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The adoption of Blockchain among the SMEs in Gauteng, South Africa

Mosa Motea

WITS Business School

A thesis presented in partial fulfilment for the degree of Master of Business Administration to the Faculty of Commerce, Law, and Management, University of the Witwatersrand

A research report project

March 2021

WITS UNIVERSITY

DECLARATION

I Mosa Motea declare that this research report entitled 'The adoption of Blockchain among the SMEs in Gauteng, South Africa' is my own unaided work. I have acknowledged, attributed, and referenced all ideas sourced elsewhere. I am hereby submitting it in partial fulfilment of the requirements of the degree of Master of Business Administration at the University of the Witwatersrand, Johannesburg. I have not submitted this report before for any other degree or examination to any other institution.



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Signed at Johannesburg on 31h March 2021

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ABSTRACT

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This study investigates factors that influence the adoption of Blockchain technology among small to medium enterprises (SMEs) within Gauteng, South Africa, through the lens of the challenges they face. The adoption of Blockchain in the SME sector is lagging as compared to other counterparts in emerging economies. It is evident, based on the literature review that SMEs face numerous business problems, and this creates severe challenges hindering the adoption of new technologies. The Technology-Organisational-Environment (TOE) framework was utilised as a theoretical framework and used for this study to analyse the adoption of technology among SMEs. A qualitative research approach was considered the most appropriate for this study. Primary data was collected from six SMEs comprising of owners and directors or senior managers using semi-structured interviews. A purposive sampling technique was chosen to select the participants. The interview question guide developed from insights gained from the literature review section, and other questions were added depending on the respondents' feedback. The author adopted Bryman's four-stage thematic coding for data analysis. The findings of this study offer's knowledge and practical enlightenment on the factors that drive the adoption of technologies among the SME sector.

Keywords: Blockchain technology, Adoption, Technology-Organisational-Environment (TOE) framework, SME, South Africa.

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DEFINITION OF KEY TERMS AND CONCEPTS

Blockchain Technology	Blockchain technology is an intelligent system, based on distributed databases allowing it to transmit and record information (Sakho, Jianbiao, Essaf, & Mbyamm, 2019).
Small to Medium Enterprises (SMEs)	SMEs are classified as a business that employs fewer than 250 employees have an annual turnover of less than R64 million with a capital asset of less than R10 million and has direct managerial involvement by owners (Ayandibu & Houghton, 2017).
Technology-Organisational-Environment (TOE) framework	The TOE framework identifies three aspects of an organisation environment that influence the process by which it adopts and implements a technological innovation (Oliviera & Martins, 2011).

1 INTRODUCTION TO THE RESEARCH

1.1 Background and context

Rapid technological changes can present two sides of the same coin in outcomes, threats and opportunities (Lai, 2017; Niforos, 2017). The speed with which technology changes compels existing businesses to adapt or risk being left behind (Hendricks, 2018; Niforos, 2017). The direct opposite of such perilous consequences is the opportunity to embrace ground-breaking and most efficient technology offerings (Lai, 2017). Striking a balance between the two is the ongoing business strategic exercise, manifesting in the anticipation for changes to avoid surprises. One critical success factor for businesses in this day and age is the adoption of relevant technology (Taufiq, Arachchilage & Abbasi, 2018).

Blockchain technology (Blockchain), or distributed ledger technology (DLT) as it is sometimes called, emerged with a promise of an archetype evolution to business operations (Kawasmi, Gyasi & Dadd, 2020). Indeed, for some businesses that have implemented Blockchain in their operations, positive changes are already experienced mainly through increased speed, security, and efficiency (Niforos, 2017). However, the technology itself is very much in the growth phase of development, as can be evidenced by increasing hype but a relatively lower rate of adoption, especially in the developing economies (Mazambani & Mutambara, 2019). As such, more challenges accompanying desired widespread adoption must be anticipated (Catalini & Gans, 2019), and in this lengthy growth process, there will be winners and losers (Iansiti & Lakhani, 2017).

Increasing appreciation and publicity for Blockchain usage provoked interest to understand adoption among small and medium enterprises (SMEs) in Gauteng, South Africa. The adoption of Blockchain has been prevalent among multinational companies as they have both financial and technical capabilities to develop and implement the technology. On the contrary, SMEs often tend to suffer from resources constraints, compared to large organisations. This study explores factors that influence the adoption of Blockchain among SMEs in Gauteng, South Africa.

1.2 Research conceptualisation

1.2.1 The research problem statement

The adoption of Blockchain in the SME sector is lagging compared to other counterparts in emerging economies (Filimonau & Naumova, 2020; Hoti, 2015; Mazambani & Mutambara, 2019). According to Harindranath, Dyerson and Barnes (2008), there is a growing need to understand factors that influence information technology (IT) adoption within the SME sector. Technology such as Blockchain is said to positively impact developing economies, such as that of the SMEs sector in South Africa if the adoption becomes widespread (Buitenhek, 2016). Blockchain offers advantages such as cost-efficiency, transparency and growth opportunities (Niforos, 2017). Furthermore, Blockchain has the potential of formalising financial transactions in developing economies, enabling stimulation of economic activity which the current systems have not been able to provide (Iansiti & Lakhani, 2017). Importantly, SMEs need to find a systematic way to lower their operational costs as they are competing with large firms in the same marketplace (Li, Luo, Anwar, Lu, Wang & Liu, 2020).

In light of the above, Tovstiga (2015) argued that strategic challenges may have their origin in both internal and external environments. For example, there is a compelling argument that places management skills and resources as some of the major challenges that SMEs face internally to their organisations (Govuzela & Mafini, 2019). Also, Sitharam and Hoque (2016) posited that changing market trends and rapid technology changes are challenging attributes within the external environment.

Considering the above, a deeper understanding of the factors that influence the adoption of Blockchain in this sector becomes critical (Mazambani & Mutambara, 2019). Also, SMEs that wish to adopt Blockchain must be mindful and critically evaluate the merits and demerits of such a decision.

1.2.2 The research purpose (aim and objectives) statement

The main aim and the objective of this study seeks to understand factors that influence the adoption of Blockchain among SMEs in Gauteng, South Africa. Specifically, what are the challenges that these SMEs face and how do they impact their quest to adopt new technology? According to Lee (2019), user adoption models can be used to understand the factors that influence the adoption of technology.

Over the years there have been well established theoretical frameworks about information technology (IT) adoption behaviour including, the Theory of Planned Behaviour (TPB) model (Venkatesh & Davis, 2000), the Technology Acceptance Model (TAM) framework (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008), the Unified Theory of Acceptance and Use of Technology (UTAUT)

(Venkatesh, Morris, Davis & Davis, 2003) and the Technology-Organisation-Environment (TOE) framework (Tornatzky & Fleischer, 1990). For this research, the author discusses the TOE framework because according to Oliviera and Martins (2011), it is the most prominent due to its consideration of the firm-wide environment and has been proven to be effective (Zhu, Kraener & Xu, 2006).

1.2.3 The research questions

According to Slack (2012), many SMEs find it challenging to handle the full-scale implementation of new technology. Therefore, the main objective of this research is to explore and understand typical considerations for SMEs when adopting new technology, specifically Blockchain. IIbiz and Durst (2019) argued that SMEs should be critical when evaluating the appropriation of Blockchain for their business needs and should follow a tailored approach whilst adopting the technology. Therefore, the study focuses on the following questions:

1) What are the key challenges of SMEs concerning technology adoption?
2) What role does the internal and external environment play in the adoption of Blockchain?

IIbiz and Durst (2019) argued that it is essential to understand the landscaped of SMEs when implementing new technology; otherwise, there would be a high likelihood of wastage of resources. Furthermore, South Africa runs the risk of further lagging to comparable markets such as India, Brazil, Kenya in implementing Blockchain which can have an effect on the competitiveness of its SME market as a whole. Crucially, where SMEs fail to keep abreast of technological changes, this can potentially result in many of them failing and closing down.

In line with the above research questions, the author makes the below proposition:

1) Management within SMEs do not necessarily have the required technical skills.
2) There is a general lack of awareness regarding Blockchain among SMEs and their customers.

1.3 Delimitations and assumptions of the research study

The delimitation of this study can emanate from the approach proposed. The study aims to better understand the adoption of Blockchain among SMEs. However, Blockchain in itself has a broad scope and can be used in different contexts. Consequently, the author believes that the variations of the different use scenarios such as market structure and size of the organisations can impact the results. The study also assumes that SMEs have generic challenges and therefore, a comparable interpretation of results can be undertaken on the sample population. It is also assumed that participants in the study answered the interview questions honestly and factually because they all have a similar understanding.

Consequently, the author of this study works on the assumption that all participants know or at the very least, understand what Blockchain entails.

To manage the delimitations and assumption, the author has:

(i) Described briefly what Blockchain is.

(ii) Assured participants that their responses will be anonymous.

(iii) Enquired about their level of education and exposure to ICT implementation; and

(iv) Described the objectives of the study and their intended outcomes fully.

1.4 Significance of the research study

SMEs are arguably the backbone of every economy (Bhorat, Asmal, Lilenstein & van der Zee, 2018); Bruwer, 2018). The same holds for South Africa because according to StatsSA (2019), SMEs expanded their total contribution to 39% out of the entire formal business sector in the first quarter of 2019. However, SMEs continue to face challenges that manifest themselves from both the internal and external environment. Some of the challenges include access to finance, management skills and technological capabilities. The extent to which these challenges affect the adoption of new technology is not well documented. Also, how the challenges can be related to the benefits that Blockchain can offer is not well discussed.

In light of the above, it is essential to conduct a study with a focus on SMEs because as stated by StatsSA, the importance of SMEs cannot be overemphasised. This has become more urgent considering the current pandemic, which has resulted in many companies closing and people losing their employment. It appeared that Blockchain was relatively known albeit without being adopted. The main findings showed that financial resources, a short-term view by owner and management, and shortage of skilled personnel were the main challenge to adoption. These challenges were predominately defined to be internal to the organisation's environment.

1.5 Preface to the research report

To this end, the report has six chapters. Following this introductory chapter, Chapter 2 provides a literature review covering the problem, past studies, the explanatory framework and the conceptual framework. Chapter 3 discusses the research strategy, design, procedures, reliability and validity measures as well as limitations. Chapter 4 and Chapter 5 presents and discusses the findings, respectively, to interrogating our research questions while Chapter 6 summarises and concludes the research.

2 LITERATURE REVIEW

The purpose of this chapter is to establish a theoretical framework for the research topic. According to Sekaran and Bougie (2013), a literature review helps to narrow down the broad problem and develop a clear and specific problem statement.

In light of the above, Tovstiga (2015) opined that taking the organisation through change implies a change of mindset. Therefore, the adoption of new technology requires an understanding of the current position of the organisation and the benefits of the new system. Therefore, this chapter reviews the current state of SMEs in line with the research questions and objectives, namely the challenges faced by SMEs in adopting new technology, such as Blockchain technology.

Information and Communication Technology (ICT) is a strategic asset for all organisations, including SMEs (Nurvyyev, Wang, Achyldurdyyeva, Jaw, Yeh, Lin & Wu, 2020). Thus, various studies have identified factors that influence the adoption of ICT in general (Nurvyyev et al., 2020) for example, top management innovation (Thong & Yap, 1995), strategic context (Nguyen, 2009), financial resources and management abilities (Heart & Pliskin, 2002; Lee & Kwon, 2014). In this regard, SMEs need to consider investment in ICT carefully (Gutter & Saleem, 2005).

There is a general misunderstanding of the behaviour of SMEs in ICT adoption and specifically Blockchain (Filimonau & Naumova, 2020). Also, there seems to be a gap in knowledge about the adoption of Blockchain by SMEs within South Africa. As such, the author believes that it is vital to consider the factors that influence SMEs' intentions to adopt new technology.

This research provides an empirical investigation into the factors affecting the adoption of Blockchain by SMEs in Gauteng, South Africa. This view is supported by Harindranath et al., (2008) who opined that there is a growing need for understanding factors that influence ICT adoption within the SME sector.

2.1 Blockchain technology

It is argued that the survival of SMEs is increasingly dependent on strategies that leverage technology (Gunasekaran, Rai & Griffin, 2011). This view is supported by Kiveu and Ofafa's (2013) findings that indicated Information and Communication Technology (ICT) facilitated improved communication, access to information, identification of markets and assisted with the lowering transaction costs.

There have been many kinds of research on Blockchain (Dai & Vasarhelyi, 2017). Blockchain is an intelligent system, based on distributed databases allowing it to transmit and record information (Sakho, Jianbiao, Essaf & Mbyamm, 2019). According to McNally (2019), Blockchain is a digital

register of transactions that have been independently confirmed by a peer-to-peer network of connected computers. Importantly, all the information that occurs on the network is made available to the participants of that network (Sakho et., 2019). Blockchain was initially proposed to solve the problem of validating third-party information that exists in traditional centralised transactions (Sakho et al., 2019). At its most basic level, Blockchain benefits are expressed in four pillars namely, security, transparency, trust and speed (Kakavand, Kost De Sevres & Chilton, 2017).

Since its introduction in 2008, Blockchain has been limited mostly to digital currency applications like Bitcoin, a digital asset that leverages the Blockchain network. Recently, however, it has been combined with new-generation information technologies such as the Internet of Things (IoT), cloud computing and artificial intelligence (Dai & Vasarhelyi, 2017), demonstrating unique application value and prospect for many fields (McNally, 2019). For example, this technology can be applied in the energy sector (Burger, Kuhlmann, Richard & Weinmann, 2016), supply chain and logistics (Iansiti & Lakhani, 2017) and the health services sector (Hoy, 2017; Kakavand et al., 2017).

To understand the broader landscape of Blockchain adoption, it is essential to understand its benefits and challenges. Therefore, section 2.2 and 2.3 looks at the benefits and challenges of Blockchain respectively.

2.2 Benefits of Blockchain

Blockchain has many features that make it very attractive to SMEs. For example, Blockchain works on distributed databases which leads to better security, auditability, data transparency and enabling wider revenue opportunities (Atlam, Alenezi, Alassafi & Wills, 2018).

2.2.1 Security

One of the essential benefits of Blockchain infrastructure is the increased auditability of information. Since the Blockchain ledger secures the data that is posted on it, this can assist with many audit-related issues. For example, information on electronic invoices, letters of credit, and receipts can be documented in the Blockchain and are easily traceable and unchangeable, allowing auditors to test the accuracy and completeness of the information (Dai & Vesarhelyi, 2017).

Furthermore, these documents can be shared among related parties in real-time for cross-validation, which can minimise fraudulent transactions (Atlam, Walters & Wills, 2018). Also, users can track the source of any ledger entry along the chain to its place of origin (Kshetri, 2017). This is a significant benefit to SMEs given a lack of resources, such as having a fully-fledged finance and audit function.

2.2.2 Transparency

By creating a distributed digital ledger system that records and stores all transactions, Blockchain offers full transparency (McNally, 2019). The parties involved in the transaction may not know each other, but they can exchange value with little fear due to its design (Atlam et al., 2018).

Blockchain records data once and therefore ensures that all systems are in sync, presenting one source of the truth (McNally, 2019). Therefore, Blockchain can help reduce the overall number of contract disputes. According to Morabito (2017), these disputes make up 57% of litigation in the United Kingdom. This is made possible because Blockchain can be used to register contracts and assets, which provides a reliable method to manage this type of information (Walport, 2015, cited by Morabito, 2017).

On the contrary, this level of transparency can be undesirable to some (Dai & Vesarhelyi, 2017). This is because the database can give the rights to read, verify and update transactions to everyone on the network. However, according to Pilkington (2016), businesses can restrict the read and write permission to certain participants. Whilst transparency is critical, it should be noted that SMEs should be able to share certain information for Blockchain to work. As a result, where a lack of understanding of Blockchain exists, this can cause adoption to be limited because transparency can be misconstrued to giving away critical company information.

2.2.3 Enabling improved revenue

SMEs often suffer from resource constraints; therefore, they always need to find ways to lower their operational costs. This can be made possible by improved transaction efficiencies which leads to business doing more with the resources at hand (Brandman & Thampapillai, 2016). One way of reducing costs is by removing the need for intermediaries in the chain of business. Consequently, SMEs can benefit from a reduction in transactional costs because Blockchain offers the potential to streamline business processes which helps to lower overall operating expenditures (McNally, 2019). In the end, Blockchain could result in improved revenue and ultimately services delivery for SMEs (Brennan & Lunn, 2016).

2.3 Blockchain challenges

2.3.1 Lack of clarity

Most SMEs do not entirely understand what Blockchain can do because it is still considered an immature technology (McNally, 2019). The lack of understanding among business, consumers and authorities exacerbates this situation (Brandman & Thampapillai, 2016). In most cases, Blockchain is

often associated with Bitcoin (Deshpande et al., 2017), and is the biggest use case of Blockchain technology (Varghese et al., 2019). Due to a lack of clarity regarding what Blockchain is, it is hard to anticipate how far and how quickly blockchain technology will advance (McNally, 2019).

2.3.2 Insufficient evidence on business gains

The cost of adopting and implementing Blockchain in the short term may be considerable (Deshpande, Stewart, Lepetit & Gunashekar, 2017). Furthermore, the running costs associated with the adoption of Blockchain are not yet transparent (Kakavand et al., 2017). Dai and Vasarhelyi (2017) argued that mass adoption is needed to maximise the benefits of this technology. Also, at this point Blockchain requires substantial electricity and computing resources, and unfortunately, this would be economically demanding for SMEs. This coupled with the challenges that SMEs face in accessing funding, results in Blockchain adoption is very low. Also, the lack of a clear business case affects clarity on the expected return on investment (Mazambani & Mutambara, 2019).

2.3.3 Regulations

Blockchain is a new technology that can connect different businesses and people from different countries without any legal or regulatory frameworks to follow, which is a severe concern for both financial regulators and business in general. Blockchain technology relies on sophisticated mathematics and cryptography to maintain trust within the network. This challenge can be a barrier and a significant deterrent to the mass adoption of Blockchain (Atlam et al., 2018).

2.4 The nature of SMEs

Broadly speaking, an SME can be classified as a business that employs fewer than 250 employees, have an annual turnover of less than R64 million with a capital asset of less than R10 million and has direct managerial involvement by owners (Ayandibu & Houghton, 2017). However, there is no universal definition of SMEs because it varies from type, size, assets, revenue, and several employees from country to country (Ilori, 2014). For this study, SMEs have been defined by the number of employees and annual turnover, according to Ayandibu and Houghton (2017).

The importance of SMEs to the economy is well documented. In South Africa, SMEs expanded their total contribution to 39% out of the entire formal business sector in the first quarter of 2019 (StatsSA, 2019). This arguably underpins the importance of small businesses in general. Accordingly, SMEs have been identified as a critical component to advancing inclusive growth and development in South Africa (Bhorat et al., 2018).

Even though SMEs contributed immensely to the South African economy, they still face challenges. Tovstiga (2015) argued that business challenges could often manifest themselves from internal and external factors. Internal factors include skills, management competencies and technological capabilities. External factors include access to finance, regulations and access to markets.

Section 2.5 discusses key challenges that affect SMEs such as access to finance (Makina, Fanta, Mutsonziwa, Khumalo & Maposa, 2015), markets (Tovstiga, 2015), technological capabilities (Lose & Tengeh, 2015), skills and management (The Banking Association of South Africa (BASA), undated).

2.5 Challenges facing SMEs

2.5.1 Access to finance

Access to finance is identified as an essential factor in the growth of SMEs (Govuzela & Mafini, 2019; Makina et al., 2015). However, according to Sitharam and Hoque (2016); Mazanai and Fatoki (2012) and BASA (undated), access to finance is considered a key obstacle. This is supported by McGuinness and Hogan (2016), who argued that SMEs are financially excluded, and generally, SMEs tend to have relatively unsustainable incomes (Brei, Gadanecz & Mehrotra, 2020). Also, BASA (undated), observed that the majority of SMEs rely on their funding, which is often contributed by the owners, family and friends. This type of funding is often inadequate or unreliable to sustain the growth of SMEs (Makina et al., 2015). To try and address this challenge, the South African government has created frameworks to support SMEs such as the Small Enterprise Development Agency (Makina et al., 2015).

Limited financial resources result in most SMEs taking a conservative approach towards the adoption of ICT because it results in a significant proportion of their capital being tied up in the project (Gutter & Saleem, 2005). Also, limited financial resources can affect the recruitment of capable ICT employees to implement and manage ICT projects.

2.5.2 Access to markets

Industry globalisation and faster technology development have put a great demand for ICT. Globalisation trends empower businesses to compete on a larger scale than before, and the result is an increased demand on bigger markets. Limited access to markets remains a critical constraint to SMEs and their potential to grow (Kiveu & Ofafa, 2013). This challenge is often a result of existing economies of scale which larger businesses enjoy (Tovstiga, 2015) and limited financial resources to grow (Gutter & Saleem, 2005).

Access to markets is further constrained by factors such as changing market trends and rapid technology changes (Sitharam & Hoque, 2016). Blockchain is addressing many of the issues of the

ever fast-changing global market trends (Ayandibu & Houghton, 2017; Govuzela & Mafini, 2019; Love & Roper, 2013). Blockchain provides a mechanism for access to new market opportunities by its interconnectedness (Hoti, 2015). For example, payments using Blockchain are immediate with a high-level of security which results in quicker delivery of goods to markets they would not necessarily enter due to payments delays. Furthermore, Blockchain can reduce layers of intermediaries because participants can exchange and or trade directly. As a result, this has the potential to give firms access to new and bigger markets.

2.5.3 Technological capabilities

Technological capability is the effective application of specialised knowledge in adopting, utilising and transforming existing expertise (Zhou & Wu, 2010). Therefore, technological capabilities are critical for SMEs in their ability to replace and acquire new technology (Salami, Taghavifard & Majidifar, 2015).

Technological capabilities are one of the primary reason SMEs continue to face growth challenges in South Africa (Adeniran & Johnston, 2016). This view is supported by Osembe and Padayachee (2016), who stated that SMEs are still hindered by their lack of technological implementation, despite advancement globally. It is worth noting that technological capabilities are also a consequence of owner and senior manager characteristics, organisation characteristics and costs (Kumar, 2013). Also, SMEs are constraint by a lack of awareness and knowledge of existing technology and its potential. This often results in low adoption of innovative technology (Lee & Kwon, 2014).

Sitharam and Hoque (2016) found that the majority of SMEs believed that technological advancement would improve their companies' performance. The adoption of new technology has many benefits, such as access to new markets and improved communication with customers and suppliers (Tzokas, Kim, Akbar & Al-Dajani, 2015).

2.5.4 Management and skills

Studies have revealed that SMEs tend to have more managerial and skills challenges (Lavia-Lopez & Hiebl, 2014) and this has resulted in SMEs being slow in adopting new technology (Kuyoro, Awodele, Alao & Omotunde, 2013).

For those SMEs that adopt new technology early, it is characterised by poor planning where decisions that are not based on accurate information results in failed implementation (Ayandibu & Houghton, 2017). Furthermore, Grimaldi and Grandi (2005) argued that SMEs owners tend not to value financial planning and project management skills where they would rather opt to manage these disciplines themselves. Consequently, the failure of SMEs is a result of a lack of managerial experience and skills

(Govuzela & Mafini, 2019; Gronum et al., 2012; Lose & Tengeh, 2015). This view concurs with Kamunge, Njeru, and Tirimba, (2014) who posited that SMEs are more concerned with short term gains than long term planning and developing a solid business strategy.

2.6 Predicting Blockchain adoption

Researchers have aimed to understand, predict and explain the factors that influence the adoption of technology at the individual and organisational level (Abbasi, Tarhini, Elyas & Shah, 2015; Tarhini, Arachchilage & Abbasi, 2015; Venkatesh & Zhang, 2010). However, according to Ndienge, Herselman, and Flowerday (2012), there is still a gap concerning the understanding of the adoption of new technology in developing countries and more studies are needed in the SMEs sector (Wright, Bisson & Duffy, 2013). To assist the researcher to understand the factors that influence the adoption of Blockchain among SMEs, a few theories and models of adoption of technology are discussed in this section.

Over the years there have been well established theoretical frameworks about ICT adoption behaviour including the TPB (Venkatesh & Davis, 2000), TAM (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008), UTAUT (Venkatesh et al., 2003) and TOE (Tornatzky & Fleischer, 1990). For this research, the author has discussed in detail the TOE framework because according to Oliviera and Martins, (2011) and Hoti (2015), the TOE framework is the most prominent due to its consideration of the firm-wide environment and has been proven to be effective (Zhu, Kraener & Xu, 2006). Given the challenges faced by SMEs, the TOE framework is adopted as the primary research model for this study.

2.6.1 Technology, organisation and environment (TOE)

The TOE framework identifies three aspects of an organisation environment that influences the process by which it adopts and implements a technological innovation (Oliviera & Martins, 2011). These are technological context, organisational context and environmental context.

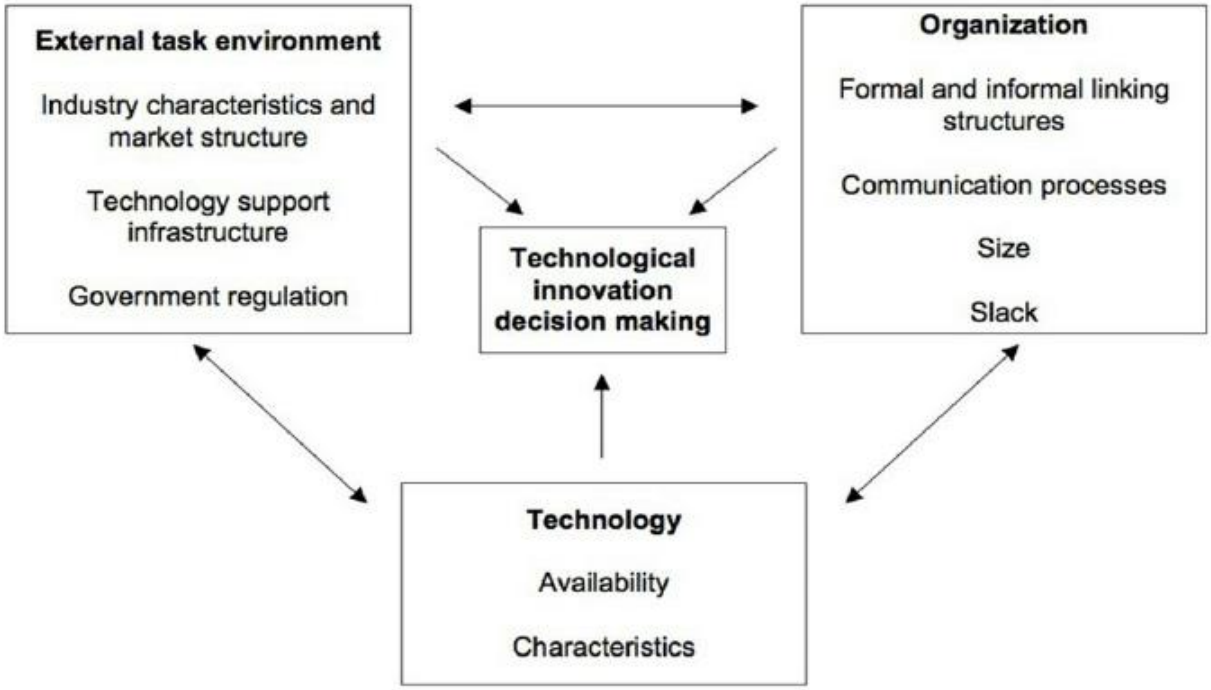
The main focus of the TOE framework is how the existing technology within the organisation as well as the available innovation external to the firm influences the innovation adoption process.

(i) The technological context describes both the internal and external technological relevance to the firm. This includes the use of innovative technology.

(ii) The organisational context refers to an organisation's internal issues such as firm size, products and services, the complexity of its management structure, the quality of its human resources and the lack of available internally resources (Hameed & Arachchilage, 2020).

(iii) The environmental context refers to the political (government policies), economic (interest rates, recession), social (changes in lifestyle, educational levels), technological (changes in technology), regulatory (laws) and economic environment in which the organisation operates. The external environment presents both constraints and opportunities for technological context (Ahmi, Saidin & Abdullah, 2015).

The below figure depicts the TOE model.



Source: Ahmi, Saidin, and Abdullah (2015)

Figure 1: TOE framework by Tornatzky and Fleischer (1990)

The TOE framework can be combined with other theories to better explain technology adoption in organisations.

Technology characteristics in terms of the TOE framework can outline several attributes available to the organisations, both internal and external. For example:

(i) Relative advantage refers to the degree to which the innovation is more productive, costs saving, less maintenance, and or efficient compared to the existing practices. Therefore, SMEs are more likely to consider Blockchain when they perceive that it is a valuable and effective tool for their organisation.

(ii) Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experience and needs of the users. Where SMEs consider Blockchain generally acceptable, it will likely result in a successful implementation.

(iii) Complexity is the degree to which the innovation is perceived as challenging to understand and use (Hameed & Arachchilage, 2020). Innovation that is simple to comprehend is more likely to be adopted by organisations. Where SMEs perceive Blockchain to be complicated, can result in a negative impact on adoption.

Organisational attributes address the facilities and inhibiting factors in the area of operations in a firm. Researchers have advocated the primary importance of organisational determinants compared to other contexts as predictors for innovation (Hameed, Counsell & Swift, 2012). SMEs adopt innovation in response to external demands or to gain a competitive advantage. For SMEs management and skills, technological capabilities are considered relative weaknesses in adopting Blockchain.

(i) Management and skills are critical factors in Blockchain adoption. It is commonly believed that management plays a vital role in all aspects of the adoption of technology (Hameed, Counsell & Swift, 2012; Low, Chen & Wu, 2011) and it is positively related to the adoption of new technology in organisations (Hameed & Arachchilage, 2020). For SMEs, management has a higher involvement, and therefore it can play a pivotal part in decided whether to adopt or not compared to larger organisations with complex structures.

(ii) The size of the organisation is an essential factor influencing innovation adoption (Premkumar & Roberts, 1999). It has a bearing on aspects such as slack resources, decision making and organisational structure (Hameed & Arachchilage, 2020). In their study, Chiu, Chen and Chen (2017) found the size to be significant in both adoption and implementation stages. SMEs have higher flexibility, and that could be an advantage.

(iii) Organisational resources such as the availability of funding play an essential role. Where funding is a constraint, adoption of new technology is minimal. For SMEs, the main question would be the ability to absorb the immediate costs of adopting Blockchain. These costs include research, salaries for people involved in implementation or consultants; therefore, financial expenditure can become considerable (Hwang, Huang & Wu, 2016).

The external environmental factors play a crucial role in the adoption of new technology.

(i) The regulatory environment plays a significant influence on the adoption of new technology (Chiu, Chen & Chen, 2017). Government attitudes, policies and initiatives are essential factors influencing the adoption of innovation for SMEs. In the case of Blockchain, where the regulatory environment has been considered uncertain, this can negatively affect the adoption of Blockchain by SMEs. However, pressures, such as threats of legal sanctions can force firms to pursue specific behaviours.

(ii) Industry characteristics and market structure play an important role in determining the adoption of new technology. Some studies have shown that competitive factors play a large role in determining firm responses to environmental issues (Hwang, Huang & Wu, 2016). For example, customers can force firms to act in a certain way, such as increased online spending. As a result, SMEs can be forced to adopt particular infrastructure to remain relevant (Chiu, Chen & Chen, 2017). Also, firms can follow their competitors merely because they strive to beat their competition (Hwang, Huang & Wu, 2016).

2.6.2 Barriers to technology adoption

In general, there are various barriers to ICT adoption, and these vary in levels from economic, behavioural and organisational (Bessant & Tidd, 2013). Economic barriers include access to information, insufficient incentives and costs. Behavioural barriers include individual priorities, motivations, rationality and inertia. Organisational barriers include funding, skills and organisational goals. The barriers to the adoption of ICT can have their roots pinned to and addressed by the TOE framework. Therefore, a link can be established, which can help SMEs to develop a relationship and how to address these concerns. Common barriers regarding the adoption of Blockchain can be funding, skills capabilities and fear of entering the unknown.

2.7 Blockchain adoption within SMEs

Understanding the Adoption of ICT projects is complex and even more challenging for SMEs due to various factors discussed in section 2 above. Attempts have been made to explain this adoption behaviour from different perspectives. Also, SMEs are inherently diverse and applying the standard models can be difficult. However, the author believes the TOE framework would be the most appropriate framework to approach Blockchain adoption by SMEs in Gauteng, South Africa to be specific.

In this instance, where SMEs are aware of Blockchain and believe that it can add value, the more likely they are to adopt Blockchain. This can be reinforced by communication through government or other agencies explaining the usefulness of Blockchain technology. According to Gimba and Ibrahim (2017), SMEs can have a strong intention to adopt technology but if they believe they do not have either the resources or capabilities the intention will not be realised or vice versa. Thus, the subjective norm can be altered through social pressure, for example, communication, training and support (Chu & Chen, 2016; Lee & Kwon, 2014).

The literature review considered some of the factors that affect SMEs and consequently, can have an impact on the ability to adopt Blockchain. It is noted that SMEs face challenges, some of which have a direct impact on the adoption of Blockchain such as management and skills, technological capabilities and access to financial resources. The author classifies the factors as suggested by Tovstiga (2015) into internal and external. Internal factors are usually controllable by SMEs' management, while external factors are less controllable and are depicted in table 1.

Table 1: Internal and External factors

Internal factors		**External factors**	
Factors	Reference	Factors	Reference
Management and skills – Perception towards ICT such as benefit, cost, ICT and business strategy	Lavia-Lopez & Hiebl, 2014; Govuzela & Mafini, 2019; Gronum et al., 2012; Lose & Tengeh, 2015.	**Access to markets** – competition	Kiveu & Ofafa, 2013; Sitharam & Hoque, 2016
Financial resources – Availability of funding	Govuzela & Mafini, 2019; Makina et al., 2015; Sitharam & Hoque, 2016; Mazanai & Fatoki, 2012; Brei et al., 2020	**Customers** – changes in taste and preferences	Sitharam & Hoque, 2016
Technological capabilities – awareness of benefits – return on investment - management skills	Adeniran & Johnston, 2016; Osembe & Padayachee, 2016	**Government** – regulations	Atlam et al., 2018

2.8 Summary and conclusion

To gain insights on factors that influence the adoption of Blockchain among SMEs, there is a need to fully understand the challenges SMEs face. While the benefits of Blockchain are known, a look-through approach on how they relate to the challenges of SMEs was considered. The literature review identified characteristics that influence the adoption of ICT innovation, as described in table 2 below.

Table 2: Summary of TOE framework judgment

Variables	**Contribution**
Technological	
Relative advantage	The degree to which the innovation is more productive, costs saving, less maintenance, and or efficient compared to the existing practices.
Compatibility	The degree to which an innovation is perceived as being consistent with the existing values, past experience and needs of the users.
Complexity	The degree to which the innovation is perceived as challenging to understand and use
Organisation	
Management and skills	Support of management and owners to the adoption of ICT innovation
Size of the organisation	SMEs have higher flexibility, and that could be an advantage.
Organisational resources	Where funding is a constraint, adoption of new technology is minimal.
Environment	
Regulatory environment	Government attitudes, policies and initiatives are essential factors influencing the adoption of innovation for SMEs.
Competitive factors (customers)	Competition and rivalry increase the likelihood of innovation adoption.

As depicted in table 1 and table 2, a conclusion can be drawn by grouping the internal and external environmental factors that SMEs should consider when considering adopting Blockchain. The TOE framework provides useful insights for this study by aligning the challenges of SMEs and what should be considered in general when considering the adoption of innovation.

The TOE framework defines factors that influence the adoption of new technology that SMEs should consider, for example, relative competitor advantage, management and skills. Lavia-Lopez and Hiebl (2014), pointed out that SMEs have more managerial and skills challenges. The regulatory environment and the state of the customer as a driver for competition also cannot be overemphasised.

3 RESEARCH STRATEGY, DESIGN, PROCEDURE AND METHODS

This chapter discusses the research methodology, which was used to collect and analyse data for this research study. This includes the research philosophy, research strategy, design, procedure and methodology. In addition, the chapter highlights issues that are related to validity, reliability and the extent of generalisability. Notably, the author included justification of the research method chosen whilst contrasting with other methodologies not chosen.

3.1 Research philosophy

The objective of this study was to understand the factors that influence the adoption of Blockchain by SMEs. This means having a candid discussion with the respondents to understand their business challenges and how much they know about Blockchain.

According to Sekaran and Bougie (2013), "a research design is a blueprint for the collection, measurement, analysis of data, based on the research questions of the study". Creswell (2013) defined the research approach as the overall plan for conducting a study and not just a method for data analysis. Furthermore, the author must understand the different philosophies with which the research is conducted. Saunders, Lewis, and Thornhill (2009) argued that the researcher should aim to select the method that provides the best possible answers to the specific research questions by knowing what the findings of the study would mean.

Importantly, there are two philosophical lenses with which the researcher can be influenced. The researcher can be bound by his or her beliefs deduced from the world around or can be uncovered through research, and this is referred to as ontology (Sekaran & Bougie, 2013). Also, the researcher can be influenced by the nature of how he or she has come to know about the world, this is known as epistemology (Crotty, 1998). The table below depicts the various philosophical lenses, according to Saunders et al., (2009).

Table 3: Approaches to research: Ontology vs Epistemology

Philosophy	**Positivism**	**Realism**	**Interpretivism**	**Pragmatism**
Ontology	External, objective and independent of social factors	Objective exists independently of human beliefs.	Socially constructed and subjective	Externally chosen to best answer the research question
Epistemology	Objective truth, focus on causality, reduced from phenomena to simplest elements.	Observable and provide credible data, facts, focus on explaining within a context	Subjective meaning and social phenomena focusing upon details of the situation.	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question.
Data collection techniques most often used.	Highly structured, large samples, measurement, quantitative but can be qualitative.	The method chosen must fit the subject matter, qualitative or quantitative.	Small sample, in-depth investigations, qualitative	Mixed or multiple methods designs, qualitative or quantitative

Source: Adapted from Saunders et al., (2009)

In this study, it can be argued that positivism which seeks to test the correlation between variables was not applicable. Therefore, interpretivism, which has a social construct, was chosen on the basis that it seeks to establish details of a situation and motivating actions. Furthermore, it focuses on a small sample and has a focus on an in-depth investigation (Saunders et al., 2009).

3.2 Research strategy

In line with the research objective, this study lends itself to exploratory research which posited that it is necessary when some facts are known, but more information is needed (Sekaran & Bougie, 2013).

According to Bryman (2012), there are three types of traditional research strategies, also known as research paradigms or research approaches. These strategies are quantitative, qualitative and mixed-method research strategy. The qualitative research approach was considered the most appropriate for this study compared to the quantitative method. According to Milena, Dainora and Alin (2014), qualitative research is considered a solution in investigating the "why" and preferable when the research is oriented to determining motivations, perceptions, or beliefs. This supports the main objective of this study which is to understand the influence of Blockchain adoption within the SMEs sector. Also, Clearly, Horsfall and Hayter (2014) argued that qualitative methods have the potential to explore a topic in-depth because the participants are personally involved. Considering that Blockchain technology is a nascent technology, the majority of research studies conducted thus far are qualitative (Brijmohun, 2017).

There are several types of qualitative research approaches, namely phenomenological, grounded theory, case study, naturalistic, ethnographic, heuristic, narrative and arts-based studies (Cruz & Tantia, 2017). All of these types of qualitative research paradigms focus on deep and insightful meaning (Merriam & Tisdell, 2016, p. 2). According to Hammersley (2013), there is widely available literature that defines what qualitative research entails.

In comparison, a quantitative research method aims to answer the "what" questions such as what number of people prefers product A or B. Bryman (2012) argued that a quantitative study seeks to analyse numeric data to make objective deductions on testing a theory. Consequently, this method is seen as offering "hard" or "factual" data (Barnham, 2015).

The quantitative method was not chosen because the process lacks flexibility, in understanding the "why" aspect which cannot be tested by a questionnaire as an example. Besides, it does not offer the opportunity to observe non-verbal communication which the author argues can reveal a lot when respondents are providing answers.

Table 4 below is a comparison of the qualitative and quantitative research methods.

Table 4: Qualitative vs quantitative research method

	Qualitative	Quantitative
Objectives	To gain an understanding of the underlying reasons and motivations.	To quantify the data and generalise the results.
	To provide insights into the setting of the problem.	To measure the incidence of various views and opinions in a chosen sample.
	Generating ideas and or hypothesis for later quantification	Sometimes followed by qualitative research, which is used to explore some findings further.
Sample	Usually a small number	Usually, large numbers of cases representing the population of interest.
Data collection	Unstructured or semi-structured for example, individual interviews or group discussion	Structured techniques
Data analysis	Non-statistical	Statistical data usually in the form of tabulation

Source: Adapted from Park and Park (2016)

The researcher's choice to employ a qualitative research strategy was also inspired by Ramukumba (2014), who conducted a descriptive qualitative research study using semi-structured interviews on SMEs. Ramukumba (2014) investigated critical success factors that could allow SMEs to become more competitive and achieve growth to reduce South Africa's high rate of SME failure. In that research, Altinay and Paraskevas (2008) advised that conducting interviews in such a case is appropriate and widely used in researches done on SME's as this type of approach seeks to understand characteristic or traits of a specified group, in this case, the cohort of SMEs in Gauteng.

3.3 Research design

According to Bryman (2012), there are five types of research designs. These research design types are cross-sectional, longitudinal, case study, comparative, and experimental research design. Given the deliberations on the literature review and the previous section of this chapter relating to the research

strategy, a cross-sectional research design making use of semi-structured interviews with the participants was considered to be appropriate for the collection of data.

According to Spector (2019), the cross-sectional research design is one of the most extensively used research designs in literature and research. A cross-sectional research design is defined as a type of observational study where the researcher can concurrently investigate the outcome and exposure of the participants at the same point in time (Setia, 2016). Although with some limitations, a cross-sectional research design can tell the researcher at a point in time, what is of value to the research (Spector, 2019). Cross-sectional studies if implemented well can be conducted relatively quicker and cheaper than other research design methods (Setia, 2016).

The researcher's choice of a cross-sectional research design study making use of semi-structured interview questions was encouraged by a similar type of study conducted by Pérez-Elizundia, Guillermo and Delgado-Guzmán (2020). The authors investigated the reasons why the financing offered by Mexican banks through factoring was inefficient for the growth of SMEs in that region. To answer the research question, the authors made use of a cross-sectional research design and created semi-structured in-depth interviews with a few participants that were knowledgeable in this alternative financing model. According to Pérez-Elizundia et al. (2020), this type of research design allows for critical factors to be identified and applied to a more general context. Ray (2020) also agreed that this type of research design is appropriate for descriptive and exploratory objectives, such as in this research study.

3.4 Research procedure and methods

This section documents the actual procedure and the methods employed in this research to collect, collate, process, and analyse empirical evidence. Broadly, we detail the data and information collection instruments (Section 3.4.1), the target population and sampling of respondents (Section 3.4.1.2), the ethical considerations during the research process (Section 3.4.2), data and information collection process and storage (Section 3.4.3), data and information processing and analysis (Section 3.4.4) as well as the background description of the respondents who provided empirical evidence for this research study (Section 3.4.5).

3.4.1 Research data and information collection instrument(s)

There are two sources of data collection, primary and secondary (Bryman, 2012; Creswell, 2013; Saunders et al., 2009; Sekaran & Bougie, 2013). According to Moyo (2017), data and information collection instruments are a central component of the research process, since they provide the practical basis for discovering answers to given research questions. Described as the technique used to physically collect data that will be analysed in a research study, thoughtful consideration of the method needs to be achieved

to have a high quality and insightful research study (Cruz & Tantia, 2017). There are two main types of data collection instruments when using a qualitative study, one either administers research observations or conducts interviews (DeVaney, Spangler, Lee & Delgadillo, 2018).

To address the research question, primary data was collected using in-depth interviews wherein semi-structured interviews were conducted. Saunders et al. (2009) described semi-structured interviews as interviews where the researcher could have a combination of predefined questions and ones that will depend on how the interview goes. The discussions can meld around the topic rather than adhering slavishly to verbatim questions as in a standard survey. This approach can benefit the study by possibly exploring other issues that were initially unforeseen (Adams, 2015, p. 493). In-depth interviews, according to Boyce and Neale (2006), involves intense individual interviews with a smaller number of respondents on a particular idea.

Comparatively, data can be collected using secondary methods, and according to Sekaran and Bougie (2013), it refers to using existing information for research purposes. Whilst data collected using existing information can be cheap and readily available, it is however not suitable for this study. Data might have been collected for the same reasons, but the circumstances might be different, and much has changed due, for example, to the current pandemic.

Due to the author opting for interviews, it is imperative to consider its advantages and disadvantages, and these are depicted in the table below.

Table 5: Advantages and disadvantages of interviews

Advantages	**Disadvantages**
Much comprehensive information can be obtained	The interviewer needs to be trained
Feedback is immediate, and the interviewer can clarify questions.	Can introduce interviewer bias
The interviewer can read the non-verbal language.	Takes a lot of personal time

Source: Adapted from Sekaran and Bougie (2013) and Bryman (2012)

The researcher's choice of a semi-structured interview schedule was inspired by a similar type of research study conducted by Asamoah and Mackin (2016).

The researchers investigated the experiences of first-year PhD students at the University of Ghana to the Educational Technology and Innovation Course Adlt704 that was designed to enable students to manage their technological learning resources. In this investigation, a semi-structured interview schedule was used for the collection of primary data. According to Asamoah et al. (2016), semi-structured interviews were ideal to obtain detailed narrative accounts of the participant's experiences with the technology course.

3.4.1.1 Research target population

The target population for this study was SMEs within Gauteng, South Africa, of which a sample was drawn. According to Ayandibu and Houghton (2017), SMEs are defined as businesses that employ less than 250 employees, an annual turnover of less than R64 million with a capital asset of less than R10 million and has direct managerial involvement by the owners. Bryman (2012) opined that the decision for sample size is affected by time and costs.

The researcher's choice of the target population was inspired by a similar type of research study conducted by Naushad and Sulphey (2020), where the researchers explored mechanisms to prioritise the factors that could improve the adoption of ICT among SMEs in the Kingdom of Saudi Arabia (KSA).

3.4.1.2 Sampling or selecting respondents from the target population

A sample is defined as a subset of the population (Sekaran & Bougie, 2013). According to Merriam and Tisdell (2016, p. 96), there are two basic types of sampling methods. The types are probability sampling and non-probability sampling. The non-probability sampling technique was selected as the method of choice for this research study as a generalisation in a statistical sense is not a goal for a qualitative research study. According to Lopez and Whitehead (2013, p. 124), there are four types of non-probability sampling techniques, these are convenience sampling, purposive sampling, snowball sampling and theoretical sampling.

The sampling technique for this study was non-probabilistic of which a purposive sampling strategy was employed. Non-probability sampling is more contented and cheaper to administer, but it has a higher risk of sampling bias. Sekaran and Bougie (2013) posited that purposive sampling involves the researcher using their judgement to select a sample that is most useful to the purpose of the research.

According to Horsfall and Hayter (2014) who and how many participants to interview depends on what the study entails, and the purpose of the enquiry and the adequacy should involve thoughtful decision-making. Consequently, when to stop the gathering of information is dependent on redundancy or saturation of information (Clearly et al., 2014). Redundancy and saturation in this instance refer to when no new themes are emerging after exhausting all the questions. Accordingly, six interviews were conducted, and a saturation point was reached on the sixth interview.

The researcher's choice of sampling was inspired by a similar type of research study conducted by (Parkin, 2020). The research aimed to assist practice theory on how SMEs can be more successful in establishing interpersonal partnerships. According to this research, to thrive, these SMEs must focus on joint work as drivers of growth and competitive advantage. The research used a qualitative research technique that used semi-structured interviews with six engineers who work at different levels in their organisations. A purposive sampling technique was used because it assisted in the acquisition of rich and resolute insights (Parkin, 2020). This sampling technique equally benefits the research study as it is time and cost-effective (Merriam & Tisdell, 2016, p. 101).

3.4.2 Ethical considerations when collecting research data

When conducting research, the researcher needs to be fully aware of the ethical principles and standards involved in the research, because issues of ethics may arise at different stages of the research process and will relate directly to the integrity of the research study (Bryman, Bell, Hirschsohn, Dos Santos & Du Toit, 2014). In general terms, ethics is defined to be the comprehensive observations of human norms and beliefs (Dhai, 2019, p. 3). For a qualitative research strategy especially, the researcher needs to be clear on the codes of conduct and acceptable ethical practices (Roth & von Unger, 2018).

In this study, the main ethical consideration relates to integrity and honesty. To manage this issue, the author briefed the participants on the purpose and objective of the study as well as seek consent for their participation in line with the university policy both on a personal level and also for the participation of their organisation.

Furthermore, participants were told that the research is anonymous and therefore no names were required, and data collected was only used for the intended purpose and will be guided by the university ethics policy. The interview sessions were recorded on audio and video and were stored on Microsoft One Account, which is a cloud-based storage platform.

3.4.3 Research data and information collection process

There are two methods to data collection namely, primary and secondary. Primary data collection can be divided into two groups: qualitative and quantitative. Qualitative research aims to ensure a greater level of depth of understanding and the methods used to collect data include interviews, questionnaires with open-ended questions, focus group and observations. Interviews can be conducted through face to face, telephone or internet-based)

For this study, interviews were conducted through Microsoft Teams, Zoom and Skype. The methods were chosen on the basis that they are cost-effective, have a wide reach and offers the opportunity to record the interviews. Importantly, due to the current COVID pandemic, it is also a safer option.

In their study, Sarosa and Zowghi (2005) set out to establish the factors that are considered, in practice that influence the adoption process of ICT within Indonesian SMEs. Data was collected using semi-structured interviews. The main advantage derived from the method was that it provided an in-depth understanding of the research problem. As a result, this study can benefit from a similar approach.

(i) Cost-effective.
(ii) Wide reach since no travelling is required on both parties, and
(iii) A better understanding of the research questions.

3.4.4 Research data and information processing and analysis

3.4.4.1 Research data and information processing

The author adopted Bryman's four-stage thematic coding for data analyses illustrated below. The below table illustrates the data analysis process. The interviews were recorded with the respondents' permission.

Table 6: Bryman's four steps of analysing data

Activity	Description
Getting a sense of the data	The author listened and read through the notes taken during the interviews. Notes were taken, themes and patterns were noted.
Preparing the data	Following on the above, the author re-read the transcript and grouped the key themes that were noted.
Coding data	Key themes highlighted were grouped on the back of key findings from the literature review. Thematic coding methodology was used.
Analysis	The author followed three concurrent flows as suggested by Miles and Heberman (1994), data reduction, data display and conclusion drawing.

The process was iterative throughout. According to Saunders et al. (2009), the interactive nature of data collection and analysis allows the researcher to recognise important themes, patterns and relationships as data is collected. After the above, the presentation of the findings is supported by direct quotations from some of the critical responses that clearly articulated responses to the research

questions. Also, general observations common to most respondents are explicitly cited. The data collected was summarised in various ways, for example, word frequency in a table, pie charts and bar graphs where appropriate.

3.4.4.2 Research data and information analysis

There are various qualitative data analysis methods such as content analysis, narrative analysis, discourse analysis and the grounded theory method (Bryman, 2012). For this study, content analysis was chosen because it is the most common method used to analyse qualitative data. And it is usually used to analyse responses from interviewees.

In their study, Sarosa and Zowghi (2005) set out to establish the factors that are considered, in practice that influence the adoption process of ICT within Indonesian SMEs. Content analysis was used because it allowed the identification of patterns and themes within the data. As a result, factors affecting the adoption of ICT within participants could be identified and other relevant information not directly related to the adoption of ICT. Consequently, a similar approach can benefit this study because outside of ICT adoption, it can reveal enriching information about SMEs outside of Blockchain adoption, which can be useful.

3.4.5 Description of the research respondents

At the research reporting stage of this research, a detailed description of the characteristics of the research respondents has been provided. A purposive sampling technique was used because it assisted in the acquisition of rich and resolute insights (Parkin, 2020). This section highlights and describes the demographic characteristics of the six research respondents.

Industry Type - Most of the respondents (83%) were professionals working in the ICT sector as depicted in figure 2 below.

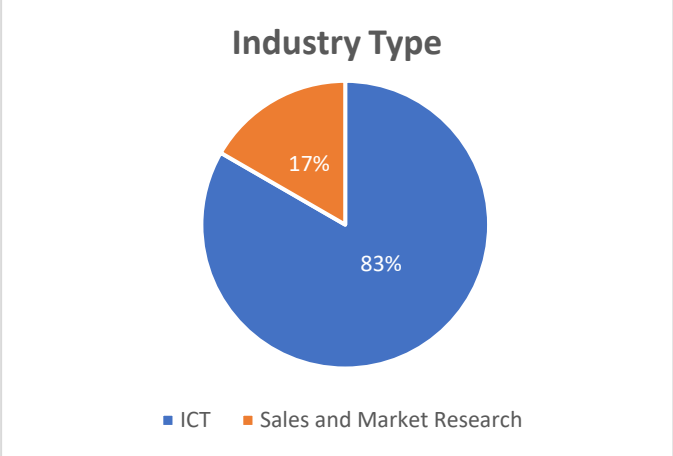


Figure 2: Respondents by industry type

Designation in Company - Figure 3 below shows a representation of those who have the authority to decide within their respective SMEs. The majority (50%) of the respondents were managing directors of the company, with 33% being founders of the companies.

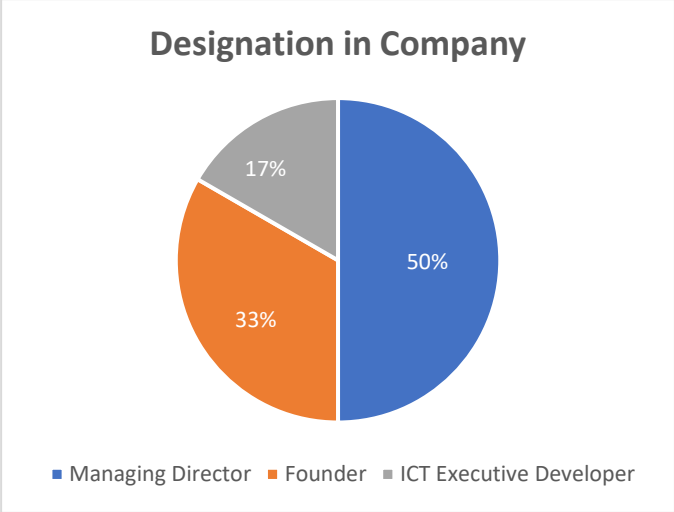


Figure 3: Designation in company

Education - The author sort to understand the respondents' educational background to draw some inference to the fact that would there be a bias towards understanding the subject of the research as well as their related work experience. Figure 4 below illustrate the respondents' work experience. Most respondents had a bachelor's degree or higher (83%), and all respondents had between five and ten years of work experience.

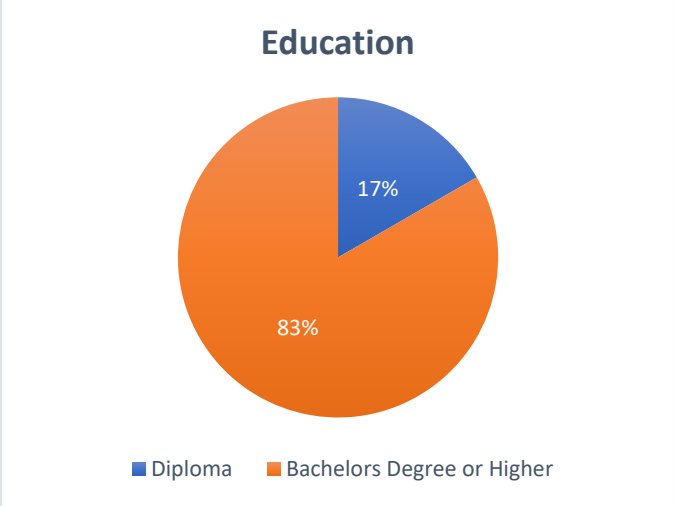


Figure 4: Educational background of respondents

Age Group - Age was considered an important factor because it can give insights because generally younger people tend to technologically savvy compared to the older generations. The majority of the respondents (83%) were between the ages of 25 – 35.

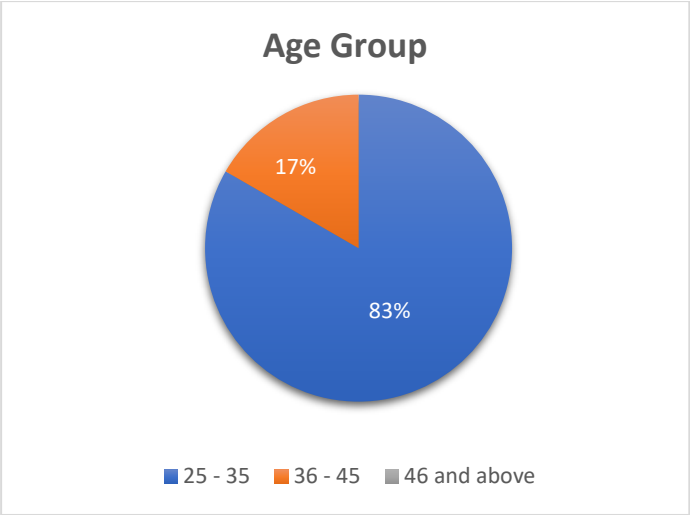


Figure 5: Respondents by age

No further analysis was done on gender because the author strongly believed it would not impact the results.

3.5 Research strengthens — reliability and validity measures applied.

To ensure that the data collected represent a true reflection of the intended purpose, it is vital to ensure that data is verified. For qualitative research studies, verification of data can be through various means such as triangulation, prolonged engagement, persistent observation and thick description (Creswell, 2013).

Barnham (2015) posited that triangulation could make qualitative research seem more objective. Thus, triangulation, according to Creswell (2013), refers to a process that typically involves corroborating evidence from different sources to shed light on the theme and perspective that emerge. To support the view, the author considered SMEs in the same ICT industries but in different circumstances.

To ensure the reliability of the research, the author used a technique of persistent observation. This entails making similar observations on different occasions noting similar outcomes. Also, a thick description was used. This refers to a process of paying attention to contextual details in observing and interpreting a social meaning. These approaches in essence have enhanced the data quality being collected in this qualitative research.

Due to the small sample size, the results cannot be generalised and thus remains applicable to the selected SMEs in the sample. Nevertheless, it forms a basis for other academic researches. However, discussing with a small group enhances the richness of data being collected because of the focus on not chasing numbers but rather depth.

3.6 Research weaknesses — Technical and Administrative limitations

The research design and data collection method are an integral part of a research study. However, there are limitations to any method chosen. By design, the qualitative method suffers from a limited sample. Also, in-depth interviews offer enormous amounts of data that require analyses which is time-consuming (Creswell, 2013). Also, the skills of the author in data analysis of this magnitude have not been tested, which can limit the depth and quality of the results. Another drawback of the research method concerning interviews is that whilst every effort is made to give comfort to interviewees; there is no guarantee that they will give an accurate description of their experiences. This can be caused by anxieties that come with interviews. As highlighted briefly above, the small sample size of this research can pose a threat to the biasness of results. Lastly, when to stop the interviews is guided by themes that emerge, and this might be problematic.

4 PRESENTATION OF RESULTS

This chapter details the analysis procedure followed and presents the findings thereof. The discussion follows key focus areas as identified in table 2 above. Furthermore, data will be presented and guided by key findings which are underpinned by insights from the literature review. Data collected is visually summarised in bar charts, pie charts and tables.

The main objective of this research was to explore and understand typical considerations for SMEs when adopting new technology, specifically Blockchain. The study focused on the below questions:

1) What are the key challenges of SMEs concerning technology adoption?
2) What role does the internal and external environment play in the adoption of Blockchain?

4.1 Fieldwork

The interviews followed the same format stated below.

- The author explained the purpose of the interview.
- The author took the respondents through consent for participation in the study.
- The author explained the matter of confidentiality.
- Informing participants that neither their identity nor names will be disclosed in the report.
- The author also highlighted the expected average duration of the interview session.

Conducting the interview.

- The author followed a semi-structured interview guide throughout the interview session.
- Respondents were allowed to ask questions during and at the end of the interview.

4.2 Response guide overview

Three pilot interviews were held to check if the questions had a concise and logical flow and whether they were understood correctly. It was evident that the author needed to explain more on question number one, relating to the respondents understanding of what Blockchain was. Furthermore, it allowed the author to make observations on non-verbal communication and the level of interest in the topic. The interview guide is attached and can be found in appendix 1.1 of this research report.

Six interviews were held with the interview guide split into two main sections namely, internal factors and external factors. This enabled the researcher to explore and understand typical challenges for SMEs when adopting new technology as guided by findings in the literature review. At the end of

each interview, the respondents were allowed to ask questions or add more information that they thought was useful. Most respondents had useful comments that added to the richness of the interviews. All the interviews were held in a candid way which makes the results useful. The interviews took an average of 48 minutes each. Interestingly, all respondents were more than willing to participate in the study and share their experiences. The results and discussions focus on the key themes that emerge and provide findings on the three sections named above.

4.3 Internal factors

In line with the literature review, the author sort to understand factors that influence the adoption of Blockchain, and internal factors were considered first.

4.3.1 Management and skills

4.3.1.1 Question: Are you familiar with Blockchain technology?

Most respondents (50%) stated that they were relatively familiar with Blockchain technology, with 33% confirming that they were aware of it and 17% indicating that they think they understand Blockchain, summarised in figure 6 below.

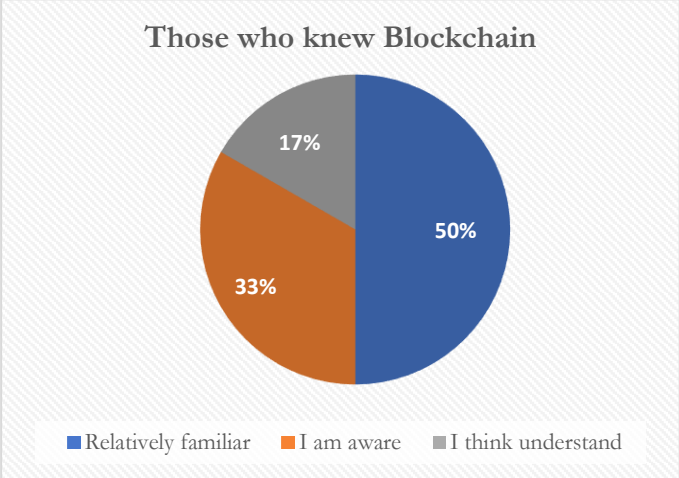


Figure 6: Respondents' knowledge about Blockchain

As this was not relatively clear, the author sort to understand from respondents how they would describe Blockchain. Figure 7 below illustrates the respondents' description of Blockchain

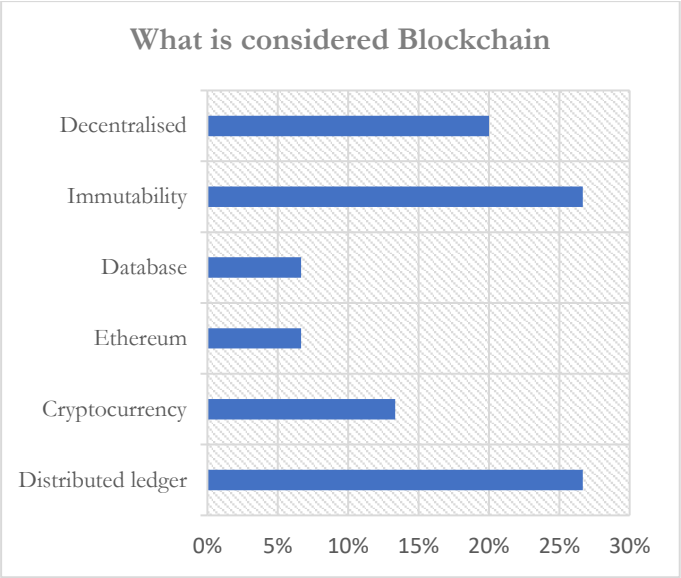


Figure 7: Description of Blockchain

A distributed ledger (27%), immutability (27%) and decentralised (20%) were terms that were mostly used to describe what Blockchain was. This suggests that all the respondents had some knowledge of what is Blockchain. Extracts from some of the respondents have been highlighted below.

"I am relatively familiar with Blockchain technology, I have also recently bought a book to expand my knowledge. Basically, my understanding of it is that Blockchain is a technology that allows you to store information across a distributed ledger, known as a network of computers" (Respondent 1).

"I think I understand Blockchain in its building principles and not from a technical configuration point of view. With Blockchain technology, the storing of that information is then distributed on computers worldwide on multiple servers" (Respondent 3).

"Blockchain technology from my view is about a distributed database" (Respondent 5).

4.3.1.2 Question: Have you considered integrating Blockchain into your business?

Having understood the respondents' view of what Blockchain was, the researcher found that most respondents (50%) had considered implementing Blockchain. However, 33% decided against the integration and 17% were unsure about their take on it. Figure 8 below depicts respondents who have considered implementing and integrating Blockchain into their business.

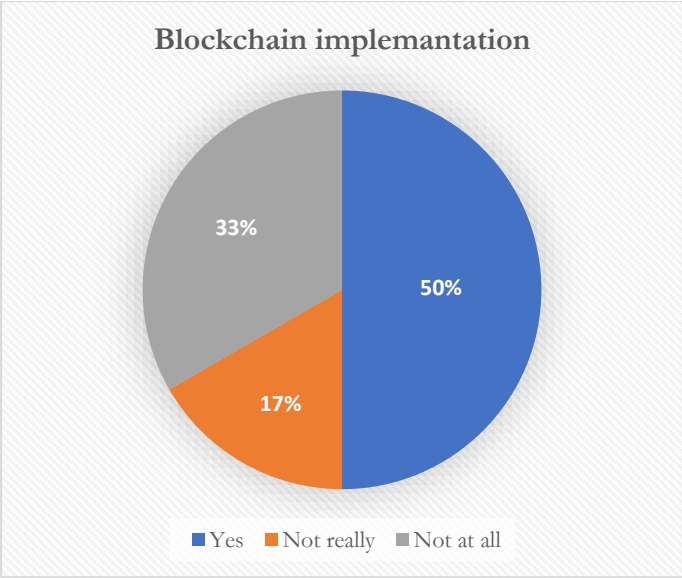


Figure 8: Consideration for Blockchain implementation

The below are extracts and views of those who considered implementing Blockchain technology.

"Basically, my business runs on the Blockchain, it is a cryptocurrency exchange" (Respondent 5).

"Yes, we have thought about Blockchain as a strategic alternative. However, practically where we are right now, the industry we are targeting is not ready for it as such" (Respondent 3).

"As an organisation, we have had some conversations where the use case was around using Blockchain to guarantee the integrity of how we process personal information" (Respondent 1).

The most commonly cited reason for not considering Blockchain was that the technology was fairly new and not well understood (67%). One of the respondents stated that "*for me, I would not say I am passionate about it, I just think it is a cool technology. However, I think it is over-hyped at the moment" (Respondent 2).*

4.3.1.3 Question: Do you believe you have the skills required to support the project?

Despite having considered or not considered the use of Blockchain in their business, respondents were asked if they had the skills capacity to implement Blockchain. Most respondents (60%) believed they had the skills required to implement a Blockchain technology project, with 40% stating otherwise.

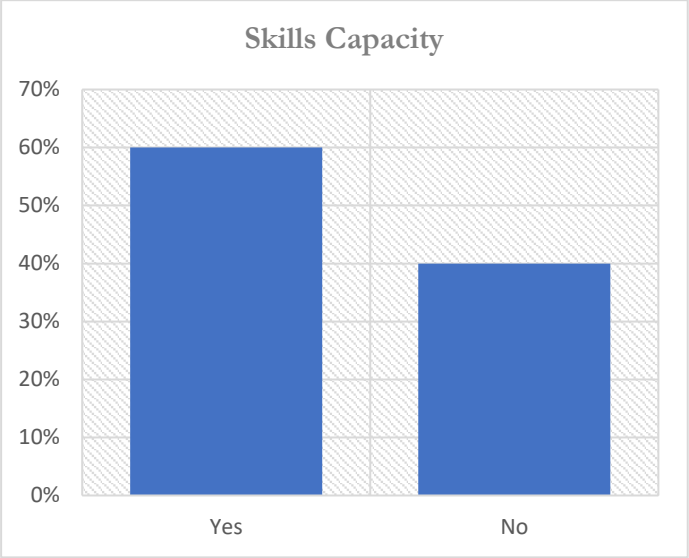


Figure 9: Respondents with the skills capacity to implement Blockchain

The responses reflect the fact that the majority of the respondents were working in the ICT sector which is naturally their area of expertise.

For those who cited lack of skills capacity, the majority (86%) believed that there was a lack of skilled resources whilst 14% stated that their companies were too small to implement Blockchain.

"People are not really educated enough about Blockchain" (Respondent 6).

"Our company is still very small" (Respondent 4).

4.3.2 Financial resources

4.3.2.1 Question: Do you believe you have the financial resources to support the implementation of such a project?

According to Gutter and Saleem (2005), limited financial resources result in most SMEs taking a conservative approach towards the adoption of ICT projects. The research showed that most SMEs (67%) did not have the financial means to adopt Blockchain as depicted in figure 10 below. Those without financial resources cited a lack of understanding of what Blockchain was as the main reason why trying to raise funding through other means would not work. According to Respondent 5, "*it is not easy to raise funds for Blockchain technology. Even the people in incubators, they do not fully understand Blockchain and the direction it is going, that creates a barrier on the financial level".*

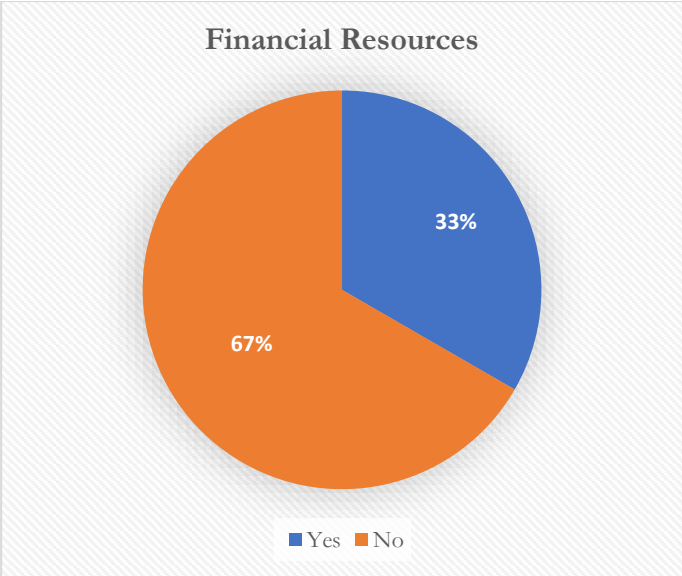


Figure 10: Financial resources capacity

Some of the respondents cited that their companies were barely managing.

"As I highlighted our companies are merely focused on survival in the immediate future" (Respondent 1).

"Right now, where we are financially as a company, we are just managing to break even" (Respondent 4).

One company that cited having financial means to implement Blockchain technology, without necessarily doing it, stated that there was a lack of clear business case to implement. According to Respondent 2, "*this exercise must be able to demonstrate the additional yield and return before we can invest limited financial resources."*

4.3.3 Technology capabilities

4.3.3.1 Question: Do you think SMEs in South Africa, Gauteng to be specific, are information technology savvy?

A question was posed to the respondents to understand if they think South African companies have the necessary technology acumen to be able to compete with other markets.

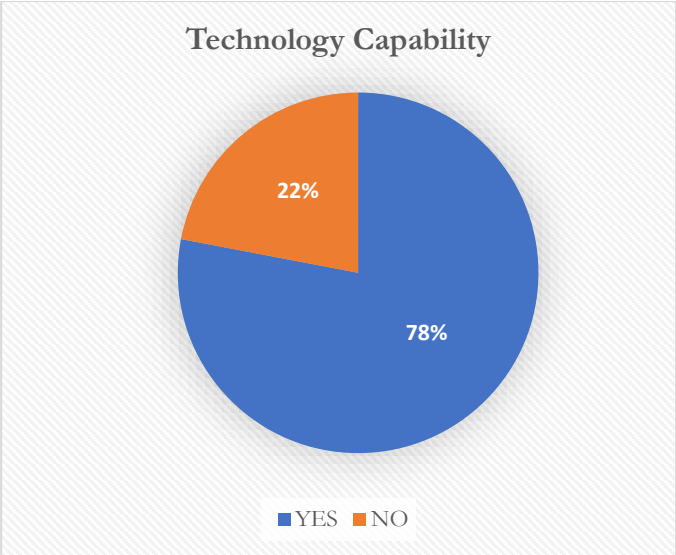


Figure 11: Technology Capability

Most respondents (78%) stated that South African SMEs were moving in the right direction. However, others (22%) felt South African SMEs were generally a couple of years behind the rest of the world. According to Respondent 4, *"even though South African SMEs have an entrepreneurial spirit, we are largely still very conservative and cautious in our approach to business"*.

4.3.3.2 Question: Have you implemented other ICT projects in your company?

Due to the varying degrees of understanding of Blockchain, the author sort to understand whether SMEs had implemented other ICT system before because this could be a sign of low technology adoption in general (Lee & Kwon, 2014). The research shows that the decision to implement technology was mainly influenced by the owner and senior manager (57%), organisational needs (37%) and other (6%). Those who decided to consider Blockchain were influenced by personal benefit (46%) and knowledge of the technology (22%). Other reasons cited were the availability of a support network (12%). Organisational needs were driven by developments in the market (25%) and having a capable team (16%).

The following table is a breakdown of the drivers and justifying factors.

Table 7: Previous technology implementation drivers – Own Analysis

Owner and senior manager's decision (57%)	Organisational needs (37%)	Other (6%)
Justifying factor	Justifying factor	Justifying factor
Knowledge – 22% Support network – 12% Personal benefit – 46%	Capable team – 16% Market Development – 25% Strategy – 8%	Fear of losing out – 18%

"I think the ones that read up and use technology understand what it can do for them. (Respondent 5).

I generally think we do. I think such things really depend on the core of the team wanting to learn new technology" (Respondent 6).

Few respondents cited other factors in their decision to implement technology previously. However, they felt the issue of finance and skills capabilities were the major hindrance to implement technology in general for SMEs.

4.4 External Factors

External factors play an important role in the adoption of Blockchain and ICT in general.

4.4.1 Customers

4.4.1.1 Question: Do you think customers are a key driver in the adoption of Blockchain?

Figure 12 below presents the opinions of respondents when asked about the role played by customers in pushing SMEs to consider Blockchain. 67% felt customers do not play a role whilst 33% felt customers could play a role.

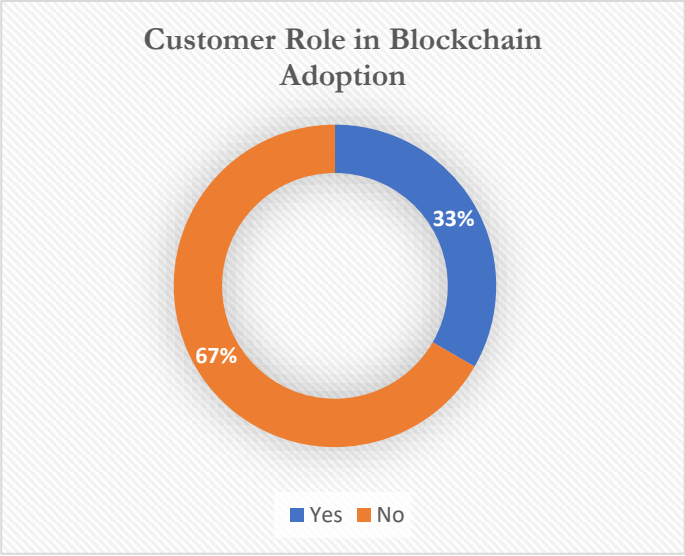


Figure 12: Customer role in Blockchain adoption

When probed further, respondents had mixed views on the role of customers in the adoption of Blockchain. Those who indicated that customers had no role in the adoption of Blockchain cited various reasons depicted in figure 12 below. The most common reason was that customers are happy with the current service (39%). This was primarily due to SMEs indicating that they were able to meet their customer needs (28%). Another common reason was that SMEs believed it was more of an internal decision rather than an external (16%) and the motive would be reducing costs and improving operational efficiencies (9%).

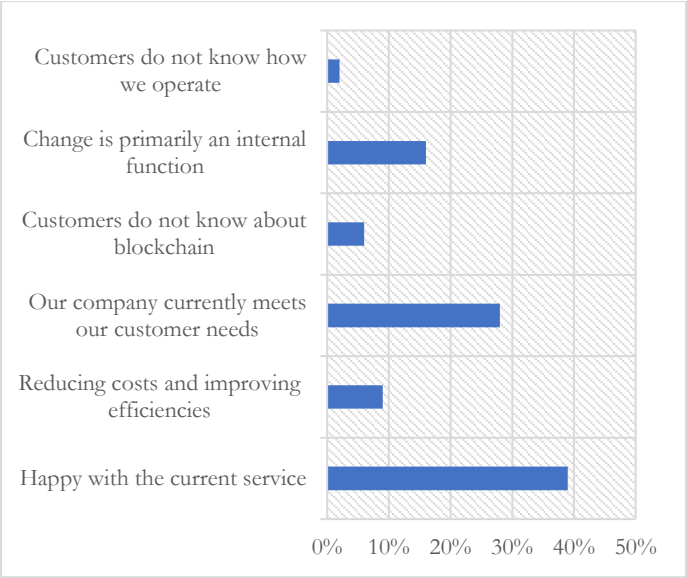


Figure 13: Reasons why customers are not drivers of Blockchain adoption

4.4.1.2 Question: Who should be responsible for creating awareness on innovations such as Blockchain?

Lastly, it was interesting to note that some of the respondents felt their customers were not aware of Blockchain. As a result, the author probed who was responsible for creating awareness of Blockchain technology. Most respondents (88%) argued that it was the role of the government while 9% stated that it was established organisations such as banks as depicted in figure 14 below.

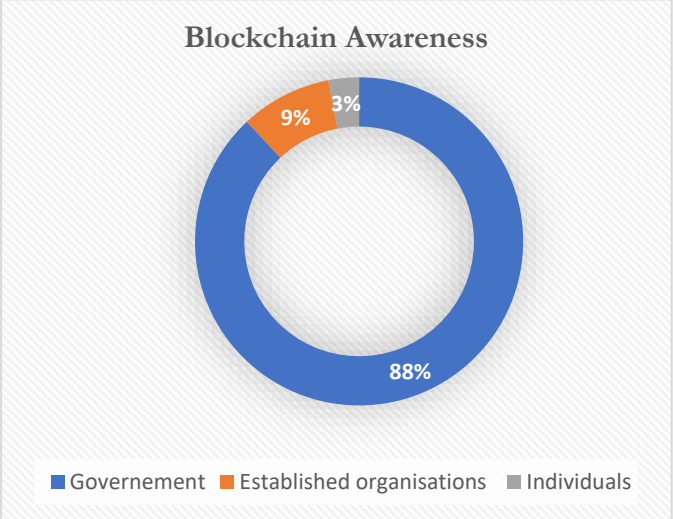


Figure 14: Blockchain awareness drive

Below are some of the respondents' expression.

"I strongly think that the government has a major role to play in driving Blockchain awareness" (Respondent 3).

"Banks have a big balance sheet, therefore they are best placed to drive Blockchain awareness" (Respondent 6).

4.4.2 Government regulations

4.4.2.1 Question: Do you think there should be policy and regulations in this industry?

Most of the respondents 67% indicated that it was important to have regulations in the industry with 33% arguing to the contrary. The respondent (100%) who argued that government should not regulate the industry stated that there was a misalignment between the expectations of the industry and government regulations been proposed.

"*I think the core challenge is that there is a misalignment on the roll-out plan. You cannot have a blanket approach for this kind of thing*" (Respondent 5).

Respondents who were in favour of regulations cited various reasons such as:

- Regulations make it more comfortable to embrace Blockchain.
- The government should step in to create an even playing field.
- The government should create a supportive environment.

Considering this, the author probed if South African SMEs were risk-takers in their drive to embrace innovation.

4.4.2.2 Question: Do you think South African SMEs are generally risk-takers when it relates to innovation?

In most cases, respondents confirmed that SMEs, in general, were risk-takers as illustrated in figure 15. Below are some of the respondents' expressions.

"*I think South Africans are very innovative and do take risks in business. I think that the government is not doing enough to make use of the talent and create the right environment for business*" (Respondent 6)

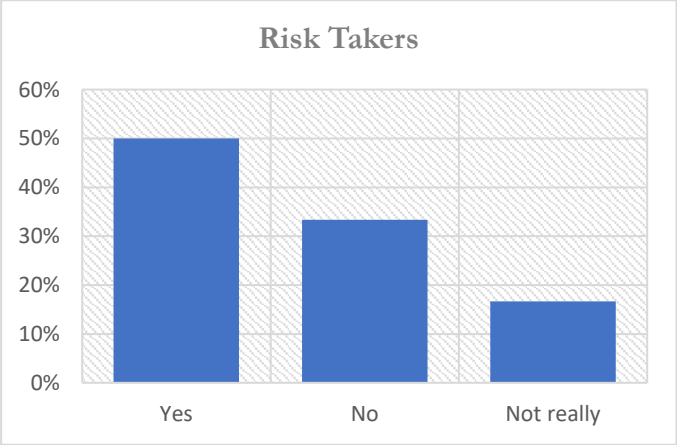


Figure 15: Are SMEs in South Africa, Gauteng risk-takers

A few respondents thought risk-taking was not related to the adoption of Blockchain. Instead, they stated that it was about what makes business sense and adds to the competitiveness of the organisation.

4.5 Summary

In summary, the above data analysis supports and gives insights into the research questions and objectives. This also highlights that the TOE framework was useful to define factors that influence the adoption of new technology as expressed in table 2 above. Consequently, giving a better understanding of what influences the adoption of Blockchain adoption among SMEs in South Africa, Gauteng. The analysis sets out the discussion of finding to be discussed in the next chapter.

5 DISCUSSION OF RESEARCH FINDINGS

This chapter provides a discussion of the findings that are derived from the data in chapter four above. The findings are following the research objectives and are related to key aspects of the literature review. Furthermore, new findings discovered in the data collection process that support understanding of the research questions are also discussed. Using the TOE framework, the analysis was structured according to the themes as identified in the data collection process, highlighted in table 6 above.

5.1 Internal factors

5.1.1 Management and skills

The findings of this research showed mixed results but suggested that SMEs had the minimum required skills and knowledge to successfully adopt and implement Blockchain technology. However, it is important to note that most of the respondents had an ICT background which could explain the divergence from the view posited by Lavia-Lopez and Hiebl (2014); Kuyoro, Awodele, Alao and Omotunde (2013), who argued that SMEs tend to have more managerial and skills challenges, and this resulted in slow adoption of new technology. However, a respondent who supported the view of Lavia-Lopez and Hiebl (2014) indicated that getting the right skills within the teams was generally a challenge, and it was not so much about management.

Kamunge, Njeru and Tirimba (2014), suggested that SME owners and senior management were more concerned with short term gains than long term planning and developing business strategy. The research data affirms this view because Blockchain adoption was found to be low due to management's view of its short-term gains. Owners and senior management suggested that it was easier to consider Blockchain technology if it was evident that there was going to be an immediate improvement in their margins, and at the current moment based on the information they had, it was not proving to be the case. With the current pandemic, most SMEs have been focused on surviving as opposed to investigating innovation that may lead to their growth prospects.

5.1.2 Financial resources

According to Sitharam and Hoque (2016); Mazanai and Fatoki (2012) and BASA (undated) access to finance was a considerable obstacle among SMEs. This is in line with the research findings because most respondents confirmed that they lacked financial resources to pursue Blockchain adoption if they had to consider it. The majority of the respondents confirmed that they could not afford to pay for resources with such skills since they are in short supply. Also, it was found that raising funding to pursue Blockchain was not viable because Blockchain was not well understood and investors were not willing to take the risk.

An interesting finding that emerged was how Blockchain was perceived to be expensive to implement even though it was evident that respondents were making assumptions as one responded noting:

"*From my perspective Blockchain sounds very expensive. I guess that is also a reason why I thought I would potentially consider it when we are a bit bigger*" (Respondent 3).

Another observation by the author was that Blockchain was perceived as not being understood well, therefore funders and financiers would not ordinarily consider it because it was deemed very risky, with one respondent saying:

"*I think this type of technology is still a bit risky because it is still new and unfamiliar to people. It would be very risky for any funder*" (Respondent 3).

One responded suggested that peer to peer funding should be considered for Blockchain however, the challenge would be finding and building the right networks.

The government was also considered not helping the cause as another respondent described:

"*If one goes to government agencies such as the Industrial Development Corporation, cryptocurrency and any Blockchain type of business are not recognised as valuable industries to invest in. The government needs to put investment in this sector as well*" (Respondent 2).

The above views are in line with the literature of Gimba and Ibrahim (2017), who suggested that SMEs can have a strong intention to adopt technology but if they believe they do not have either the resources or capabilities the intention will not be realised.

5.1.3 Technology capabilities

The author posed a question to respondents to understand if they had implemented an ICT project before and if they believed that they have the right skills, the technology savviness to implement Blockchain.

According to Salami, Taghavifard, and Majidifar (2015), technological capabilities are critical for SMEs in their ability to replace and acquire new technology. The research found the decision to implement technology was mainly influenced by the owner and senior manager (57%) and organisational needs (37%). This concurs with the view of Kumar (2013) who stated that owner and senior manager characteristics, organisation characteristics and costs played a role in the organisation's technology capabilities. The findings suggest that previous capabilities played no role in the adoption of Blockchain technology. However, there was a good suggestion that knowledge of technology played a key role in the decision to implement new technology. Despite that, the current environment in which SMEs find themselves seem to suggest that adoption of Blockchain will continue and remain very low.

There was a strong sense that there was a need for SMEs to be educated about Blockchain and the government was suggested to be the key stakeholder needed to provide support. Some of the respondents stated that:

"The government just needs to ensure that there is sufficient support for SMEs" (Respondent 2).

"*I think the Council for Scientific and Industrial Research (CSIR) which is a government agency should be giving people exposure to the technologies such as Blockchain*" (Respondent 4).

This observation supports Chu and Chen (2016); Lee and Kwon (2014) who argued that subjective norms can be altered through social pressures such as training support and communication. Another interesting observation by the author was that SMEs tend to compete and work in silos, thereby making it difficult to create partnerships that leverage their strengths, which would ultimately help elevate the service delivered to customers. Therefore, it was not likely that an individual SME would find the right solution on their own. In addition, Blockchain was still considered very new, such that its basics needed those with experience to assist and lead the industry.

5.2 External factors

External environmental factors such as customer preferences and government regulations have been identified as influencing the adoption and implementation of technological innovation. The external environment presents both constraints and opportunities for a technological context (Ahmi, Saidin & Abdullah, 2015). The following external environment themes were discovered in the data collection process.

5.2.1 Customers

The research found that customers had no innate desire to use Blockchain solutions, instead the motive to improve the services to customers was mainly driven by the SME's internal aspirations to reduce costs and improving internal operational efficiencies. This supports Sitharam and Hoque's (2016) view that changing market trends are essential attributes within the external environment that leads to the adoption of new technology. However, there was a strong consensus that customers did not influence the adoption of Blockchain itself. This is attributed to the fact that SMEs did not think customers were aware of Blockchain technology.

"*Unfortunately, the customer is somewhat delaying in educating themselves about the technology, that puts pressure on businesses not to create solutions and adopt at the rate that would be profitable*" (Respondent 2).

SMEs who considered Blockchain argued that the market was not wide enough to warrant such an investment. Also, it was argued that were the market was wide and deep enough Blockchain would be

more acceptable and the result would be an improved return on investment. However, SMEs mentioned that it would be ideal to use Blockchain if it was currently practical.

5.2.2 Government regulations

The research revealed the importance of government involvement in helping SMEs to adopt Blockchain technology. According to Chen and Chen (2017), the regulatory environment plays a significant influence on the adoption of new technology. Most respondents echoed the sentiments that the government should create a supportive environment. Also, SMEs argued that it was the role of the government to create awareness and educate the industry on the latest developments. Consequently, government attitudes, policies and initiatives were considered essential factors influencing the adoption of innovation for SMEs.

One policy proposal that was suggested was that the government through one of its technology agencies, should partner with SMEs by issuing licences for the use of this technology. Furthermore, award the SMEs opportunities to solve practical government problems, such as immigration and capital outflows in the country. SME's could be given the opportunity and resources to explore the use of this technology without having to worry about their next income.

The research also found that some of the SMEs felt regulations were not aligned with the market and therefore posed themselves as a hindrance. The blame was put on the government's failure to understand the role of SMEs and how they operate. Instead, it appeared that policy decisions are based on the back of big businesses rather than all market participants.

5.3 Summary

Following the above discussions, there are notable findings that give insights to the core of the research questions. The research provided evidence on the factors that influence the adoption of Blockchain among SMEs. Most respondents cited the challenges of financial resources, skills gap and the role that government should play in creating awareness and regulating the industry. In addition, most SMEs were seen to be driven by short term profit which aligns with Kamunge, Njeru, and Tirimba, (2014) who stated that SMEs were concerned with short term gains than long term planning and developing business strategies. This was also evident when the respondent stated that the decision to implement technology was mainly driven by their need to reduce costs and improve their operational efficiencies.

Contrary to the literature, management skills were not hindering the adoption journey, although it can be argued that there is an element of bias due to most respondents being in the ICT sector. Lastly, a good understanding of the organisation's environment as suggested by the TOE framework was critical in assisting the adoption of Blockchain among SMEs.

6 CONCLUSION AND RECOMMENDATIONS

The key objective of this research was aimed at providing insights into understanding what influenced the adoption of Blockchain technology among SMEs. Key to achieving this objective and to understand the insights were the investigations to answer the following questions:

1) What are the key challenges of SMEs concerning technology adoption?
2) What role does the internal and external environment play in the adoption of Blockchain?

This chapter provides the concluding remarks of the findings in line with the overall research question. Subsequently, recommendations are provided.

6.1 Conclusions

The survival of SMEs is increasingly dependent on their technological strategies (Gunasekaran, Rai & Griffin, 2011). While the role of SMEs in the economy and their challenges are well documented, it remains interesting to note that Blockchain adoption among SMEs has not been widely researched. Especially in the local context to understand what influences the adoption of Blockchain by SMEs.

During the research process, it appeared that Blockchain technology in itself was relatively known albeit without being adopted and integrated into the SMEs business functions. The main findings showed that financial resources, a short-term view by the owner and senior management, and a shortage of skilled resources were the main challenges of SMEs when adopting technology. These challenges according to the TOE framework were classified as being internal to the organisation's business environment.

A lack of financial resources was also attributed to the fact that financiers and investors generally were not yet comfortable with Blockchain technology and therefore were reluctant in taking the risk to fund Blockchain projects. This created an organisational void for SMEs to raise working capital requirements to support such projects, thus a low level of adoption.

Concerning the external influence of customers, the research found that customers played no direct role in influencing the adoption of Blockchain among SMEs. It was rather a function of internal decisions by the organisations where cost reduction and improving operational efficiencies were the main drivers. Another important variable was relating to the government's role in influencing the adoption of Blockchain. SMEs believed they needed to overcome the financial hurdle and the government support was deemed to be extremely imperative. In general, SMEs seem to suggest that they are better placed to implement Blockchain technology if their business environment can be supportive through the availability of financial resources, government support and improved availability of the necessary skills. In addition, where there was a clear business case for Blockchain adoption, SMEs were amiable to consider the technology.

6.2 Limitations

Technical and administrative limitations relating to the research methodology have been discussed in section 3.6 above. These limitations create weaknesses to the research approach; however, the author has endeavoured to mitigate as much as possible. Another noteworthy limitation of this study is that the skills and research expertise of the author have not been tested. The author does not have extensive experience in the field of academic research, thus posing a limitation on the depth of this investigation. As discussed in section 3.4.5, the majority of the respondent had an ICT background which could create a bias in the research results. Consequently, future research with a wider audience with different professional backgrounds could be of benefit.

Another limitation to this study could the research questionnaire template used, and the methodology deployed. The author was forced to do a bit of explaining on other questions which could have resulted in respondents answering the same question differently because interviews were conducted at different times. Those who asked questions might have had a different understanding of a similar question compared to those who didn't ask for some clarity.

The author observed that some of the respondents would pre-empt questions that were supposed to be asked further and had to steer the respondents to explain what was asked only. As a result, this somewhat distorted the flow of the questions and the way they had to be put across.

Lastly, although there was a fairly good understanding of Blockchain, the author believes that there were still limitations of the understanding relating to what Blockchain technology can do.

6.3 Recommendations

The recommendations are based on the results of the research which indicates that generally, SMEs are constraint by a lack of financial resources, having a short-term view and or lack of long-term planning and the government not playing a supportive role to create an enabling environment. The author proposes the following recommendations.

Data analysis support the notion that financial resources are a constraint which is in line with Sitharam and Hoque (2016); Mazanai and Fatoki (2012). It is recommended that the financial services sector should have dedicated product lines that are geared towards introducing innovative financing for SMEs that are keen on new technologies such as Blockchain. These should have alternative credit decision mechanisms and sector assessments that specifically deal with new technology adoption at large. Financial institution usually requires collateral that SMEs do not have, therefore it is recommended that relaxing some of the collateral rules should be considered. Alternative repayment mechanisms should be considered such as

an extended repayment period that is tied to the improvement of cash flows. However, this can be a challenge during benign economic cycles.

The government has been identified as a key player in Blockchain adoption. It is recommended that a policy framework that addresses SME should have a pillar that looks at the adoption of innovative technologies such as Blockchain, with an independent function to the current government technology agencies. In addition, government advisory services should be consultative in nature pooling requisite skills from the market in support of SME financing activities.

The government should endeavour to introduce supportive initiatives that enable fair and well-thought-out policies to create an enabling environment, for example, incentives schemes for SMEs that participate in Blockchain adoption and improving the availability of market information for SMEs. This can be done by creating partnerships with SMEs who provide services to the government building their infrastructure using Blockchain technology.

The skills capabilities of owners and senior management were identified to play a significant role in the adoption of Blockchain. Therefore, it is recommended that owners and senior management be provided with literacy programs to enhance and improve financial management capabilities and long-term strategic planning.

The SME sector is also required to innovate and investigate improved Blockchain use-cases to increase the widespread adoption of Blockchain in the marketplace. This will increase awareness and eventually improved the support network from institutions such as the government. Improving Blockchain adoption among SMEs requires a collective effort by partnering with all key stakeholders such as the government, customers, and financiers. The importance of technology as a strategic pillar for SMEs cannot be overemphasised as discussed in the literature review.

6.4 Future research

The above recommendations have been drawn based on the conclusions. However, it is important to note the limitation details in section 3.6 and 6.2 above.

The author believes that this research has brought a different dimension to the Blockchain discourse and has added insights. However, given the author's novice competencies in qualitative research methods and data analysis, the study may exhibit a few shortcomings that were not evident at the time of analysis to the researcher. Nevertheless, the author strongly believes that there are some good insights in understanding factors that influence the adoption of Blockchain among SMEs through the window of the business challenges that they face.

Future research should be more pointed towards specific industries within SMEs, for example, supply chain, to have a better understanding that can be more applicable at the bottom end of the spectrum. Furthermore, there is a need to have research in other geographical areas in South Africa to draw comparatives for policy decision making. In addition, given that the population were mainly respondents with an ICT background, future research should be broadened to other professionals to improve on understanding.

Another potential future research area should involve the bottom end of the SMEs such as Small, Medium and Micro Enterprises (SMMMEs) such as vendors, on how they can adopt technology especially for payments that can be linked to their banks to avoid holding cash, especially in the current pandemic when social distance is now a requisite.

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APPENDICES

Appendix 1: Data collection instrument(s)

Interview guide: Semi-structured interview questions

Purpose: To understand the factors that drive Blockchain adoption among SMEs in Gauteng.

Duration: 40-90 minutes. Interviewer: Mosa Motea

Figure 1: Data collection instrument

Question	Element	Theory
Internal factors		
1. Are you familiar with Blockchain technology? 2. Have you considered integrating Blockchain into your business? 3. Do you believe you have the skills required to support the project?	Management and skills	Lavia-Lopez & Hiebl, 2014; Govuzela & Mafini, 2019; Gronum, Verreynne et al., 2012; Lose & Tengeh, 2015.
4. Do you have the funding to implement Blockchain? [if not do you believe if you want to apply for funding you will access it?]	Financial resources	Govuzela & Mafini, 2019; Makina et al., 2015; Sitharam & Hoque, 2016; Mazanai & Fatoki, 2012; BASA (undated); McGuinness & Hogan,2016; Brei et al., 2020)
5. Have you implemented an IT system before? 6. Do you believe you have the right skills to support the implementation of Blockchain?	Technology capabilities	(Adeniran & Johnston, 2016; Osembe & Padayachee, 2016)
External Factors		
7. Would you consider customers as the drivers for your business in considering the adoption of Blockchain?	Customers	(Sitharam & Hoque, 2016)
8. Do you think there are policy barriers or enablers to adoption and implementation?	Government regulations	(Atlam et al., 2018)

Appendix 2: One-page bio of the researcher

Figure 2: One-page bio of the researcher

Short Biography

PERSONAL INFORMATION

SURNAME	Motea
FIRST NAMES	Mosa
NATIONALITY	South African
GENDER	Male
CONTACT DETAILS	083 507 9010
EMAIL ADDRESS	Mosa.motea@fnb.co.za

SHORT BIOGRAPHY

I am a 37-year-old South African patriot; highly motivated and determined to play a role in developing South Africa for the better. I am currently pursuing my MBA with Wits Business School and hope that at the end of the MBA journey, I would have been able to build long-lasting business relationships and would have equipped myself for the betterment of myself, my family and the society at large.

For my undergrad, I completed my Bachelor of Science degree in Mathematical Sciences Majoring in Pure Mathematics and Computational and Applied Mathematics. I then continued with my studies and completed my Honours Degree in Computational and Applied Mathematics at the University of the Witwatersrand.

I am currently employed by First National Bank as an Analytics Head for FNB Consumer.

Employer Name:	First National Bank (FNB Consumer Banking)	FNB
Title Name:	Head of Analytics: Dynamic Decisioning (Band B)	
Date and Duration	September 2007 - Current	
Job Description	• Management of data sets to support strategy function for Debt Review, IDA & LH. • Monthly performance reporting incorporating performance reads of different strategy changes and new initiatives. • Establishing a data governance framework, implementing quality controls and database auditing operations. • New strategy development including data-driven analytics, test design, and rollout plans • Assist in the development of segmentation and advanced analytics to drive different collection treatments and strategies. • Campaign Performance analysis, agent performance analysis, dialer performance MI and reporting.	

Appendix 3: Ethics clearance certificate

Figure 3: One-page bio of the researcher

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SCHOOL OF GRADUATE SCHOOL OF BUSINESS ADMINISTRATION ETHICS COMMITTEE
CONSTITUTED UNDER THE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

CLEARANCE CERTIFICATE **PROTOCOL NUMBER: WBS/BA0103319G/615**

PROJECT TITLE Adoption of blockchain technology in the South African banking sector

INVESTIGATOR Mr Mosa Motea

SCHOOL/DEPARTMENT OF INVESTIGATOR MBA (Research Article)

DATE CONSIDERED 24 November 2020

DECISION OF THE COMMITTEE Approved unconditionally

RISK LEVEL MINIMAL RISK

EXPIRY DATE 30 JUNE 2021

ISSUE DATE OF CERTIFICATE 7 December 2020 **CHAIRPERSON** _____
(Dr MDJ Matshabaphala)

cc: Supervisor: Mr Mutanho

DECLARATION OF INVESTIGATOR

To be completed in duplicate and **ONE COPY** returned to the Chairperson of the School/Department ethics committee.

I fully understand the conditions under which I am are 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/we undertake to resubmit the protocol to the Committee.

M.Motea
Signature

08 / 12 / 2020
Date

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

Appendix 4: Consent Form - Participants

Figure 4: Consent Form - Participants

Consent Form

Title of project:

The adoption of Blockchain among the SMEs in Gauteng, South Africa

Name of researcher:

Mr. Mosa Motea

I, ……, agree to participate in this research project. The research has been explained to me and I understand what my participation will involve. I agree to the following:

(*Please circle the relevant options below*).

I agree that my participation will remain anonymous	YES	NO
I agree that the researcher may use anonymous quotes in his / her research report	YES	NO
I agree that the interview may be audio recorded	YES	NO
I agree that the information I provide may be used anonymously after this project has ended, for academic purposes by other researchers, subject to their own ethics clearance being obtained.	YES	NO

Name of participant: ……

Signature: ……

Date: ……

Name of participant: ……

Signature: ……

Date: ……