of method (qualitative or quantitative) or research design, researchers employ a variety of data collection methodologies. Primary data is obtained by the researcher from an immediate source, according to Hox and Boeije (2005). Data can be collected using methods such as interviews, surveys, and observation (Galawe, 2017). This study employs primary data in the form of emails sent to participants' social media accounts, while secondary data was acquired from any source other than the survey, in other words, data collected from a source other than the survey's distribution. The Cronbach's alpha ratings (reliability) of the study used in the survey all came from previous research. Secondary data used in this study came in the form of past writing such as past articles. These were the study's secondary data (Galawe, 2017; Nabatanzi-Muyimba, 2014).

3.6 Measuring instrument

The research instrument was adopted from similar published scholarly studies (Awa, 2016; Bhardwaj, 2021). There were three dimensions the were adopted from reviewed literature for our study: organisational context that was measured by top management support and technology readiness; individual context that was measured by perceived ease of use and perceived usefulness and lastly, innovation context that was measured by relative advantage. An online self-administered questionnaire was used which enables objectivity, confidentiality and reduces social desirability (Galawe, 2017). The online questionnaire was administered from late November 2021 to early January 2022. The research instrument collected demographics such as industry, occupation, gender, education, and age to understand the profile of the participants (see research instrument in the Appendix C). This research was based on the technology adoption theory and entrepreneurship. The research instrument used a 7-point Likert scales which are widely used to measure opinions and attitudes of the participants (Dawes, 2008). Scales are utilized to measure the degree of agreement or disagreement as shown below.

Table 4: Measures used in the study

Number	Construct	Literature sources	Dimensions	Comment on instrument
1	Organizational context Assessed using 7-point Likert- scale with a range from (1) strongly agree to (7) strongly disagree	Bhardwaj et al., (2021), Awa et al, (2016), Almahirah, (2021)	TMS and TR	7 statements were constructed to test TMS and TR. Exploratory factor analysis was used to confirm the factor structure (instrument tested variables separately however EFA confirmed a single factor. Secondly, instrument tested cost, security and privacy, dimensions. These were confirmed factors; however, the data was not normally distributed, then were subsequently removed). Cronbach's alpha internal consistency reliability of α = .956
2	Individual context Assessed using 7-point Likert- scale with a range from (1) strongly agree to (7) strongly disagree	Bhardwaj et al., (2021), Awa et al, (2016), Almahirah, (2021)	PEOU and PU	7 statements were constructed to test PEOU and PU. Exploratory factor analysis was used to confirm the factor structure (instrument tested variables separately however EFA confirmed a single factor). Cronbach's alpha internal

				consistency reliability of α = .925
3	Innovation context Assessed using 7-point Likert- scale with a range from (1) strongly agree to (7) strongly disagree	Bhardwaj et al., (2021), Awa et al, (2016), Almahirah, (2021)	RA	4 statements were constructed to RA. Exploratory factor analysis was used to confirm the factor structure (instrument tested complexity, however no factor loaded for complexity, thus removed). Cronbach's alpha internal consistency reliability of α = .850
4	Adoption of Blockchain Assessed using 7-point Likert- scale with a range from (1) strongly agree to (7) strongly disagree	Bhardwaj et al., (2021), Awa et al, (2016), Almahirah, (2021)		4 statements were initially constructed to test blockchain. Exploratory factor analysis was used to confirm the factor structure (Due to cross loading only 3 items remained as a factor). Cronbach's alpha internal consistency reliability of α = .790

The questionnaire assured participants in confidentiality of information provided, stating that the research was meant for academic purposes only. Structural equation modelling (SEM) was used as guide which recommends a minimum of 3 items per construct avoiding under identification and parameter instability (Babin & Svensson, 2012; Nabatanzi-Muyimba, 2014).

3.7 Data analysis

3.7.1 *Demographic*

The second segment of the research instrument will be evaluated; this segment traces the employee's profile and discusses information such as the employee's sexual orientation, employee's age, employee's education level, the employee's current industry and occupation in the workplace.

3.7.2 *Descriptive statistic*

Descriptive statistics are a sort of coefficient that summarizes a data flow; also, they might be a representation of the entire population or a sample of the population. Measurements of variability (variance and standard deviation), frequency distribution and measure of central tendency (mode, median, and mean), are common examples of descriptive measurement (Abdi and Williams, 2010). The descriptive measurement will be used to depict, show, or summarize significant amounts of data.

3.7.3 *Exploratory factor analysis (EFA)*

EFA is a variable reduction technique that examines the relationships between the data obtained for several constructs and determines which construct data is more closely related to the other (Cooper and Schindler, 2009). The trial to supply the variables and their loadings is Principal Components and Varimax Rotation.

According to Kaiser-Meyer-Olkin (KMO), a sample adequacy (Barlett and KMO) can be used to assess the appropriateness to factor analysis given a sample size. The test provides a range from 0 to 1 stating that the closer the value is to one, the more adequate sample. Kaiser (1970) suggests a cut-off point of 0.5 and anything less than that will be inappropriate for factor analysis (Ali et al., 2006; Galawe, 2017). Table 5 below provides guidelines and interpretation from SPSS KMO Test.

Table 5: KMO Sampling Adequacy critical values

KMO Range	Decision

Greater than 0.9	Superb
Between 0.8 and 0.9	Great
Between 0.7 and 0.8	Good
Between 0.5 and 0.7	Mediocre

Source: (Field 2009.p.647; Galawe, 2017)

The Barlett's Test of Sphericity is used to test inter-correlation between variables that represent the same construct with the objective to reject the null hypothesis where the significant value is greater than 0.05 i.e., meaning factor analysis is appropriate if the p-value is less than 0.05 (Field, 2009; Galawe, 2017)

3.7.4 *Inferential statistic*

a. ***Pearson Correlation***

Pearson correlation is a statistical approach that measures the degree of relationship between two constructs, according to Spearman, C. (1906). It shows if and to what extent two or more sets of variables are related (Clayton, 2011). The statistical technique will be used to see if there is a correlation between the dependant variable (blockchain adoption) and the independent variables (organizational context, individual context, and innovation context) in this study. Furthermore, it will reveal the strength of these bonds i.e., how closely are these variables related? This is determined by looking for any instances of multicollinearity.

b. ***Multiple linear Regression***

There are various types of regression analysis, including nonlinear, multiple linear, and linear. Multiple linear and linear are the most common; nonlinear is employed when the predicted variable and predictor variable (s) have a nonlinear relation (Bowerman & O'Connell, 1990). Multiple linear regression will be used in this study because three independent variables will be used to predict the dependent variable. By the definition a Multiple Regression is a technique that investigates the relationship between a predicted variable and more than one predictor variables, according to Bowerman & O'Connell (1990). It examines how the predictor variables influence the dependent variable's outcome. Furthermore, the technique identifies which

independent variable significantly predicts the dependent variable's outcome (Bowerman& O'Connell, 1990). Following that, the mathematical equation:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_2 X_2 + \varepsilon$ (population equation)

$\hat{\gamma} = \hat{\beta}_0 + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_2 + \hat{\beta}_3 X_3$ (sample equation)

Where:

Y: Adoption of block chain

β_0 =a: intercept (constant)

$\beta_1 = \beta_2 = \beta_3$: Regression coefficient

X_1: organizational context

X_2: Individual context

X_3: Innovation context

3.8 Ethical consideration

Research ethics guides the quality of the research and provides protection of the moral rights of the participants (Kumar, 2014). Research ethics primarily deals with the collaboration that exists between the researcher and participants when gathering data for the examination (Mack et al., 2005). For this research, the researcher adhered to strict ethical code when collecting and analysing data. Participation to the study was on voluntary basis, instrument used ensured consent was obtained and the questions were neutral. Confidentially was reasonably assured not guaranteed, however only limited demographic data was sourced which was limited to, industry, occupation, gender, and age. Blockchain technology has not been adopted by the listed companies in our study and as result no sensitive company information such as trademarks or secrets was obtained or could be obtained. This study did not utilise company information and no access to company records was required as only general opinions of decision makers (managers, senior managers, executives) and IT professionals about radical technology in the market were collected. This is in line with the POPI Act of 2013 which requires all South African institutions to conduct themselves responsible when collecting, processing, storing, and sharing personal information. None of the companies involved are identifiable in the report. Supervisor ensured that researcher cannot proceed to collect

information until the ethics clearance form was obtained from the University. The research ethics protocol number for this study is WBS/EN1558168/533 which was obtained on the 21 November 2021.

CHAPTER 4

4 RESULT PRESENTATION

4.1 Introduction

This chapter summarizes the data and presents the study findings based on responses to quantitative research questionnaires from participants. The chapter is divided into seven sections. The first section presents the rate of response, second data screening, third section dealt with validity, fourth section dealt with reliability of the research instrument, fifth section dealt with the normality of data of each construct, sixth section looked at descriptive analysis, seven and last section looked both bivariate and multivariate analysis, which are inferential statistics, which was used to assess all the hypotheses.

4.2 Response rate

Various scholars argue that when analyzing the data, the larger the sample size, the better, however, there is no agreement on what constitutes a large sample (Galawe, 2017). Hoyle (1995) argued that a sample size of 100 when performing regression analysis can be used. Smaller sample estimates in regression analysis research, according to Field (2009), tend to provide "low quality responses." Sample size with less than 100 observations is generally considered smaller (Kline, 2005). Generally, a good indicator of a sample size is the response rate, no matter the reason, individuals are hesitant to share information especially with strangers and researchers. As result, data collection was challenging. Previous studies had had trouble in collecting data from entrepreneurs by using online surveys (Chaganti and Greene 2002), The response rate is unknown for this study as the social media platforms were used, making it difficult to ascertain how many participants that research instrument was shared with. In the statistical analysis, the researcher only employed surveys in which all the items were completed. A total of 67 questionnaires were eliminated due to participants not meeting the qualification criteria of being a manager, senior manager, executive and or IT professional.

4.3 Data screening

Statistical studies are unsuccessful when there are missing values and missing values often needs to be understood or eliminated. The most important step in obtaining high-quality results is to ensure that the data has been thoroughly reviewed for anything that could expose the researcher to the risk of studying low quality data. Schumacker and Lomax (2004) stated that data screening is a critical step in the data analysis process.

4.3.1 *Consent and qualification criteria*

The research instrument explicitly stated that "Your participation in this research is 100% voluntary and you have the right to withdraw at any point during the study, for any reason, and without any prejudice. The questionnaire will not be gathering any personal data, only information related to the specific study. Confidentially will be observed throughout the research process and the final report will be for academic purposes only. Your responses remain strictly confidential". Secondly, the research instrument required participants to give their agreement to participate in the study. Therefore, the assumption is that everyone who read proceeded to complete the questionnaire agreed to participate in the study. In addition, the research instrument specifically asked, "Are you currently employed as a manager or senior manager or executive and or IT professional by a company that is listed on the Johannesburg Stock Exchange?". Once again, the assumption is that those who continued, met the stated criteria.

4.3.2 *Dealing with missing values*

Participation in data collection is entirely optional, and participants can withdraw at any moment throughout the study, for any reason, and without penalty. Whilst, researchers and analysts work to compile complete data sets, they regularly run against gaps (information). Participants may forget to answer a question in a long survey; mechanical errors in exploratory methods may result in a datum not being recorded; and maybe participants may exercise their right not to reply to an inquiry in sensitive research (for example, sexual conduct). During data analysis, it was noted that there were only two missing values. Whilst the reasons for missing values were unknown and due to tight deadlines, there were fewer responses collected than ideal. Therefore, further statistical tests needed to be performed to determine if the missing values were at random or not. Little's MCAR test was performed to determine whether missing data were missing completely at random or were not missing completely at random. (Little, 1988). The E-M (expectation-maximization) was 0.059 greater than 0.05, MCAR was significant (Ch-square=77.992; DF=60; Sig=.059). Therefore, we failed to reject the null hypothesis i.e., data was missing completely random. The series mean was used to fill those two missing values for questions 3.15 and 3.31.

4.4 Validity

The validity of the questionnaire was tested using exploratory factor analysis (EFA). The items that were most closely related to the construct being researched were identified using exploratory factor analysis. The goal is to establish a loading pattern that reflects all the elements that must measure the same thing (Cooper and Schindler 2009). However, just because items clump together under a factor doesn't mean the instrument is measuring the construct it was designed to measure. EFA simply displays which elements are loaded together under a factor, not the construct being measured. However, where the dimensions loaded together under the main construct tested, the researcher proceeded with that factor structure. Cooper and Schindler are two of the most famous people in the world (Cooper and Schindler, 2009). The table 6 below indicates sampling adequacy.

Table 6: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.835
Bartlett's Test of Sphericity	Approx. Chi-Square	1433.292
	df	210
	Sig.	.000

Source: Primary data

The Kaiser-Meyer-Olkin (KMO) Measure of Sampling adequacy is an indicator that determines whether a correlation matrix is suitable for EFA. According to several sources (Kaiser and Rice 1974), a KMO of .50 indicates that the data are suitable for EFA analysis. Kaiser and Rice (1974) argue that a value greater than .65 is preferable. As indicated in table 4, the P-value (sig) is .000, which is less than 0, 05, and the KMO is .835, which falls within both schools of thought's safe zone and indicates that the data is suitable for EFA analysis. According to the table 7 below, 4 components explained 75.6 percent of the variation in the dataset's data.

Table 7: Total variance explain

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	9.196	43.789	43.789	9.196	43.789	43.789	5.663	26.965	26.965
2	2.897	13.796	57.585	2.897	13.796	57.585	5.105	24.312	51.277
3	2.448	11.658	69.243	2.448	11.658	69.243	2.867	13.654	64.931
4	1.344	6.398	75.641	1.344	6.398	75.641	2.249	10.710	75.641
5	.974	4.638	80.279						
6	.766	3.647	83.926						
7	.519	2.470	86.397						
8	.477	2.272	88.669						

Extraction Method: Principal Component Analysis.

Source: Primary data

The table 7 above is a reduced version of the table 39 in the appendix Table 7 contains only a fraction of the Eigenvalues. The total variance explained by a factor is represented by eigenvalues. Factors 1 to 4 explain 75.641 percent of variance among items, according to

table 7. Figure 9: scree plot validates what the table 7 above has already stated. Looking at the figure 6, one can see that there are 4 factors with Eigenvalues greater than 1 and all other potential factors with Eigenvalues less than 1 were not recovered according to the Kaiser criterion (Kaiser, 1970).

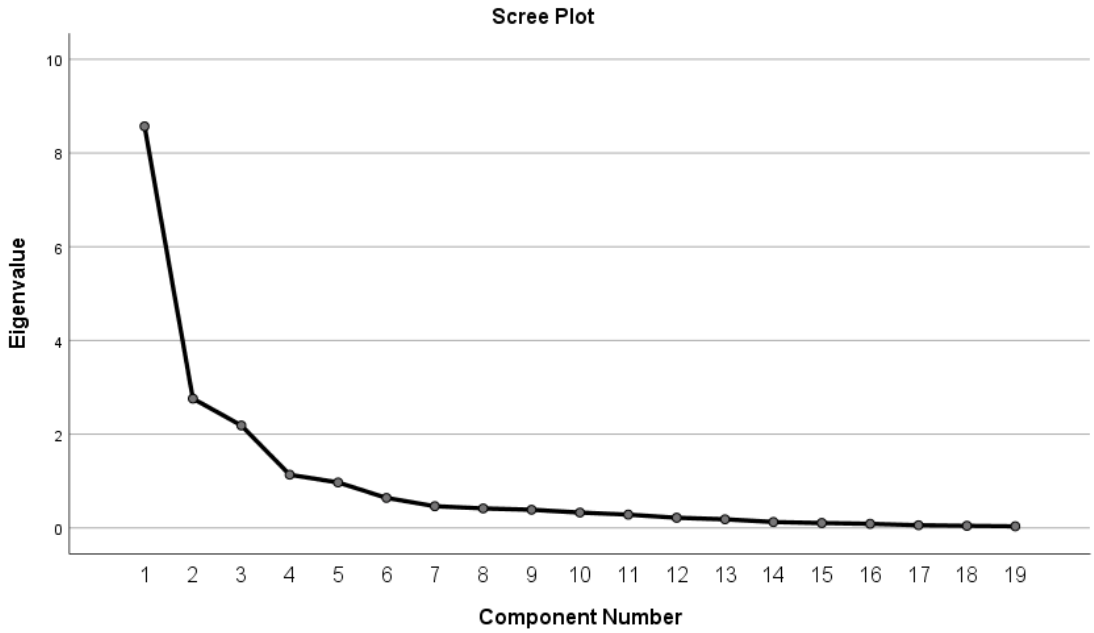

Figure 9:Scree plot

The following items were loaded under separate variables and did not meet the normality assumption, therefore, Q3.4, Q3.5, Q3.6, Q3.8, Q3.9, Q3.10, Q3.11, Q3.7, Q3.12, Q3.18, Q3.25, Q3.26, and Q3.27 were removed from this study. The collection of items before they were erased is shown in Table 48 (see Appendix A). As previously noted, the loading pattern is assumed to reflect all the high stacking for objects intended to measure a similar design. This research instrument is branded as valid since each collection of items loads in one distinct component or factor, and the number of components was computed by SPSS (Cooper and Schindler 2009) table 8 indicates each item loadings.

Table 8: Rotated Component Matrix

	Component

	1	2	3	4
Organisational context 3	.878			
Organisational context 2	.866			
Organisational context 5	.854			
Organisational context 4	.840			
Organisational context 1	.835			
Organisational context 7	.828			
Organisational context 6	.811			
Individual context 4		.891		
Individual context 1		.868		
Individual context 3		.865		
Individual context 2		.859		
Individual context 6		.718		
Individual context 7		.658		
Individual context 5		.590		
Innovation context 4			.803	
Innovation context 1			.754	
Innovation context 2			.745	
Innovation context 3			.735	
Blockchain 1				.803
Blockchain 2				.777
Blockchain 3				.733
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.				
a. Rotation converged in 6 iterations.				

***Source**: Primary data*

4.5 Reliability

4.5.1 *Organisational context*

The overall variance explained by one factor exceeded the suggested limit of 70% for organisational context (see table 9). The Kaiser-Mayer-Olkin (KMO) test was also used to ensure adequate sampling. KMO = 0.880 in this study (which is also above the recommended value of 0.7). Sphericity test by Bartlett (X2 = 624.535; p = .000 which is < 0.05) as indicated on table 9. Cronbach's alpha was likewise high, at 0.956, as seen table 11.

Table 9: KMO and Bartlett's Test for organisational construct

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.880
Bartlett's Test of Sphericity	Approx. Chi-Square	624.535
	df	21
	Sig.	.000

Source: Primary data

Table 10: Total Variance Explained for organisational construct

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.557	79.380	79.380	5.557	79.380	79.380
2	.747	10.671	90.051			
3	.285	4.067	94.118			
4	.156	2.230	96.348			
5	.126	1.805	98.153			
6	.085	1.219	99.372			
7	.044	.628	100.000			
Extraction Method: Principal Component Analysis.						

***Source**: Primary data*

Table 11: Reliability Statistics for Organisational construct

Cronbach's Alpha	N of Items
.956	7

***Source**: Primary data*

4.5.2 *Individual context*

For the individual context construct, the total variance explained by one factor exceeded the prescribed 70 percent limit (see table 12). The Kaiser-Mayer-Olkin (KMO) test was also used to ensure adequate sampling. KMO = 0.858 in this study (which is also above the recommended value of 0.7). Sphericity test by Bartlett (X2 = 448.647; p = .000 which is < 0.05) as indicated in table 12. As shown in the table below, Cronbach's alpha was also high, at 0.925 see table 14.

Table 52: KMO and Bartlett's Test for individual context

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.858
Bartlett's Test of Sphericity	Approx. Chi-Square	448.647
	df	21
	Sig.	.000

***Source**: Primary data*

Table 13: Total Variance Explained for individual construct

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.905	70.076	70.076	4.905	70.076	70.076

2	.884	12.626	82.702			
3	.441	6.305	89.007			
4	.306	4.369	93.376			
5	.251	3.584	96.960			
6	.162	2.309	99.268			
7	.051	.732	100.000			
Extraction Method: Principal Component Analysis.						

Source: Primary data

*Table 6**: Reliability Statistics for individual context***

Cronbach's Alpha	N of Items
.925	7

Source: Primary data

4.5.3 *Innovation context*

In the context of innovation, the total variance explained by one factor exceeded the suggested 70 percent limit (see table 15). The Kaiser-Mayer-Olkin (KMO) test was also used to ensure adequate sampling. As shown in table 15, KMO = 0.761 (which is also higher than the suggested value of 0.7) was used for this analysis. Sphericity test by Bartlett (X2 = 122.06; p = .000 which is < 0.05). Cronbach's alpha was likewise very high, at 0.850, as shown in table 17.

*Table 15**: KMO and Bartlett's Test for innovation construct***

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.761
Bartlett's Test of Sphericity	Approx. Chi-Square	122.06
	df	6
	Sig.	.000

Source: Primary data

*Table 16**: Total Variance Explained for innovation construct***

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.769	69.912	69.912	2.769	69.912	69.912
2	.550	13.744	82.694			
3	.431	10.775	93.739			
4	.250	6.261	100.00			
Extraction Method: Principal Component Analysis.						

***Source**: Primary data*

*Table 17**: Reliability Statistics for innovation construct***

Cronbach's Alpha	N of Items
.850	4

***Source**: Primary data*

4.5.4 *Blockchain*

The overall variance explained by one factor exceeded the suggested limit of 70% for block chain construct (see table 18). As shown in table 18, the Kaiser-Mayer-Olkin (KMO) measure was employed to evaluate the sample adequacy for the analysis, with KMO = 0.684 (which is also higher than the suggested value of 0.7). Sphericity test by Bartlett (X2 = 63,984; p = .000 which is < 0.05). Cronbach's alpha was likewise very high, at 0.584, as shown in table 20.

*Table 78**: KMO and Bartlett's Test for blockchain construct***

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.684
Bartlett's Test of Sphericity	Approx. Chi-Square	63.984
	df	3
	Sig.	.000

***Source**: Primary data*

*Table 89**: Total Variance Explained for blockchain construct***

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.119	70.618	70.618	2.119	70.618	70.618
2	.539	17.959	88.577			
3	.343	11.423	100.000			
Extraction Method: Principal Component Analysis.						

***Source**: Primary data*

*Table 20**: Reliability Statistics for blockchain construct***

Cronbach's Alpha	N of Items
.790	3

***Source**: Primary data*

*Table 21**: Reliability Statistics summary***

Construct	Number of items	Cronbach's Alpha	Reliability level
Organizational context	7	.956	Superb

Individual context	7	.925	Superb
Innovation context	4	.850	Great
Blockchain adoption	3	.790	Good

***Source**: Primary data*

4.6 Normality and outliers

When testing normality of data used in this study, the researcher made use of Kolmogorov-Smirnov Test and the Shapiro-Wilk Test. Table 49 in the Appendix examined whether data obtained in the initial factor structure (shown in table 48) was normally distributed, however the results indicated that security, privacy, and costs concerns were not normally distributed. Therefore, those items were removed in this study. Table 44, 45, 46 and 48 demonstrates the distribution of responses for organisation context, individual context, innovation context and blockchain adoption. The mean scores for all four constructs do not show big outliers.

4.6.1 *Organisational context*

The normalcy test is shown in Table 22, the p-value (.200) for Kolmogorov is greater than 0.05, this indicates that data is normally distributed. The organisational context construct was measured using seven items. A brief check of the means in the table 40 in the appendix reveals that there was a high level of agreement among respondents. Figure 10's histogram indicates that the data is typical. The skewness and kurtosis values were all within West et al. (1995) recommended limits, and the box plot in Figure 11 similarly revealed no probable outliers.

Table 92: test of normality of organization context construct

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Organisational context	.092	71	.200*	.957	71	.017
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

***Source**: Primary data*

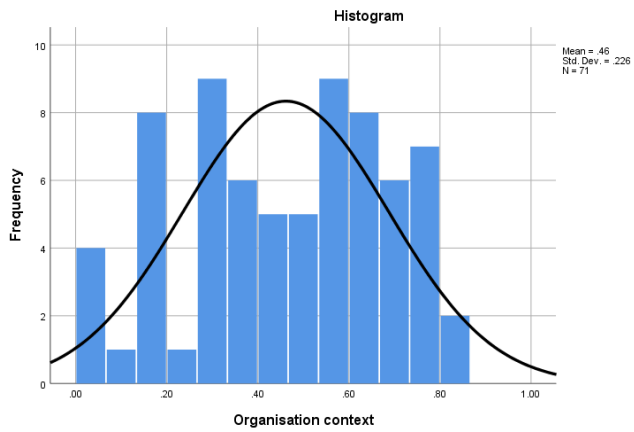

Figure 10: Philanthropic histogram

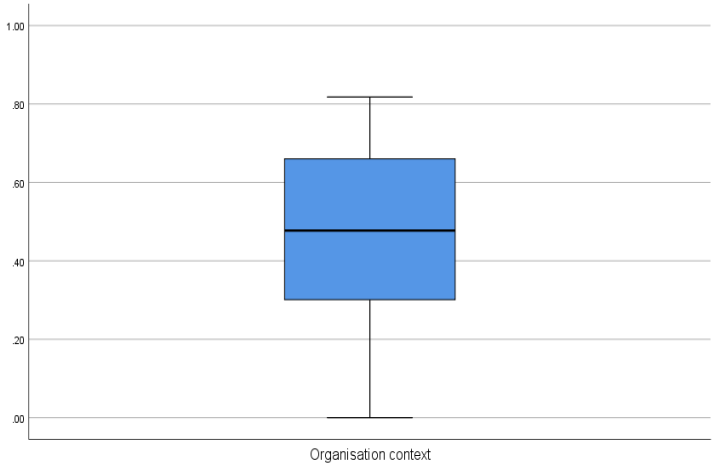

Figure 11: Philanthropic Box plot

4.6.2 *Individual context*

The p-values for both Kolmogorov and Shapiro (.200 and.353) are greater than 0.05, indicating that the data is regularly distributed, as shown in Table 23. Individual context construct was measured using four items. A brief check of the means in the table 41 in the appendix reveals that there was a high level of agreement among respondents. The histogram in Figure 12 indicates that the data is normal, and the skewness and kurtosis values were all within the West et al. (1995) recommended limits. The box plot in Figure 13 likewise shows no probable outliers.

Table 103: test of normality of individual context construct

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Individual context	.093	71	.200*	.981	71	.353
*. This is a lower bound of the true significance.						

a. Lilliefors Significance Correction

***Source**: Primary data*

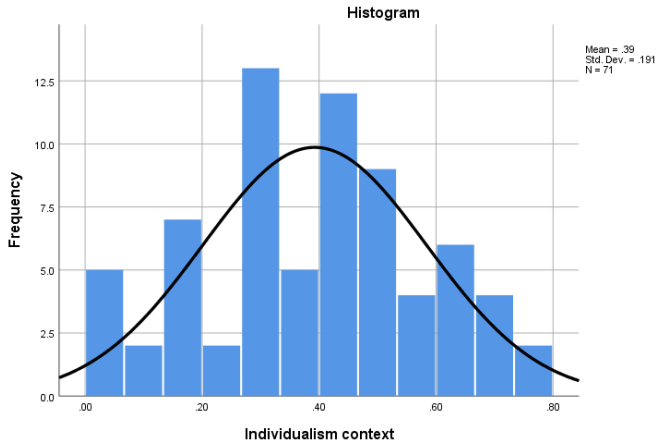

Figure 12: individual context histogram

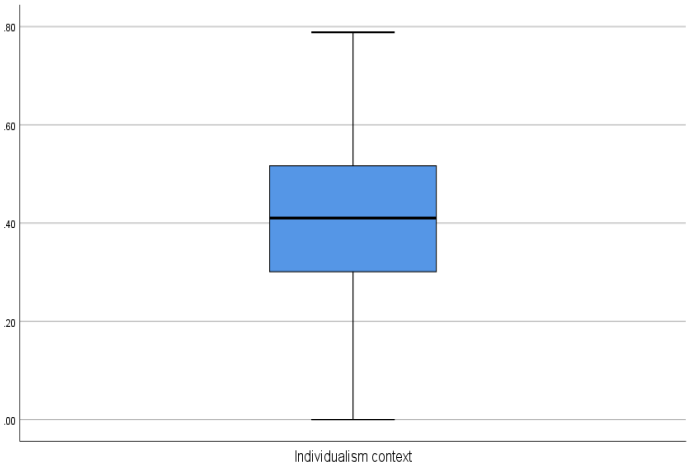

Figure 13: individual context Box plot

4.6.3 *Innovation context*

Table 24 displays the Shapiro test, which has a p-value of greater than 0.05, indicating that the data is normally distributed. The innovation context construct was measured using four items. A brief check of the means in the table 42 in the appendix reveals that there was a high level of agreement among respondents. Figure 14's histogram reveals that the data is normal; the skewness and kurtosis values were all within West et al. (1995)'s recommended limits, and Figure 15's box plot also shows one possible outlier.

Table 11: test of normality of innovation context construct

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.

Innovation context	.117	71	.017	.970	71	.086
a. Lilliefors Significance Correction						

***Source**: Primary data*

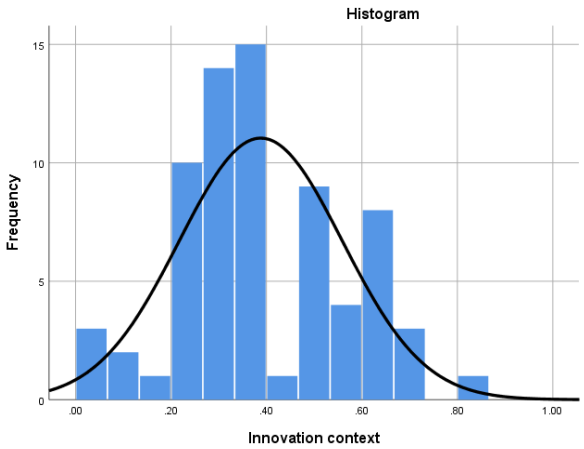

Figure 14: innovation context histogram

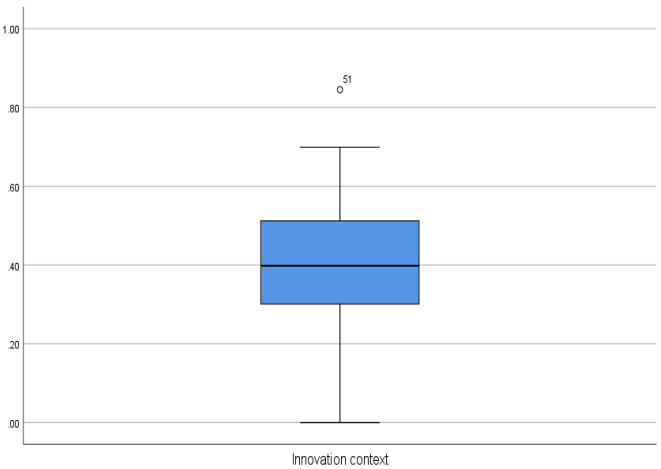

Figure 15: innovation context Box plot

4.6.4 *Blockchain construct*

The descriptive statistics for the block chain construct are shown in Table 25, which includes skewness and kurtosis. The adoption of blockchain technology was measured using three criteria. A cursory look at the means reveals that respondents were very much in agreement. The data in Figure 16 appears to be almost typical, according to the histogram. The skewness and kurtosis values were all within West et al. (1995) recommended bounds, but Table 26 provides the normality test, which demonstrates that the data in this construct is not normally distributed for both Kolmogorov and Shapiro's tests. In addition, there are probable outliers in Figure 17's box plot.

*Table 12**: Descriptive of blockchain construct***

Statistics

Blockchain_before_log		
N	Valid	71
	Missing	0
Mean		2.2606
Std. Deviation		.97233
Variance		.945
Skewness		1.051
Std. Error of Skewness		.285
Kurtosis		1.005
Std. Error of Kurtosis		.563

***Source**: Primary data*

Table 136: test of normality of blockchain construct

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Blockchain	.117	71	.017	.961	71	.027
a. Lilliefors Significance Correction						

***Source**: Primary data*

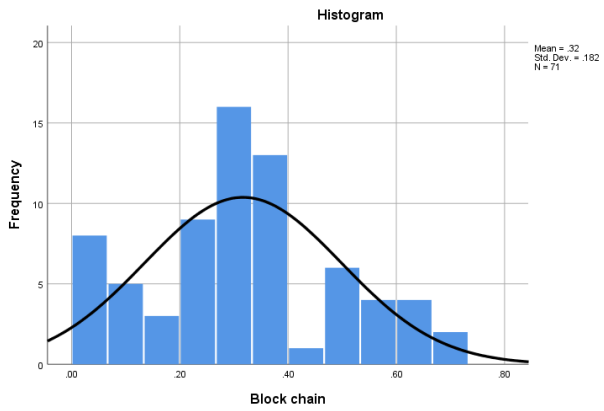

Figure 16: blockchain histogram

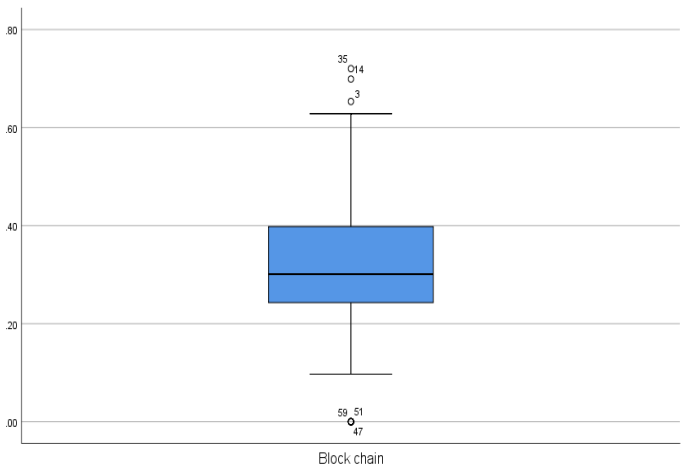

Figure 17: block chain Box plot

4.7 Personal demographics

Age, gender, degree of education, present occupation, and industry were among the personal demographic factors for which data was gathered. The personal demographics of the respondent samples are presented in the form of tables and figures below.

4.7.1 *Gender*

Table 27 show the gender distribution of the sample. A total of 50.7% of the respondents were male and 49.3 per cent were male.

Table 27: Gender

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	36	50.7	50.7	50.7
	Female	35	49.3	49.3	100.0
	Total	71	100.0	100.0	

***Source**: Primary data*

Figure 18 shows a pie chart of the above distribution. As can be clearly seen on the pie chart, female respondents constituted most of the respondents when compared to male respondents.

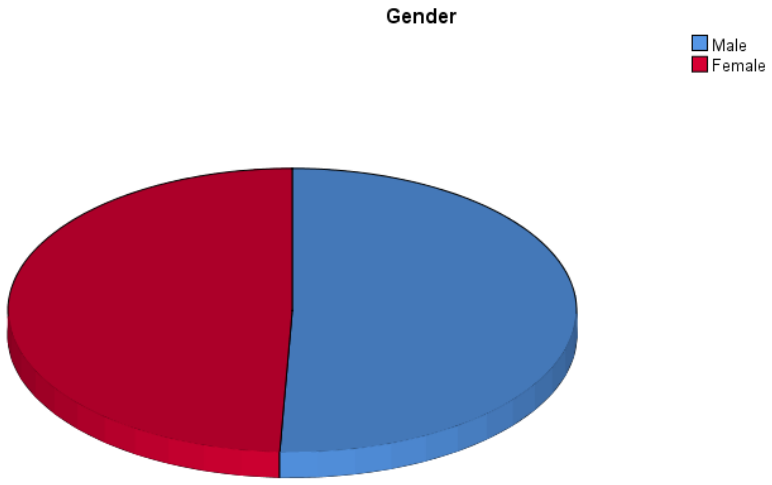

Figure 18: Gender distribution

4.7.2 *Age*

Table 28 show the Age distribution of the sample. 1.4% of the respondents were between 18 – 24 years of age, 26.8 per cent were between 25 – 34 years of age, 52.1 per cent were between 35 – 44 years of age, 18.3 per cent were between 45 – 54 years of age, 1.4 per cent were between 65 – 74 years of age.

Table 28: Age of respondents

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18 - 24 years	1	1.4	1.4	1.4
	25 - 34 years	19	26.8	26.8	28.2
	35 - 44 years	37	52.1	52.1	80.3
	45 - 54 years	13	18.3	18.3	98.6
	65 - 74 years	1	1.4	1.4	100.0
	Total	71	100.0	100.0	

***Source**: Primary data*

Figure 19 shows a bar chart of the above distribution. As can be clearly seen on the bar chart, respondents between 35 – 44 years of age constituted most of the respondents followed by respondents between 25 -34 and 45 – 54 years of age respectively.

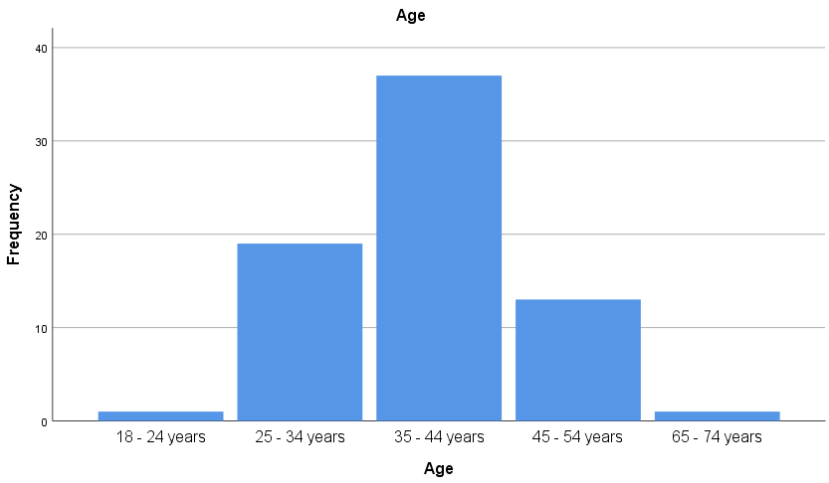

Figure 19: Age distribution

4.7.3 *Level of education*

Table 29 show the level of education distribution of the sample. 2.8 per cent of the respondents had completed grade 12, 15.5 per cent of the respondents had a diploma, 16.9 per cent of the respondents had bachelor's degree, 36.6 per cent of the respondents had honours' degree, 26.8 per cent of the respondents had masters' degree, only 1.4 per cent of the respondents had a PhD.

Table 29: Level of education

Level of education					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Grade 12	2	2.8	2.8	2.8
	Diploma	11	15.5	15.5	18.3
	Bachelor's degree	12	16.9	16.9	35.2
	Honors	26	36.6	36.6	71.8
	Masters	19	26.8	26.8	98.6
	PhD	1	1.4	1.4	100.0
	Total	71	100.0	100.0	

***Source**: Primary data*

Figure 20 shows a bar chart of the above distribution. As can be clearly seen on the bar chart, respondents with honour's degree constituted most of the respondents followed by respondents with master's degree.

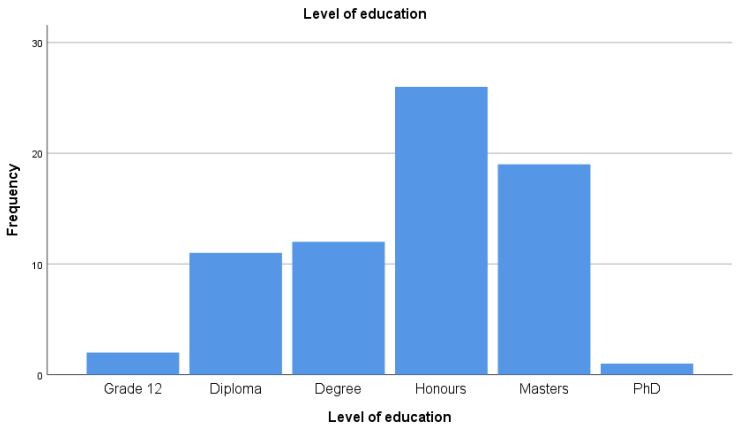

Figure 20: Level of education distribution

4.7.4 *Industry*

Table 30 show the level of education distribution of the sample. 21.1 per cent of the respondents were operating in the financial industry, 57.7 per cent of the respondents were operating in the media and telecommunication industry, 2.8 per cent of the respondents were operating in the retail industry, 5.6 per cent of the respondents were operating in Mining industry, while 12.7 per cent of the respondents were operating in industries other than what was specified in the study.

Table 30: Industry

Industry					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Financial service	15	21.1	21.1	21.1
	Media and telecommunication	41	57.8	57.8	78.9
	Retail	2	2.8	2.8	81.7

	Mining	4	5.6	5.6	87.3
	Others	9	12.7	12.7	100.0
	Total	71	100.0	100.0	

***Source**: Primary data*

Figure 21 shows a bar chart of the above distribution. As can be clearly seen on the bar chart, media and telecommunication industry constituted most of the respondents followed by financial industry.

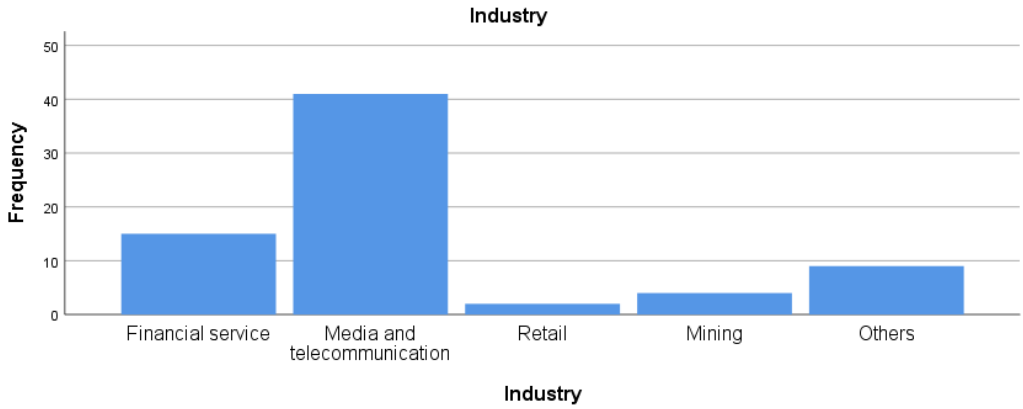

Figure 21: Industry distribution

4.7.5 *Current occupation*

Table 31 show the current occupation distribution of the sample. From the respondents 5.6 per cent of the respondents occupied a position of an executive, 26.8 per cent of the respondents occupied a position of senior manager, 46.5 per cent of the respondents occupied a position of a manager, 15.5 per cent of the respondents occupied a position of an IT professional and only 5.6 per cent of the respondents occupied a position other than what is suggested in this study.

Table 31: Current occupation

Current occupation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Executive	4	5.6	5.6	5.6

	Senior Manager	19	26.8	26.8	32.4
	Manager	33	46.5	46.5	78.9
	IT professional	11	15.5	15.5	94.4
	Others	4	5.6	5.6	100.0
	Total	71	100.0	100.0	

***Source**: Primary data*

Figure 22 shows a bar chart of the above distribution. As can be clearly seen on the bar chart, managers constituted most of the respondents followed by senior managers and IT professionals.



Figure 22: Current occupation distribution

Items descriptive statistic

4.7.6 *Consolidated table of demographics*

The demographics are combined and illustrated below in Table 32:

VARIABLES	OPTIONS	FREQUENCY	PERCENTAGE
Gender	Male	36	50.7%
	Female	35	49.3%
	Nonbinary/ third gender	0	0%

	Prefer not to say	0	0%
	Total	71	100%
Age	Under 18 years	0	0%
	18 - 24 years	1	1.4%
	25 - 34 years	19	26.8%
	35 - 44 years	37	52.1%
	45 - 54 years	13	18.3%
	55 – 64 years	0	0%
	65 - 74 years	1	1.4%
	75 – 99 years	0	0%
	Total	71	100%
Education	Below grade 12	0	0%
	Grade 12	2	2.8%
	Diploma	11	15.5%
	Bachelor’s degree	12	16.9%
	Honors	26	36.6%
	Masters	19	26.8%
	PhD	1	1.4%
	Total	71	100%
Industry	Financial service	15	21.1%
	Media and telecommunication	41	57.8%
	Manufacture	0	0%
	Retail	2	2.8
	Agriculture	0	0%
	Mining	4	5.6%
	Others	9	12.7%
	Total	71	100%
Occupation	Executive	4	5.6%
	Senior Manager	19	26.8%
	Manager	33	46.5%

	IT professional	11	15.5%
	Others (General managers)	4	5.6%
	Total	71	100%

***Source**: Primary data*

4.8 BIVARIETE AND MULTIVARIATE ANALYSIS

4.8.1 *Pearson correlation analysis*

Table 33: Pearson correlation

Correlations					
		Organization context	Individual context	Innovation context	Block chain
Organization context	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	71			
Individual context	Pearson Correlation	.517**	1		
	Sig. (2-tailed)	.000			
	N	71	71		
Innovation context	Pearson Correlation	.409**	.476**	1	
	Sig. (2-tailed)	.000	.000		
	N	71	71	71	
Blockchain	Pearson Correlation	.305**	.253*	.447**	1
	Sig. (2-tailed)	.010	.033	.000	
	N	71	71	71	71
**. Correlation is significant at the 0.01 level (2-tailed).					

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

***Source**: Primary data*

- From the Pearson correlation table 33, it is found that with a total number of participants being 71, organisation context has a positive relationship with block chain at 1% level of significance having *P-Value* of .010 and Pearson correlation value of .305 or 30.5%.
- From the Pearson correlation table 33, it is found that with a total number of participants being 71, individual context has a positive relationship with block chain at 5% level of significance having *P-Value* of .033 and Pearson correlation value of .253 or 25.3%
- From the Pearson correlation table 33, it is found that with a total number of participants being 71, innovation context has a positive relationship with block chain at 1% level of significance having *P-Value* of .010 and Pearson correlation value of .305 or 30.5%.

4.8.2 *Regression analysis*

a. *Testing for regression assumption*

- The normality assumption: The Kolmogorov-Smirnov Test and the Shapiro-Wilk Test were used by the researcher. All the p-values for the constructs utilized in the study were not statistically significant, indicating that they were normally distributed. When applying the Kolmogorov-Smirnov Test and the Shapiro-Wilk Test, which is the requirement to be branded normally distributed
- Linearity: There is a linear relationship between the expected cum prob and the observed cum prob in the NORMAL P-P plot in figure 23 of the appendix, in other word the relationship between the independent and dependent variables is linear.
- Homoscedastic: The variance distribution is homoscedastic, not heteroscedastic, as shown in figure 24 in the appendix, implying that error terms are equal across the values of the independent variables.
- Multicollinearity: The assumption is that there is no relationship between independent variables. However, the Pearson Correlation table 30 shows that some independent variables correlate with each other, but none have violated multicollinearity as per Alin's (2010) instructions. There is no multicollinearity present. As a result, the research meets this assumption. Furthermore, in collinearity diagnostics, no condition index is greater than 10.

- Sample Assumption: If the dependent variable is normally distributed, the rule of thumb is to use n=20. If the dependent variable is not normally distributed, the rule is n=20xm, where m is the number of independent variables (Green, 1991). The dependent variable in this study is normal distributed, as proved by Tests of Normality. Furthermore, the study's n=71 is much more than the required number of 20x3 = 60 participants. This hypothesis was confirmed by the research.

b. ***Regression model development***

Table 34: Model summary

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.466[a]	.217	.182	.16455	.217	6.205	3	67	.001	1.880

a. Predictors: (Constant), Innovation context, Organisational context, Individual context

b. Dependent Variable: Blockchain

***Source**: Primary data*

The first table (table 34) in the regression analysis section is the Model summary table. It provides the value of R, R^2 and adjusted R^2. The R^2 value describe to what extent changes in the dependent variable are explained by the independent variables. From table 31 when looking at R, R^2 adjusted R^2. R^2 has a value of .217. This value of R indicates very low explanation. Moreover, R and adjusted R^2 have respectively .466 and .182. this suggest that only 21.7% of the variation of the dependent variable is explained by the independent variables used in this study (organisation context, individual context, and innovation context). This implies that other variables or factors not used in this research explains 78.3% of Block chain technology adoption among South African organisation. It is important to note that when dealing with many independent variables adjusted R^2 is explains better the variation than the R^2 because R^2 value tend to increase when more independent variables are included. The Durbin-Watson d = 1.880, which is between the two critical values of $1.5 < d < 2.5$ and therefore we can assume that there is no first order linear autocorrelation in the data. Moreover, the model was significant with a p-value of .001.

Table 145: Analysis of the variance

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.504	3	.168	6.205	.001[b]
	Residual	1.814	67	.027		
	Total	2.318	70			
a. Dependent Variable: Blockchain						
b. Predictors: (Constant), Innovation context, Organisational context, Individual context						

***Source**: Primary data*

The second table (table 35) in the multiple linear regression section is the Analysis of the variance (ANOVA), it tests whether the model is good fit in other word the ANOVA table evaluate the model ability to predict the outcome variable which is adoption of block chain. This is done based on F-test. The linear regression's F-test has the null hypothesis that the model explains zero variance in the dependent variable. H_0 is rejected if the F-calculated is less than F-critical (2.5336). Regarding this study F-calculated value (6.205) is significant. Hence, we reject H_0 and conclude that there is significant amount of variation in blockchain that is explained by the model. Furthermore, the *p-value* (0.001) is less than alpha (α= 0.05) indicating the model is significant in predicting the outcome variable.

Table 156: Coefficients

Coefficients[a]										
	Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
Model	B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF

1	(Constant)	.104	.056		1.858	.068					
	Organisational context	.121	.104	.150	1.163	.249	.305	.141	.126	.698	1.432
	Individual context	-.010	.128	-.011	-.081	.936	.253	-.010	-.009	.649	1.541
	Innovation context	.415	.134	.390	3.101	.003	.447	.354	.335	.737	1.357
a. Dependent Variable: Blockchain											

***Source**: Primary data*

The third table (table 36) is coefficient table, this table provide information of different coefficient as well as their p-values necessary to develop an equation able to predict the outcome of the dependent variable (blockchain) from selected predictors or independent variable (organisation context. Individual context, innovation context). Looking at the coefficient table it can be notice all the independent variables' coefficient were not significant except for the innovation context which had a p-value less than 0.05 and unstandardized coefficient of 0.415, The data in the table above additionally allows the possibility to check for multicollinearity in the regression model. tolerance ought to be > 0.1 (or VIF < 10) for all factors, which they are. From the information obtained the regression model formula for this study is:

$$Y = \beta_1 X_1 + \varepsilon \text{ (population equation)}$$

$$\hat{\gamma} = \hat{\beta}_1 X_1 \text{ (sample equation)}$$

$$Blockchaim = 0.415\ x\ Innovation$$

Where:

Y: Blockchain

β_1: Regression coefficient

X_1: innovation

Table 37: Collinearity diagnostics

Collinearity Diagnostics[a]				
Model	Dimension			Variance Proportions

		Eigenvalue	Condition Index	(Constant)	Organisation context	Individual context	Innovation context
1	1	3.713	1.000	.01	.01	.01	.01
	2	.112	5.759	.26	.50	.12	.25
	3	.094	6.272	.25	.36	.64	.08
	4	.081	6.787	.48	.13	.23	.67
a. Dependent Variable: Blockchain							

***Source**: Primary data*

From table 37 the condition index across all dimensions is less than 10, an indication of no collinearity between independent variables.

CHAPTER 5

5 DISCUSSION

5.1 Introduction

In-depth analysis of the participants was presented in the previous chapter, only key finding will be highlighted in this section. Firstly, examination of the sample was conducted, analyzing the profiles of participants, and their personal demographics. The measurement parts of the scales used in this inquiry come in second. Each hypothesis is then evaluated using appropriate examination techniques, with the p-value determining whether to accept or reject the Null Hypothesis.

5.2 Discussion pertaining to validity and reliability of the research instrument

The validity of the scale item was tested using exploratory factor analysis. The purpose of exploratory factor analysis was to find the items that were most closely related to the construct under investigation. The expectation was for a pattern of loadings that reflected all the high loading for items supposed to measure the same construct (Cooper and Schindler, 2009). This was achieved, and the research instrument was deemed valid. The Cronbach's alpha coefficient was used to measure the instrument's reliability. Reliability examines how closely the scale may produce similar results. Cronbach alpha values are used in item analysis to examine the reliability of the different dimensions or constructs in the questionnaire. In this study, a Cronbach's alpha of 0.7 or higher is necessary to label a construct as reliable.

5.3 Discussion pertaining to normality and outliers

A considerable number of statistical analyses including t-tests, correlation, regression, and analysis of variance, namely parametric tests, assume that the data is normally distributed. Hence, measuring the normality of data is a paramount when analysing data. The test of normality helps determine how well the data is modelled and shows a normal distribution. To test the normality of data used in this study, the researcher made use of Kolmogorov-Smirnov Test and the Shapiro-Wilk Test. This is the requirement for the data to be normally distributed before any inference can be made. When using Kolmogorov-Smirnov Test and the Shapiro-Wilk Test, the p-value must be greater than 0.05 for the data to be normally distributed (It is generally accepted that when the p-value of either Kolmogorov-Smirnov or Shapiro is greater than 0.05, then the data is normally distributed. It is not always the case that both must be

greater than 0.05). However, the blockchain construct (the dependent variable in the study) using Kolmogorov-Smirnov Test and the Shapiro-Wilk Test was found not to be normally distributed. Nonetheless, the construct was good to be used for parametric analysis according to West, Finch, and Curran (1995). According to authors (West, Finch, and Curran, 1995) the recommended cut-off is the absolute value of skewness = 2 and kurtosis = 7. The findings of this investigation imply that all the data's skewness and kurtosis are within acceptable boundaries, as suggested by West et al (1995).

5.4 Discussion pertaining to respondent's personal demographic

5.4.1 *Gender*

It is important to note that on the research instrument participants were given the choice to choose" nonbinary / third gender" and "other or prefer not say" in case their gender is not given as an option, however, none of the participants identified none other than male or female. Moreover, the result in chapter 4 indicated that a total of 50.7% of the respondents were male and 49.3 per cent were male. Indicating that the majority on participants in this study were male, looking at the gender distribution, The findings are consistent with previous empirical studies about the participation of women in the economy, some scholars have attributed the lack of women's participation in Africa due to African cultural orientation that used prejudice women (Ravinder and Narayana, 2006). However, current movement feminism, take a girl at work will further empower woman not only to participate in the informal economy but also to participate more in the formal economy. Therefore, as the result of this, female participation is likely to increase as these movement continue to impact society (Rogan and Alfers, 2019).

5.4.2 *Age*

Table 28 show the Age distribution of the sample. 1.4% of the respondents were between 18 – 24 years of age, 26.8 per cent were between 25 – 34 years of age, 52.1 per cent were between 35 – 44 years of age, 18.3 per cent were between 45 – 54 years of age, 1.4 per cent were between 65 – 74 years of age. Most respondents are between the ages of 18 and 54, accounting for 97.2 percent of the total number of respondents. This finding emphasizes the labour market's youth in South Africa. Many more empirical research (King et al., 2002; Pillay and

Maharaj, 2013; Smith, 2019) have confirmed the continent's youth. This pattern is like that found in a GEM sample. Africans between the ages of 20 and 49 are the most entrepreneurially engaged. Rising entrepreneurial activity in Africa, according to the GEM (2019), is an indication of a mature entrepreneurial population that sees entrepreneurship as a viable career option.

5.4.3 *Level of Education*

Table 29 show the level of education distribution of the sample. 2.8 per cent of the respondents had completed grade 12, 15.5 per cent of the respondents had a diploma, 16.9 per cent of the respondents had bachelor's degree, 36.6 per cent of the respondents had honours' degree, 26.8 per cent of the respondents had masters' degree, only 1.4 per cent of the respondents had a PhD. Most respondents in the South African labour market had at least a bachelor's degree or an honours degree, according to the findings. In a similar vein, Magruder, J. R. (2010) argued that, due to the competitive nature of the labour market, a high level of education is required. Furthermore, the authors stated that educated individuals have a competitive advantage because they are more knowledgeable and have developed certain skills such as financial management. However, while these abilities and degrees can be useful in the workplace and educated individuals are likely to adopt new technologies (Cloete, 2015).

5.4.4 *Industry*

Table 30 show the industry distribution of the sample. 21.1 per cent of the respondents were operating in the financial industry, 57.7 per cent of the respondents were operating in the media and telecommunication industry, 2.8 per cent of the respondents were operating in the retail industry, 5.6 per cent of the respondents were operating in Mining industry, while 12.7 per cent of the respondents were operating in industries other than what was specified in the study. The result indicate that the majority of respondent are in media and telecommunication industry. Empirical studies indicate the financial services and telecommunication are driving fintech's solution to narrow the financial inclusion gap (Almahirah, 2021). Therefore, there is a likelihood of adopting financial technologies

5.4.5 *Current occupation*

Table 31 show the current occupation distribution of the sample. From the respondents 5.6 per cent of the respondents occupied a position of an executive, 26.8 per cent of the respondents occupied a position of senior manager, 46.5 per cent of the respondents occupied a position of a manager, 15.5 per cent of the respondents occupied a position of an IT professional and only 5.6 per cent of the respondents occupied a position other than what was suggested in this study. This result indicates that most respondents held a position of authority. As a result, they matched the study's responder profile. This is since one of the study's goals was to learn more about why South African corporations have yet to embrace such a radical technology by looking into the "Antecedents of blockchain adoption by South African listed firms." Managers are the decision makers on the ground in most companies, therefore having managers as most of the respondents lends credibility to the study's findings.

5.5 Discussion pertaining to Hypothesis

5.5.1 Organisational context and the adoption of blockchain

In the present study the null hypothesis predicting that Organisational context will positively influence the adoption of blockchain technology was rejected. A no significant association between organizational context which was measured by top management support and the adoption of blockchain was found in the present study. This result differs to previous studies (Bhardwaj et al, 2021; Lee et al, 2019; Prewett et at., 2019; Angelis and da Silva., 2019), Many experts have proven the importance of organizational context as a predictor of technology adoption. For example, Bhardwaj (2021) discovered that senior management support plays a favourable role in the adoption of blockchain technology when studying Determinants of Blockchain Technology Adoption in Supply Chains. Top management's deployment of necessary human, financial, and infrastructure resources, according to Bhardwaj (2021), has a crucial impact in the adoption of innovative technologies such as blockchain. The findings of the available research (Sadhya and Sadhya, 2018) further highlight the need of having the necessary resources and senior management's willingness to take on the risks associated with blockchain adoption.

When comparing the findings of this study to those of prior studies, one could claim that because senior management plays such a significant influence in the allocation of financial resources, corruption could be the reason for the failure of blockchain technology in South African companies (Bruce, 2014). Corruption, as Van Vu et al (2018) point out, can erode the efficient allocation of critical resources that determine a company's reputation and culture, as well as the desire for innovation. Furthermore, corruption obstructs the entry of new business sectors because incumbents subjectively use their corrupt relationships with government officials to delay transactions, and officials tend to take larger payments from new businesses (Van Vu et al., 2018). Moreover, because the hypothesis was rejected and as consequence the relation was of no significance, the extent of the influence of organisation context and the interpretation of the variable in the equation could not be explained as a result.

5.5.2 *Individual context and the adoption of blockchain*

In the present study the null hypothesis predicting that the individual context will positively influence the adoption of blockchain technology was rejected. Previous empirical research by authors like Lui et al. (2021), Bhardwaj et al. (2021). In a similar vein, Bhardwaj et al. (2021) identified perceived usefulness as the key influencer in inducing positive intention to utilize new technology, arguing that people are more willing to accept technology that improves their job performance. Because one of the values associated with adopting blockchain technology is the enhancement of legacy systems, the author (Bhardwaj et al., 2021) went on to say that perceived utility enhances the likelihood of technology being adopted or accepted (Lee et al., 2019). When comparing the findings of this study to those of prior studies, one could argue that the findings of this study indicates that perhaps participants are not yet conversant with blockchain technology and are yet to understand its utility to the organisation or industry they operate. Moreover, because the hypothesis was rejected and as consequence the relation was of no significance, the extent of the influence of individual context and the interpretation of the variable in the equation could not be explained as a result.

5.5.3 *Innovation context and the adoption of blockchain technology*

The study failed the reject the null hypothesis, which predicted that the innovation setting will favourably influence the adoption of blockchain technology by South African businesses. The

current study discovered a strong favourable influence of the individual situation, as assessed by relative advantage, on the adoption of blockchain technology. The existing literature (Wong et al., 2020) has reported similar findings, with relative advantage being an important factor in the adoption of blockchain technology by businesses. This is because blockchain technology provides distinct features such as data transparency, (Francisco and Swanson, 2018; Awaysheh and Klassen, 2010), traceability (Wong et al., 2020; Awaysheh and Klassen, 2010), reliability (Park et al, 2020), and immutability verifiable records with timestamp (Pilkington, 2016; Queiroz and Wamba, 2019). Given the above, it may be presumed that innovation context has a positively significant influence on the adoption of blockchain technology by south African listed companies, below is the mathematical formular derived from the regression equation and its interpretation:

$Y = \beta_1 X_1 + \varepsilon$ (population equation) $\hat{\gamma} = \hat{\beta}_1 X_1$ (sample equation) $Blockchaim = 0.415\ x\ Innovation$	Where: Y: Block chain β_1: Regression coefficient X_1: innovation

5.5.4 *Model interpretation*

Innovation	**Interpretation**
H_o: $\beta_1 = 0$ H_a: $\beta_1 \neq 0$ sig (0.000) < 0.05 **sig** being less than alpha we reject the null hypothesis, and we have sufficient evidence to conclude in favour of the H_a which states that H_a: $\beta_1 \neq 0$	For every one-unit increase in one's ability to innovate ceteris paribus, the predicted value committed to adopt blockchain by South African company will increase with 0.415 units

5.5.5 *The extent of the influence of variables*

Given that all other independent variable were not significance this means that the extent of their influence is of no importance, however, innovation context being significant, the extent of its influence can be explained. Looking at table 36 under standardized coefficients table it can be noted that 39% of influence in the dependent variable adoption of blockchain technology by south African companies is accounted for by the innovation context construct.

5.5.6 *Summary of the chapter*

In this chapter, Empirical research found that relative advantage does in fact influences the adoption of blockchain technology. There was no statistical finding which supported that top management support, and perceived usefulness influences the adoption of blockchain technology. What can be deduced from this study is that when a technology is relatively unknown, only the features of the technology such as relative advantage influences a decision to adopt such technology. Other studies have found that top management support, security and privacy, cost concerns and perceived usefulness should be an influencing factor to adopt a new technology.

CHAPTER 6

6 CONCLUSION AND RECOMMENDATION

6.1 Introduction

This study examined whether blockchain adoption can be influenced by organisational factors, individual factor, and innovation factor. Organisational factors were measured by top management support, while individual factor was measured by perceived ease of use and perceived usefulness and innovation factor was measured by relative advantage. An integrated theoretical framework (TOE, TAM & DOI) was adopted to understand blockchain adoption. This section will discuss the finding reported in the previous chapters and provides limitations and recommendations for the future research, finally conclusion will be reported.

6.2 Conclusion of the study

The main objective was to understand the antecedents that influences blockchain adoption and the extent of how these antecedents influence the adoption of blockchain technology by South African listed companies. Furthermore, the study argued that the failure by South African companies to adopt blockchain technology can explored from constructs termed in this study as organizational context that was measured by top management support; secondly, individual context which was measured by perceived ease of use and perceived usefulness; lastly, innovation context measured by relative advantage. The influence of all these variables was measured individually to determine the influences on the blockchain adoption. Out of a total of 3 hypotheses proposed, only one was supported by the study. The findings reveal a significant influence of innovation which was measured by relative advantage on the adoption blockchain technology by south African companies. The study further indicates that relative advantage is an important factor in the adoption of blockchain technology by businesses. Blockchain technology provides distinct features such as data transparency, traceability, reliability, immutability verifiable records with timestamp which qualifies the technology to be radical innovation.

6.3 Limitation and further research

6.3.1 *Limitations*

Due to the epidemic, the University of Witwatersrand enacted guidelines allowing the researcher to collect less data than the needed sample of 375 people. As a result, the researcher only gathered a valid sample of 71 people. Employees of JSE-listed companies in South Africa were the only ones whose data was collected. Therefore, the comparability and generalizability of the findings of this study may differ from that of other comparative studies that use the entire South African population. In addition, a convenience sampling method was used, which could lead to the Sample not being a true representation of the population. As a result, the research findings cannot be generalized.

6.3.2 *Recommendation for further research*

Future research can supplement this study by have mediating variables as most managers were not aware that blockchain have use-cases in corporate environment. Whilst it was not part of the study, there are some technicalities that participants are unsettled about for example, how does blockchain integrates to legacy system, how many storage servers needed, what type of consortium is needed to run a blockchain technology. Additionally, should all companies in the value chain be involved e.g., all suppliers. Although environmental factors such as regulatory concerns were not part of this study, some participants were mostly concerned about that and as result that might have clouded their judgment. All these factors should be thoroughly studied in future research. Notably, other variables were not statistically significant, and the researcher believes future studies should revisit such analyses with a higher sample size as intuitively, these factors will influence as decision to adopt blockchain.

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8 APPENDIX

8.1 Appendix 1: Ethics clearance

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg

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

Ethics Clearance Certificate

Ethics protocol number: WBS/EN1558168/533
This certificate is only valid with a legitimate ethics protocol number and signed by the Researcher (below).

Project title	Antecedents of blockchain adoption by South African listed companies
Investigator / Researcher	Mr Luyanda Mbeki
Nature of Project	MM (Entrepr & New Venture Creation)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed confidentialty.
Issue Date of Certificate	2021-11-21
Expiry date	Date of submission of the project report
Chairperson	Prof Anthony Stacey ☎ +27 11 717 3587 +27 82 880 4531 anthony.stacey@wits.ac.za

Declaration by Researcher

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

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

Signature

21 November 2021
Date:

8.2 Appendix 2: Research Instrument

Research Design Theory questionnaire

Start of Block: Survey consent

Survey Instructions Dear Participant

My name is Luyanda Mbeki and I am a Master's student in Entrepreneurship and New Venture Creation at the University of the Witwatersrand, Johannesburg. As part of my studies, I must undertake a research project and I am studying the **antecedents of blockchain adoption by South African listed companies** under the supervision of Professor Urban Boris (boris.urban@wits.ac.za).

I am inviting you to participate in my research by completing the accompanying questionnaire. The questionnaire is divided into 3 parts. The first is your consent to participate. Second, the demographic questions and thirdly, questions relating to the measurement scales. This online questionnaire should not take longer than 10 minutes of your time.

Your participation in this research is 100% voluntary and you have the right to withdraw at any point during the study, for any reason, and without any prejudice. The questionnaire will not be gathering any personal data, only information related to the specific study. Confidentially will be observed throughout the research process and the final report will be for academic purposes only. Your responses remain strictly confidential. Thank you sincerely for your contribution to this study.

Yours sincerely
Luyanda Mbeki (email: 1558168@students.wits.ac.za)

Consent and qualification criteria
Q1.1 Survey consent

- ○ I consent to begin the study (1)
- ○ I do not consent to begin the study (3)

Skip To: End of Survey If Survey consent = I do not consent to begin the study

Q1.2 Are you currently employed as a manager or senior manager or executive and or IT professional by a company that is listed on the Johannesburg Stock Exchange?

If yes, then continue with the survey

- ○ Yes (1)
- ○ No (2)

Skip To: End of Survey If Are you currently employed as a manager or senior manager or executive and or IT professional by... = No

Demographics

Q2.1
Please choose the industry

- ○ Financial Service (1)
- ○ Media and Telecommunication (2)
- ○ Manufacturing (3)
- ○ Retail (4)
- ○ Agriculture (5)
- ○ Mining (6)
- ○ Other (7)

Q2.2 Which role do you currently occupy?

- ○ Executive (1)
- ○ Senior Manager (2)
- ○ Manager (3)
- ○ IT professional (4)
- ○ Other (6)

Q2.3 What is your gender?

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ Prefer not to say (4)

Q2.4 What is the highest level of education completed?

- ○ Below Grade 12 (1)
- ○ Grade 12 (2)
- ○ Diploma (3)
- ○ Degree (4)
- ○ Honours (5)
- ○ Masters (6)
- ○ PhD (7)

Q2.5 What is your age?

- ○ Under 18 (1)
- ○ 18 - 24 (4)
- ○ 25 - 34 (5)
- ○ 35 - 44 (6)
- ○ 45 - 54 (7)
- ○ 55 - 64 (8)
- ○ 65 - 74 (9)
- ○ 75 - 99 (11)

- Measurement Scale Instructions

The next set of questions use 7-point Likert scales where 1 = strongly agree and 7 = strongly disagree. Indicate the extent to which you agree or disagree.

Top Management support
Q3.1
Our top management supports the implementation of blockchain technology

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.2 Our top management is ready to provide the necessary resources for the introduction of blockchain technology

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.3 Our top management is willing to take the possible risks involved in the adoption of blockchain technology

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Security and data privacy

Q3.4

The degree of organization’s concern with data security is low while using blockchain technology

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q3.5 The degree of organization’s concern with the security of online transactions is low while using blockchain technology

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q3.6 The degree of organization’s concern about privacy is low while using blockchain technology

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.7 Blockchain has the advanced technology to protect your personal information

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Costs concerns

Q3.8

Blockchain technology adoption requires high hardware and software facility costs

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q3.9 Blockchain technology adoption requires a high cost of training and recruiting

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q3.10 Blockchain technology adoption requires high up-front investment costs

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.11 Supporting the ongoing use of blockchain is costly

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Reverse question

Q3.12 The ongoing operational costs of blockchain are high

- ○ Strongly disagree (1)
- ○ Disagree (2)
- ○ Somewhat disagree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat agree (5)
- ○ agree (6)
- ○ Strongly agree (7)

Perceived usefulness

Q3.13 Using blockchain technology will allow us to improve performance

- ○ Strongly agree (1)
- ○ Agree (3)
- ○ Somewhat agree (4)
- ○ Neither agree nor disagree (5)
- ○ Somewhat disagree (6)
- ○ Disagree (7)
- ○ Strongly disagree (8)

Q3.14 Using blockchain technology will allow us to improve productivity

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (8)

Q3.15 Using blockchain technology will allow us to improve efficiency

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.16 Using blockchain helps me accomplish things more quickly

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Perceived ease of use
Q3.17
It is easy-to-use blockchain technology

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q3.18 The features of blockchain technology are clear and understandable

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.19 As compared to conventional ways of the business, blockchain technology can be used with more ease

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.20 It is easy for me to become skillful at using blockchain

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Technology readiness
Q3.21
Our organization understands how blockchain technology can support the business

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.22 Our organization is dedicated to acquiring the required managerial and technical skills for implementing blockchain technology

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.23 Our organization is dedicated to ensuring that employees are regularly updated with knowledge on blockchain technology

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.24 Our organization adequately understands how to utilize blockchain technology within the business

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Reverse question
Q3.25
Our top management is ready to provide the necessary resources for the introduction of blockchain technology

- Strongly disagree (1)
- Disagree (2)
- Somewhat disagree (3)
- Neither agree nor disagree (4)
- Somewhat agree (5)
- Agree (6)
- Strongly agree (7)

Complexity

Q3.26 It is difficult to learn how to apply blockchain technology in our organisation

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q3.27 The tools of blockchain technology are not easy to use

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Relative advantage

Q3.28

Blockchain technology enables transparency of data across various participants in our organisation

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.29 Blockchain technology allows tracking of the route of the material from its origin to the delivery point

- ○ Strongly agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.30 Blockchain technology provides the availability of data with an exact timestamp

- Strongly Agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q3.31 Blockchain technology enables a verifiable record of each and every transaction across the organisation

- Strongly agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Blockchain adoption

Q3.32 Our organisation intends to adopt blockchain technology in the near future

- ○ Strongly Agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.33 Our organisation intends to digitally transform general business operations in the near future

- ○ Strongly Agree (1)
- ○ Agree (2)
- ○ Somewhat agree (3)
- ○ Neither agree nor disagree (4)
- ○ Somewhat disagree (5)
- ○ Disagree (6)
- ○ Strongly disagree (7)

Q3.34 Our organization is likely to use blockchain technology on a regular basis in the near future

- Strongly Agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)
- Strongly disagree (7)

Q3.35 I predict that our organization is likely to use blockchain technology in the near future

- Strongly Agree (1)
- Agree (2)
- Somewhat agree (3)
- Neither agree nor disagree (4)
- Somewhat disagree (5)
- Disagree (6)

Strongly disagree (7)

End of Block: Survey consent

8.3 Appendix 3: Consistency Matrix

Table 38: consistency matrix

<table>
<tr><th colspan="8">Antecedents of blockchain adoption by South African listed companies</th></tr>
<tr><th colspan="8">Problem: Failure by South African listed companies to adopt blockchain</th></tr>
<tr><th colspan="8">Main Objective: Seeking to understand the antecedents that influences intentions to adopt blockchain technology by South African listed companies</th></tr>
<tr><th>Sub-Objectives</th><th>Literature Review</th><th>Research questions</th><th>Hypotheses</th><th>Variables (Independent & Dependent)</th><th>Source of data</th><th>Type of data</th><th>Analysis</th></tr>
<tr><td rowspan="2">Ascertain organisational context that influences the adoption of blockchain technology</td><td rowspan="2">Prewett et al., (2019), Clohessy et al, (2020), Saurabh & Dey, (2021), Angelis and da Silva, (2019)</td><td rowspan="2">To what extent does organisational context influence the adoption of blockchain technology?</td><td rowspan="2">H1 – Organisational context influences adoption of blockchain technology</td><td>IV1=Organisational context</td><td>Questionnaire</td><td rowspan="3">Ordinal Data (7 likert Scale)</td><td rowspan="3">1. Descriptives
2. Correlation
3. Exploratory factor Analysis
4. Regression</td></tr>
<tr><td>DV1=Blockchain adoption</td><td></td></tr>
<tr><td>Examine individual context</td><td>Bhardwaj et al., (2021), Lee et al.,</td><td>To what extent does individual context</td><td>H2 – Individual context influences</td><td>IV2=Individual context</td><td>Questionnaire</td><td></td></tr>
</table>

that influences the adoption of blockchain technology	(2019), Lui et al., (2020), Manoj et al., (2014), Macial and Wamba, (2019)	influence the adoption of blockchain technology?	adoption of blockchain technology	DV1=Blockchain adoption		Ordinal Data (7 likert Scale)	
Investigate innovation context that influences adoption of blockchain technology	Bhardwaj et al., (2021), Lee et al., (2019), Lui et al., (2020), Manoj et al., (2014), Macial and Wamba, (2019)	To what extent does innovation context influence the adoption blockchain technology?	H3 – Innovation context influences adoption of blockchain technology	IV3= Innovation context DV1=Blockchain adoption	Questionnaire	Ordinal Data (7 likert Scale)	
KEYWORDS – Technology, innovation, blockchain, cryptocurrencies, adoption							

8.4 Appendix 4: Tables pertaining to analysis

*Table 39**: Total Variance Explained***

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %

1	9.564	32.981	32.981	9.564	32.981	32.981	5.695	19.637	19.637
2	3.452	11.904	44.885	3.452	11.904	44.885	5.247	18.093	37.730
3	3.052	10.525	55.410	3.052	10.525	55.410	2.875	9.915	47.644
4	2.196	7.572	62.983	2.196	7.572	62.983	2.802	9.663	57.308
5	1.885	6.499	69.481	1.885	6.499	69.481	2.743	9.457	66.765
6	1.813	6.252	75.733	1.813	6.252	75.733	2.601	8.969	75.733
7	.856	2.950	78.684						
Extraction Method: Principal Component Analysis.									

*Table 40**: Descriptive of organizational context***

Descriptive				
			Statistic	Std. Error
Organization context	Mean		3.2797	.18600
	95% Confidence Interval for Mean	Lower Bound	2.9087	
		Upper Bound	3.6506	
	5% Trimmed Mean		3.2328	
	Median		3.0000	
	Variance		2.456	
	Std. Deviation		1.56724	
	Minimum		1.00	
	Maximum		6.57	
	Range		5.57	
	Interquartile Range		2.57	
	Skewness		.403	.285
	Kurtosis		-.936	.563

*Table 161: **Descriptive of individual***

Descriptives				
			Statistic	Std. Error
Individual context	Mean		2.7091	.14054
	95% Confidence Interval for Mean	Lower Bound	2.4288	
		Upper Bound	2.9894	
	5% Trimmed Mean		2.6411	
	Median		2.5714	

	Variance	1.402	
	Std. Deviation	1.18422	
	Minimum	1.00	
	Maximum	6.14	
	Range	5.14	
	Interquartile Range	1.29	
	Skewness	.882	.285
	Kurtosis	.540	.563

Table 42: ***Descriptives of innovation***

Descriptives				
			Statistic	Std. Error
Innovation context	Mean		.3881	.02029
	95% Confidence Interval for Mean	Lower Bound	.3476	
		Upper Bound	.4285	
	5% Trimmed Mean		.3894	
	Median		.3979	
	Variance		.029	
	Std. Deviation		.17099	
	Minimum		.00	
	Maximum		.85	
	Range		.85	
	Interquartile Range		.21	
	Skewness		.033	.285
	Kurtosis		.136	.563

Table 43: ***Descriptive blockchain***

Descriptives				
			Statistic	Std. Error
Blockchain	Mean		.3168	.02160
	95% Confidence Interval for Mean	Lower Bound	.2737	
		Upper Bound	.3598	
	5% Trimmed Mean		.3141	
	Median		.3010	

	Variance	.033	
	Std. Deviation	.18198	
	Minimum	.00	
	Maximum	.72	
	Range	.72	
	Interquartile Range	.15	
	Skewness	.018	.285
	Kurtosis	-.358	.563

Table 44: ***Organisational context descriptive statistics***

Statements	Frequency	Strongly Disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly Agree	Means	Std
Org 1: Our top management supports the implementation of blockchain technology	71	4.2	9.9	5.6	16.9	19.7	25.4	18.3	3.13	1.723
Org 2: Our top management is ready to provide the necessary resources for the introduction of blockchain technology	71	4.2	11.3	4.2	18.3	19.7	26.8	15.5	3.20	1.712
Org3: Our top management is willing to take the possible risks	71	5.6	14.1	5.6	14.1	15.5	32.4	12.7	3.32	1.819

involved in the adoption of blockchain technology										
Org4: Our organization understands how blockchain technology can support the business	71	4.2	9.9	8.5	14.1	18.3	29.6	15.5	3.17	1.724
Org 5: Our organization is dedicated to acquiring the required managerial and technical skills for implementing blockchain technology	71	5.6	14.1	5.6	15.5	16.9	31.0	11.3	3.38	1.792
Org 6: Our organization is dedicated to ensuring that employees are regularly updated with knowledge on blockchain technology	71	4.2	15.5	11.3	18.3	8.5	31.0	11.3	3.51	1.804
Org 7: Our organization adequately understands how to utilize blockchain	71	8.5	9.9	11.3	15.5	8.5	36.6	9.9	3.45	1.858

technology within the business										

Table 45: ***Individual context descriptive statistics***

Statements	Frequency	Strongly Disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly Agree	Means	Std
Indi 1: Using blockchain technology will allow us to improve performance	71	1.4	2.8	14.1	16.9	35.2	0	29.6	3.00	1.558
Indi 2: Using blockchain technology will allow us to improve productivity	71	0	2.8	1.4	16.9	18.3	33.8	26.8	2.41	1.249
Indi 3: Using blockchain technology will allow us to improve efficiency	71	0	4.2	1.4	15.5	18.3	33.8	26.8	2.44	1.306

Indi 4: Using blockchain helps me accomplish things more quickly	71	0	5.6	4.2	12.7	19.7	36.6	21.1	2.59	1.369
Indi 5: It is easy-to-use blockchain technology	71	1.4	9.9	5.6	14.1	21.1	38.0	9.9	3.03	1.512
Indi 6: As compared to conventional ways of the business, blockchain technology can be used with more ease	71	0	8.5	7.0	8.5	21.1	39.4	15.5	2.77	1.456
Indi 7: It is easy for me to become skillful at using blockchain	71	1.4	8.5	4.2	8.5	18.3	42.3	16.9	2.72	1.514

Table 46: ***Innovation context descriptive statistics***

Statements	Frequency	Strongly Disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly Agree	Means	Std
Inno 1: Blockchain technology enables transparency of data across various participants in our organization.	71	1.4	4.2	4.2	23.9	12.7	43.7	9.9	2.87	1.362
Inno 2: Blockchain technology allows tracking of the route of the material from its origin to the delivery point.	71	1.4	4.2	2.8	22.5	14.1	45.1	9.9	2.82	1.334
Inno 3: Blockchain technology provides the availability of data with an exact timestamp	71	1.4	2.8	0	15.5	16.9	45.1	18.3	2.48	1.252

Inno 4: Blockchain technology enables a verifiable record of each and every transaction across the organization.	71	1.4	2.8	1.4	11.3	15.5	45.1	22.5	2.38	1.280

Table 177: ***Blockchain adoption descriptive statistics***

Statements	Frequency	Strongly Disagree	Disagree	Somewhat disagree	Neutral	Somewhat Agree	Agree	Strongly Agree	Means	Std
Block 1: Our organisational intends to adopt blockchain technology in the near future	71	0	0	5.6	11.3	16.9	33.8	32.4	2.24	1.189
Block 2: Our organisational intends to digitally transform general business	71	0	4.2	2.8	8.5	9.9	35.2	39.4	2.13	1.330

operations in the near future.										
Block 3: Our organization is likely to use blockchain technology on a regular basis in the near future.	71	0	2.8	2.8	7.0	28.2	39.4	19.7	2.42	1.142
Block 4: I predict that our organization is likely to use blockchain technology in the near future	71	0	2.8	1.4	9.9	16.9	42.3	26.8	2.25	1.168

Table 48: ***Initial factor structure***

Rotated Component Matrix[a]						
	Component					
	1	2	3	4	5	6
Q3.3	.884					
Q3.2	.881					
Q3.1	.863					
Q3.22	.837					
Q3.21	.802					

Q3.24	.788					
Q3.23	.779					
Q3.16		.885				
Q3.13		.850				
Q3.15_1		.828				
Q3.14		.811				
Q3.19		.756				
Q3.20		.689				
Q3.17		.670				
Q3.34			.926			
Q3.35			.822			
Q3.32			.712			
Q3.33			.709			
Q3.29				.788		
Q3.28				.774		
Q3.31_1				.766		
Q3.30				.717		
Q3.5					.906	
Q3.4					.868	
Q3.6					.864	
Q3.10						.798
Q3.8						.778
Q3.9						.761
Q3.11						.754

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Table 49: ***Summary – test of normality (all variables initial factor structure)***

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Organisational context – security and privacy	.146	71	.001	.930	71	.001
Organisational context – Cost concerns	.131	71	.004	.960	71	.025
Organisational context – top management & tech. readiness	.092	71	.200*	.957	71	.017
Individual context – perceived ease of use & usefulness	.093	71	.200*	.981	71	.353
Innovation context – relative advantage	.117	71	.017	.970	71	.086
Blockchain	.117	71	.017	.961	71	.027
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

8.5 Appendix 5: Graphs

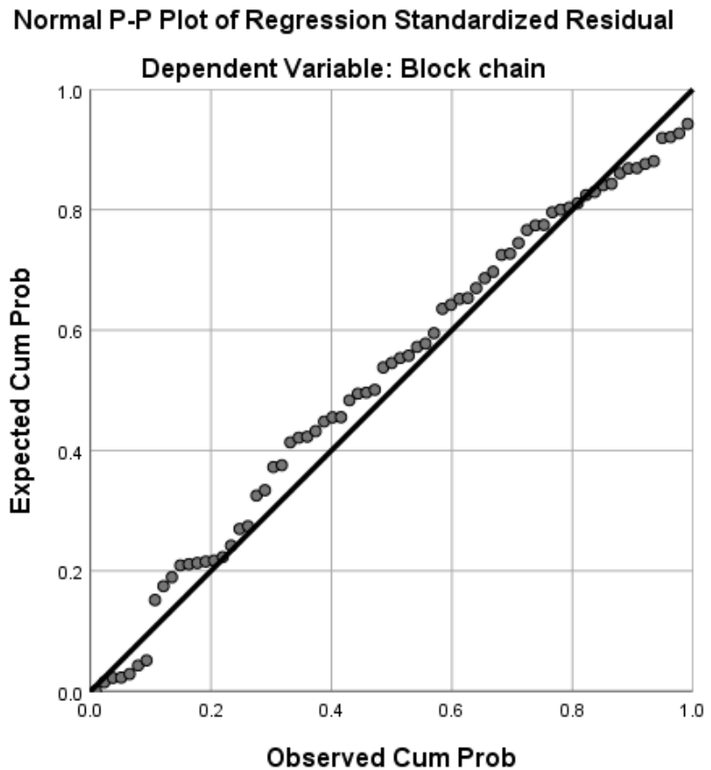

Figure 23: Normal P-P plot

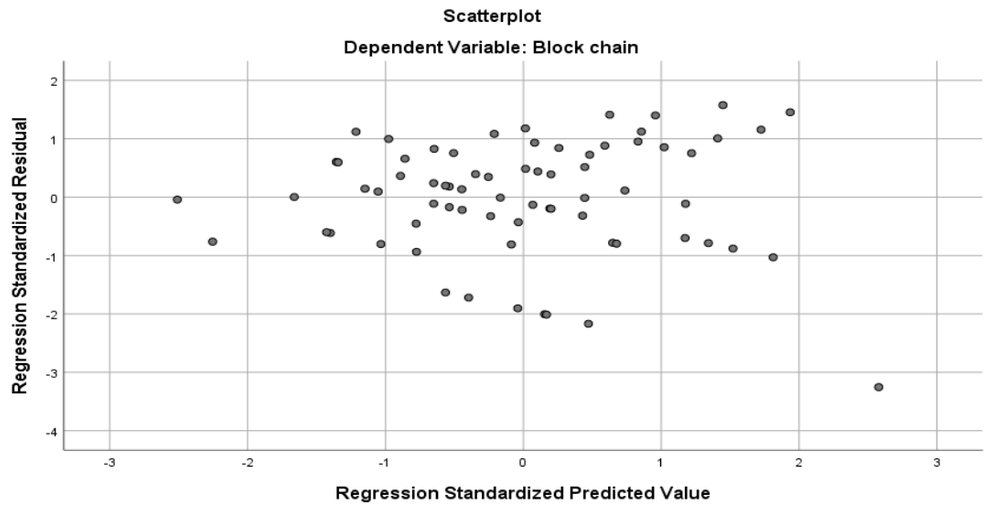

Figure 24: Scatterplot

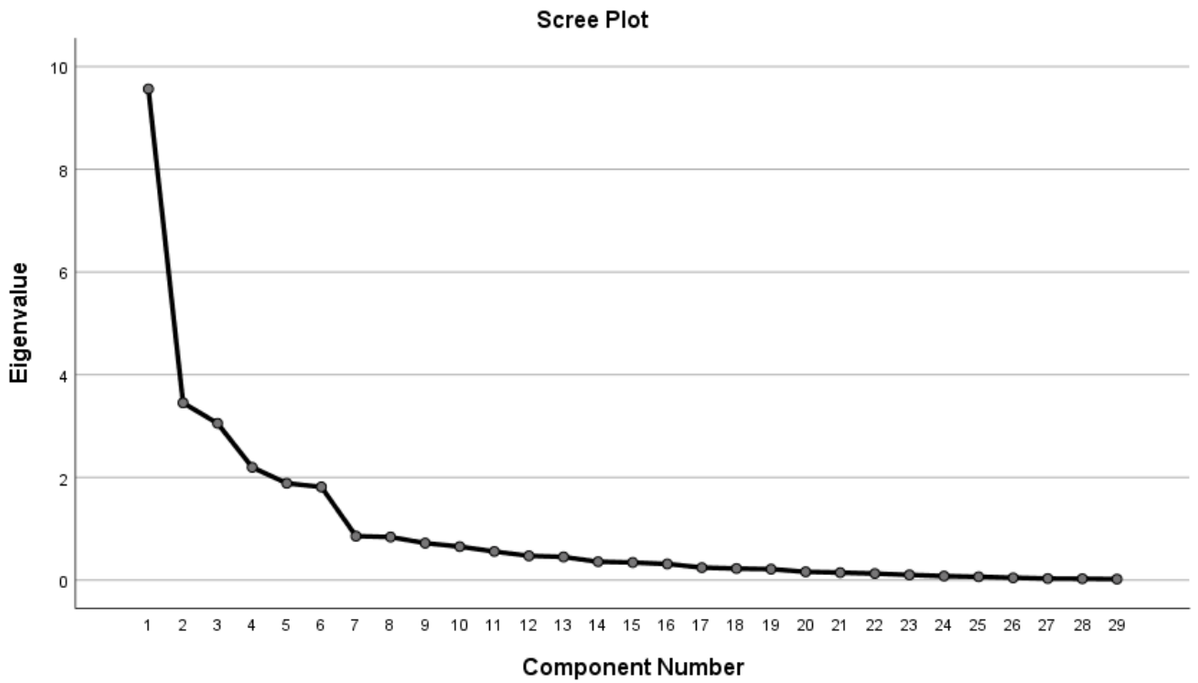

Figure 25: Initial Screen plot