The role of fintech in financing SMMEs in the South African mining sector

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ABSTRACT

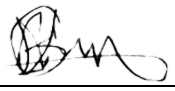
Small, micro, and medium enterprises (SMMEs) in South Africa's mining sector face significant funding constraints due to remote operational locations, high capital demands, and fluctuating revenue flows. Guided by the Technology-Organisation-Environment (TOE) framework, this qualitative study investigated how financial technology (fintech) solutions could alleviate these financing challenges. Data were collected through semi-structured interviews with SMME owners, fintech providers, and industry consultants. The findings reveal that fintech platforms offer rapid loan approvals, flexible repayment terms, and reduced procedural burdens benefits particularly crucial for capital-intensive mining operations. However, adoption is hampered by limited internet connectivity, digital-literacy gaps, mistrust of new platforms, and regulatory complexities. Recommendations include improving infrastructure in remote areas, instituting targeted training and capacity-building programs, and clarifying fintech regulations to mitigate compliance risks. The study concludes that, while fintech holds substantial promise for enhancing financial access and operational efficiency in the mining sector, its full potential depends on concerted efforts by policymakers, service providers, and industry stakeholders to address contextual barriers and build a supportive ecosystem for digital finance.

KEYWORDS

Fintech; Small, Micro, and Medium Enterprises (SMMEs); Financial Inclusion; Mining Sector; South Africa; Technology-Organization-Environment (TOE) Framework; Access to Funding; Digital Lending Platforms; Financial Literacy; Financial Inclusion Policies.

DECLARATION

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

Name: Lebogang Brian Ngweye Signature: 

Signed at Centurion

On the 6 day of June 2025

DEDICATION

This work is dedicated to my late father, whose pride in my achievements continues to inspire me every day, and to my wife and family, whose unwavering support and love have been my foundation throughout this journey.

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I would like to begin by giving all praise to God for providing me with the strength, wisdom, and perseverance needed to complete this research. Without His guidance, this achievement would not have been possible.

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LIST OF ABBREVIATIONS AND ACRONYMS

- AI: Artificial Intelligence
- ATLAS.ti: Computer-Assisted Qualitative Data Analysis Software
- CAQDAS: Computer-Aided Qualitative Data Analysis Software
- CPA: Consumer Protection Act
- DOI: Diffusion of Innovations
- ERP: Enterprise Resource Planning
- FICA: Financial Intelligence Centre Act
- Fintech: Financial Technology
- GDP: Gross Domestic Product
- IT: Information Technology
- NCA: National Credit Act
- P2P: Peer-to-Peer
- RegTech: Regulatory Technology
- RQ: Research Question
- SME: Small and Medium Enterprise
- SMME: Small, Micro, and Medium Enterprise
- TOE: Technology-Organization-Environment
- UTAUT: Unified Theory of Acceptance and Use of Technology

CHAPTER 1. INTRODUCTION

1.1 Statement of Purpose

This study investigates the role of financial technology (fintech) in financing Small, Micro, and Medium Enterprises (SMMEs) in the South African mining sector.

1.2 Background of the Study

Financial technology (Fintech) has been growing since 1866, evolving through different stages over time. However, the fintech that this study is focused on emerged in 2008 because of events such as the 2008 financial crisis. This marked the third stage of fintech's evolution (Setiawan & Maulisa, 2020). Fintech utilises technology to transform financial services by providing a diverse range of options such as mobile banking and peer-to-peer (P2P) lending. It arose because of global financial crisis and a recognition of the need for more financial inclusion. These factors led to the democratisation of finance by offering alternatives to traditional banks. The emergence of fintech has posed challenges for regulators and market participants, as it has required them to navigate carefully the balance between fostering innovation in financial services and managing associated risks (Arner et al., 2015).

Fintech has significantly improved the customer experience in the financial services industry by offering more convenient, personalised, and efficient solutions such as streamlined account management, tailored investment options, and quick and secure transactions. It has revolutionised various financial activities, such as internet banking, by enabling quick and secure online transactions, mobile payments for convenient purchases on-the-go, crowdfunding for accessible investment opportunities, and robo-advisory services for automated and personalised financial advice. These advances have made financial services more accessible and user-friendly for customers (Schueffel, 2017).

The abbreviation SMME stands for Small, Micro, and Medium Enterprise. The National Small Business Act specifies the yearly turnover and employee count that determine the classification of SMMEs in South Africa (Department of small business development (South Africa), 2023). The thresholds for each sector are set out in Table 1 below.

Table 1: Definition of SMMEs according to the National small business amendment act of (2018)

Column 1	Column 2	Column 3	Column 4
Sectors	**Size or class of enterprise**	**Total full-time equivalent of paid employees**	**Total annual turnover**
Agriculture	Medium	51-250	< 35.0 million
	Small	11-50	<17.0 million
	Micro	0-10	<7.0 million
Mining and Quarrying	Medium	51-250	<210.0 million
	Small	11-50	<50.0 million
	Micro	0-10	<15.0 million
Manufacturing	Medium	51-250	<170.0 million
	Small	11-50	<50.0 million
	Micro	0-10	<10.0 million
Electricity, Gas and Water	Medium	51-250	<180.0 million
	Small	11-50	<60.0 million
	Micro	0-10	<10.0 million
Construction	Medium	51-250	<170.0 million
	Small	11-50	<75.0 million
	Micro	0-10	<10.0 million
Retail, motor trade and repair services	Medium	51-250	<80.0 million
	Small	11-50	<25.0 million
	Micro	0-10	<7.5 million
Wholesale	Medium	51-250	<220.0 million
	Small	11-50	<80.0 million
	Micro	0-10	<20.0 million
Catering, Accommodation and other Trade	Medium	51-250	<40.0 million
	Small	11-50	<15.0 million
	Micro	0-10	<5.0 million
Transport, Storage and Communications	Medium	51-250	<140.0 million
	Small	11-50	<45.0 million
	Micro	0-10	<7.5 million
Finance and Business Services	Medium	51-250	<85.0 million
	Small	11-50	<35.0 million
	Micro	0-10	<7.5 million
Community, Social and Personal Services	Medium	51-250	<70.0 million
	Small	11-50	<22.0 million
	Micro	0-10	<5.0 million

These businesses are of great importance to the South African economy, as they make a substantial contribution to the country's Gross Domestic Product (GDP) and employment levels (Government of South Africa, 2023). The mining industry is an important sector in South Africa, with a significant contribution of around 202.05 billion South African Rand made by the industry to the country's GDP in 2023 (Cowling, 2024). However, SMMEs that operate in the mining industry often face a substantial shortfall in funding, which impedes their ability to expand and progress.

SMMEs make up ninety per cent of businesses and fifty per cent of jobs worldwide, making them vital to the global economy. While they contribute significantly to economic growth, they often remain underserved by traditional financial institutions. According to (Lindsay et al., (2023), the global financing gap for SMMEs is estimated to be around five trillion dollars an amount that is nearly three times larger than earlier estimates of the financing shortfall for small businesses. This substantial gap underscores the urgent need for alternative financing solutions, which fintech providers are increasingly aiming to supply.

1.3 Research Problem

Fintech has become a disruptive force in the financial sector, as it promises to use innovative financial service delivery to lower income inequality and promote equitable economic growth (Zhu & Niu, 2024). Research has indicated that fintech improves the efficiency of credit allocation, reduces credit fraud, streamlines funding procedures, and encourages enterprises to make more prudent investment choices (Su & Xu, 2023). Fintech solutions have been associated with better access to capital and increased sustainable performance, which are especially advantageous for SMMEs (Siddik et al., 2023). Fintech also reduces financial gaps, enables SMMEs to embrace digital transformation, and allows them to respond to shocks (Zhou & Sun, 2024). Fintech platforms also offer advantages to traditional financial institutions. They allow banks to broaden their customer base, add new clients, diversify their loan portfolios, and cut operations-related expenses (Basten & Ongena, 2024).

Sarfo et al. (2024) recognise the importance of SMMEs in promoting innovation and stimulating economic growth, especially in developing countries. According to Sati (2024), SMMEs make significant contributions to the GDP, employment, job creation, poverty alleviation, commerce promotion, and technology growth in numerous locations, including the European UnionClick or tap here to enter text. SMMEs in South Africa are crucial for economic development and employment generation (Enwereji, 2024).

Although studies have shown the beneficial effects of fintech on SMMEs' ability to obtain financing and withstand challenges such as the COVID-19 pandemic (Zhou & Sun, 2024), there is limited research on how fintech specifically affects the South African mining industry. Prior research has predominantly concentrated on the overall advantages of fintech for SMMEs across different industries (Li et al., 2024; Sanga & Aziakpono, 2023). Nevertheless, the mining sector's distinct operational and financial attributes necessitate a tailored assessment of the implementation and consequences of fintech solutions in this context.

Previous studies have shown that fintech has many benefits for SMMEs, such as making it easier for them to get loans, lowering loan costs, and making them more resistant to sudden changes in the economy (Zhou & Sun, 2024). However, the mining industry's operations and finances necessitate a special study to understand their use and adoption of fintech solutions.

This study fills this research gap by examining how SMMEs in the mining sector in South Africa leverage fintech and its effects on financial performance, growth, and resilience.

1.4 Research Objectives

The objectives of this research are as follows:

- To investigate the role of fintech in promoting access to funding to SMMEs in the mining sector in South Africa.
- To identify the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions.

- To investigate the enablers of fintech adoption by SMMEs in the South African mining sector.

1.5 Rationale

There is a great deal of interest in fintech because it is growing quickly in developing economies and could change the way finances work. This study was inspired by the fact that while fintech's effects on SMMEs have been studied in different contexts, not much is known about its role in the South African mining industry. Because this sector is so important to the South African economy, it creates a special setting where SMMEs often face unique financing challenges.

This study aims to help policymakers, financial institutions, and mining SMMEs by shedding light on these challenges. The results will help government to enact targeted policies and strategies to improve financial inclusion in the mining sector. This could lead to better economic outcomes for both SMMEs and the communities.

In addition, this study intends to assist financial institutions in better understanding the specific financial demands and constraints faced by SMMEs in the mining sector, allowing them to provide personalised products and services. It also highlights the possibility for collaboration between traditional financial institutions and fintech companies, which would result in a more inclusive financial ecosystem for SMMEs in the mining industry.

1.6 Delimitations of the Study

- **Sectoral focus:** This study covers only South African mining SMMEs.
- **Geographic scope**: Fintech use, and its impacts vary by country and law; for this reason, this study focuses only on South Africa.
- **SMME definition:** South African government definitions of SMMEs based on staff count and yearly turnover are used in the study. This delimitation ensures consistency and comparability with previous South African SMME

research (see Table 1: Definition of SMMEs according to the National small business amendment act of (2018)

- **Fintech solutions**: The study focuses on financial services-related fintech solutions such as funding, payment, and financial management tools. Fintech may have additional applications in mining, but this delimitation allows for a more in-depth investigation of its financial impact on SMMEs.
- **Time frame:** The research examines fintech uptake and its effects on mining SMMEs without looking at historical trends or future estimates. This delimitation provides a snapshot examination of the current situation, providing relevant information.

1.7 Definition of Key Terms

- **Fintech:** Fintech is defined as the use of technology in new ways to provide financial services, such as mobile payments, online loans, and digital wealth management (Arner et al., 2015).
- **Small, Micro, and Medium Enterprises (SMMEs):** These are businesses that fall within a certain size range in terms of their assets, employees, and annual turnover (Government of South Africa, 2023).
- **Financial performance:** The term "financial performance" refers to how profitable a business is, how well it uses its money, and the state of its overall financial health. Usually, metrics such as revenue, net income, and return on investment are used to measure financial performance (Wu et al., 2024).
- **Gross domestic product (GDP):** A country's GDP refers to the total amount of final goods and services produced and sold in the country (Tuncsiper, 2023).

1.8 Assumptions

The study makes the following assumptions:

- Mining SMMEs are expected to engage in the study and answer survey and interview questions honestly.

- It is assumed that small and medium-sized businesses in the mining industry know the basics of fintech solutions and how they might apply to their business.
- The research assumes that the SMMEs chosen for the study are typical of all mining SMMEs in South Africa.

1.9 Chapter Outline

This research report is organised into six chapters, beginning with Chapter 1: Introduction, which sets the stage by presenting the research problem, the research objectives, the significance of the study, and the scope of investigating fintech's role in financing SMMEs within South Africa's mining sector.

Chapter 2: Literature Review and Theoretical Framework delves into existing studies on fintech and SMME financing, identifying key challenges, such as access to capital, regulatory hurdles, and market concentration. The chapter introduces the Technology-Organization-Environment (TOE) framework as the guiding theoretical lens and presents the conceptual framework used for the study.

Chapter 3: Research Methodology outlines the research approach adopted for the study. The chapter details the research paradigm and design selected, the data-collection methods used (including semi-structured interviews and document analysis), and how the sample was selected. It describes the data-analysis strategies adopted and the use of the computer-aided qualitative data analysis software (CAQDAS) ATLAS.ti for data analysis. It concludes by discussing the means used to assure the quality of the study, including ethical considerations.

Chapter 4: Presentation of Findings, this chapter begins by presenting the demographics of the 20 participants chosen for the study, which included SMME owners, fintech providers, and financial advisers. It then sets out the detailed findings structured around the three research questions, which highlight themes such as fintech's role in increasing funding access, the barriers faced by SMMEs

in adopting fintech solutions, and the enablers that facilitate fintech integration in the mining sector.

Chapter 5: Discussion interprets the findings presented in Chapter 4 in relation to the existing literature and the TOE framework. This chapter provides an in-depth analysis of how fintech improves financial accessibility for SMMEs; the specific challenges related to infrastructure, digital literacy, and regulatory issues; and the factors that support successful fintech adoption, such as technological advancements, organisational support, and supportive government policies.

Chapter 6: Conclusion and Recommendations provides a comprehensive closure to the study by summarising the key findings, drawing conclusions in relation to the Technology-Organisation-Environment framework, and outlining practical recommendations for stakeholders in the mining sector. The chapter first restates the purpose of the research and synthesises the insights presented in Chapters 4 and 5, showing how each research objective was met. It then highlights the broader implications of the findings, discussing how fintech can enhance financial access and resilience among SMMEs, provided infrastructure, skills, and regulatory barriers are addressed. The chapter further identifies specific actions for policymakers such as improving digital infrastructure and streamlining compliance guidelines and for fintech providers, including the development of tailored fee structures and user-centric platforms. Lastly, it acknowledges the study's limitations, underscores the need for continued investigations through longitudinal and cross-sector research, and concludes by emphasising the potential of fintech to foster more inclusive economic development in South Africa's mining sector.

CHAPTER 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

This chapter reviews literature related to research on fintech and its role in financing SMMEs in the South African mining sector. The chapter begins with an overview of fintech, including its definitions, evolution, and various models. It then discusses the economic relevance of SMMEs and the unique financial issues they face, particularly in South Africa's mining sector. The chapter goes on to explore the legislative and policy landscape governing fintech in South Africa, highlighting potential impediments and opportunities. The chapter reviews the theoretical frameworks most appropriate to the study and concludes by presenting a conceptual framework derived from the theoretical framework selected for the study to guide the empirical study.

2.2 Background

2.2.1 Fintech: A comprehensive overview

Fintech encompasses the use of innovative technologies and business models within the financial sector to bring about transformative changes and enhance financial services, in this way propelling progress and restructuring the industry (Setiawan & Maulisa, 2020). Sahabuddin et al. (2023) suggest that fintech refers to the use of financial technologies to improve efficiency and effectiveness in the global financial sector. These technologies include digital products and services that offer secure, convenient, and transparent procedures while also promoting financial inclusion and encouraging sustainable practices in organisations.

Fintech has evolved over four main stages. The period known as Fintech 1.0 (1866–1967) initiated financial globalisation by implementing analogue technologies such as the telegraph and credit card. Fintech 2.0 (1967–2008) introduced digitisation through the creation of ATMs, internet banking, and the

integration of existing institutions with digital technology. Fintech 3.0 (2008 to the present) has witnessed the emergence of non-bank businesses that provide inventive services such as digital wallets and P2P financing. This growth was driven by the 2008 financial crisis. Fintech 4.0 (2015 to the present) is primarily concerned with the establishment of regulatory sandboxes to provide secure experimentation with innovative ideas, as well as the implementation of open banking initiatives. These efforts aim to shape the future of financial services by promoting greater sharing of data and by fostering collaboration (Setiawan & Maulisa, 2020). Fintech has advanced to incorporate various industries. Within these industries, it works to streamline payment systems by enabling enabling faster and more secure transactions, optimise consumer experiences through personalised services and intuitive user interfaces, facilitate funding accessibility by connecting borrowers with lenders through online platforms, employ artificial intelligence (AI) and chatbots to provide 24/7 customer support and deliver tailored financial recommendations, develop digital ecosystems that integrate multiple financial services into a single platform, and foster financial inclusivity by reaching underbanked populations and reducing barriers to entry (Mah et al., 2022).

Fintech has fundamentally transformed the way SMMEs access funding by providing a range of inventive solutions to traditional financial barriers. The following are a range of fintech models that are available to assist SMMEs to access funding:

- **Peer-to-peer:** P2P lending systems provide direct online contacts with lenders, which circumvents traditional banks and improves efficiency for SMMEs (Putri Rusadi & Benuf, 2020).
- **Blockchain:** This technology enables SMMEs to obtain capital by using asset tokenisation, P2P lending, smart contracts, worldwide lending options, and improved transparency and security (Chen, 2024).
- **RegTech (Regulatory Technology**): RegTech streamlines regulatory compliance to improve SMME funding availability. RegTech solutions boost the reputation and credibility of SMMEs with lenders by automating practical guidance and supervision, regulatory information, transaction

monitoring and reporting, identity management, and risk management (Sanga & Aziakpono, 2023).

- **Robo-advisors:** Robo-advisors use AI to provide SMMEs with optimised financial planning and investing strategies. By using this advanced financial management system, SMMEs can increase their chances of obtaining funding and can improve their overall financial well-being (Britchenkoet al., 2018).
- **Crowdfunding:** Crowdfunding offers SMMEs an alternative means of obtaining funds, as it makes cash more accessible by connecting SMMEs with a wider pool of possible investors. Engaging in this activity not only increases the level of exposure and confirms the viability of company concepts but also provides vital input and market intelligence from prospective consumers and investors. In addition, crowdfunding decreases dependence on conventional funding, promotes financial inclusivity, and facilitates the expansion of industries that have a positive impact and the broader economy (Marina et al., 2023).
- **Remittance and payments**: Fintech solutions in the fields of payment and remittance may assist SMMEs in obtaining finance by offering alternative avenues for financial transactions and lending. This helps to overcome obstacles faced by traditional financial institutions (Karim et al., 2022).
- **Digital banks and neobanks:** Digital banks and neobanks are currently addressing historical deficiencies in the market by giving priority to providing funding for SMMEs and fintech companies. They achieve this by taking intellectual and digital assets as collateral and by creating innovative financing frameworks. In addition, collaborations with traditional financial institutions serve to broaden the scope of funding options available to SMMEs, in this way guaranteeing improved access to financial resources (Prodanova & Bondarenko, 2023).

2.2.2 SMMEs and financing

SMMEs play a crucial role in the South African economy, comprising almost ninety per cent of all formal enterprises and contributing to over seventy-five per cent of new job creation. Their contribution to the country’s GDP is substantial,

with estimates ranging from fifty per cent to sixty per cent (Matekenya & Moyo, 2022). Various initiatives and strategies have been launched to assist the growth of SMMEs in South Africa, which have been officially acknowledged by the government as an effective means to tackle inequality, poverty, and unemployment. Despite these strategies, obstacles such as restricted financial resources and inadequate managerial expertise continue to prevent the sector from reaching its maximum capacity. Notwithstanding these challenges, SMMEs continue to be the cornerstone of the South African economy, as they exert a crucial influence on alleviating poverty, generate employment opportunities, facilitate international trade, and drive technical advancements (Enaifoghe & Ramsuraj, 2023).

Recent literature has extensively investigated the financial challenges encountered by SMMEs. Wang (2022) points to challenges such as insufficient collateral, limited credit history, frequent defaults, and exorbitant customer acquisition expenses and suggests using fintech solutions to tackle these challenges. At the same time, Bu et al. (2024) emphasise a wider range of variables that contribute to the financing gap, such as inherent vulnerabilities, limited options despite the expansion of digital banking, and prejudice against non-state-owned firms. In their study, which specifically examined the situation in Brazil, Godke Veiga and McCahery (2019) highlight several significant obstacles faced by SMMEs. These include limited availability of conventional bank loans, a lack of alternative financing options, regulatory hurdles, high interest rates, market concentration, and unequal distribution of resources. These studies highlight the complex and different nature of obstacles faced by SMMEs in obtaining funding. They also emphasise the necessity of employing various tactics to overcome these obstacles.

2.2.3 Barriers faced by SMMEs in obtaining financing in the mining sector

In the year 2023, The mining sector contributed 202,050 million rands to the South African GDP (Cowling, 2024). While this points to the importance of this sector, literature highlights the ongoing challenges involved in obtaining institutional financing for small-scale mining enterprises, particularly in

developing countries and other resource rich regions across the world. The challenges arise from operational and legal irregularities Eniowo, (2024); Hilson et al. (2018) such as the absence of legal recognition, temporary operations, and restricted access to mining permits, which complicate the evaluation of feasibility and sustainability by official lenders. Furthermore, the absence of collateral, financial literacy, and access to banking services, along with lenders' concerns about uncertain profitability and environmental issues, provide further obstacles to obtaining formal financing (Eniowo, 2024; Eniowo et al., 2022). This issue is exacerbated by a discrepancy between the specific criteria set by formal lenders (such as collateral, licences, and proved reserves) and the miners' capacity to fulfil these criteria. As a result, miners are compelled to seek alternative means of financing, which are generally informal and exploitative in nature (Eniowo et al., 2022). The presence of these obstacles throughout areas such as sub-Saharan Africa has resulted in an ongoing lack of funding that prevents the expansion and legalisation of the small-scale mining industry.

2.2.4 Regulatory and policy landscape

The incorporation and rapid expansion of fintech in the financial services sector in South Africa have made it necessary to establish a comprehensive regulatory framework. This framework aims to maintain the stability and reliability of the financial system, safeguard consumer interests, and promote innovation. South Africa has made significant progress in implementing laws to tackle the issues presented by fintech, including the National Credit Act (NCA), the Consumer Protection Act (CPA), and the Financial Sector Regulation Act (Chitimira & Magau, 2021).

But these laws do not deal with how to use new technology to help low-income people obtain access to banking services, which is a big problem in South Africa. To find the right mix between innovation and compliance, it is important to create a clear regulatory framework for the use and regulation of fintech to help more people access financial services.

2.3 Theoretical Framework

The integration of fintech into the funding of SMMEs in the South African mining industry is a complex procedure that encompasses both technological and financial changes. To achieve the research goals of this study related to fintech integration, it is essential to employ robust theories and frameworks that can accurately reflect the complexities of financial and technological adoption (Lim & Perrin, 2014).

Several theoretical frameworks could be employed to guide this study. The Diffusion of Innovations (DOI) framework provides valuable insights into the dissemination of new ideas and technology within cultures, with a specific emphasis on the rates at which they are adopted and the many stages of adoption (Zhu et al., 2006). However, the DOI framework may lack the level of specificity necessary to address effectively the unique organisational and environmental circumstances that are specific to the mining industry. Similarly, the Unified Theory of Acceptance and Use of Technology (UTAUT) mainly focuses on user acceptance of and intention to use technology, which may not fully cover the wider organisational and environmental factors that influence the integration of fintech into the mining sector (Lim & Perrin, 2014).

The Technology-Organization-Environment (TOE) framework was chosen in this study as the preferred option for assessing the role of fintech in financing SMMEs in the South African mining industry. The TOE framework provides a comprehensive approach for analysing the adoption and integration of financial technologies into the mining industry as this framework considers technological factors, organisational structures, and environmental factors (Taneja et al., 2024).

2.3.1 The Technology-Organization-Environment (TOE) Framework

The TOE framework, which was developed by Tornatzky & Fleischer, (1990), has become an important model for comprehending the adoption and execution of different technologies in businesses (Ahmed, 2020). The theory proposes that the choice to embrace a novel technology is influenced by three important factors: technological, organisational, and environmental (Niknejad et al., 2016).

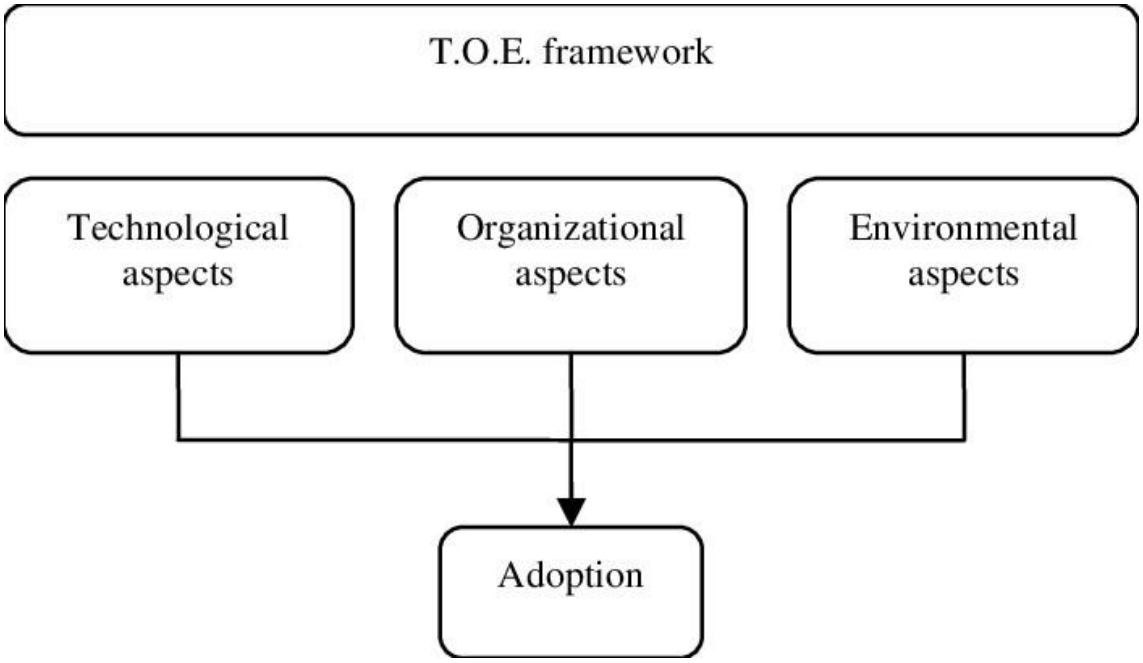

Figure 1: TOE framework (source Tornatzky & Fleischer, 1990)

The technological aspect of the framework focuses on the technology itself and considers factors such as what its benefits are thought to be, how difficult it is to use, and how well it works with other systems (Urumsah et al., 2022). The organisational context includes factors such as the structure, resources, and management support of the company (Chong & Olesen, 2017). The environmental context looks at factors outside of the company that have the potential to affect the acceptance of technology. These factors include competition in the industry, government regulations, and pressure from partners (Chatterjee et al., 2021).

The TOE framework has been used to investigate how different technologies are adopted, such as e-commerce, enterprise resource planning (ERP), cloud computing, and, more recently, fintech (Urumsah et al., 2022). For instance, studies have shown that the TOE framework could help to explain what motivates SMMEs to use the cloud (Ahmed, 2020).

A study on the use of fintech in Indonesia found that the TOE framework helped the researchers to understand the main factors that led to the use of fintech, such as the availability of technology, support from organisations, and pressures from outside forces (Urumsah et al., 2022). Overall, the TOE framework has been

useful for both researchers and professionals who intend to gain a better understanding of how complicated it is for different types of organisations to adopt new technologies.

The TOE framework was used for this study because it enables a thorough investigation into all aspects of fintech's influence on SMME funding within the mining sector. Unlike the UTAUT framework, which focuses on individual user acceptance (Nambiar & Bolar, 2023), the TOE framework covers technological, organisational, and environmental aspects (Chatterjee et al., 2021). This greater scope is important as the study explores the general context in which fintech functions to promote SMME funding. The TOE framework provides for an in-depth investigation of existing fintech solutions (technology context); the characteristics and readiness of mining sector SMMEs (organisation context); and external impacts such as regulatory rules and market conditions (environment context). This means that this framework provides a more effective method of understanding how fintech may finance SMMEs in the South African mining sector.

The technological, organisational, and environmental contexts as they relate to the research problem are outlined below.

Technological

Fintech promotes financial inclusion, lowers transaction costs, and provides faster, cheaper finance, all of which increase financial literacy and job creation (Etudaiye-Muhtar et al., 2024). Fintech has been shown to improve innovation, access to capital, risk management, and decision-making in China's mining and manufacturing industries (Akhtar et al., 2024). Fintech also minimises the gender gap in financial inclusion, affecting socio-demographic characteristics. Fintech is shaped by economic development, economic freedom, religion, and rural environments. Online banking and mobile payments promote inclusive development and financial access. In African countries, for example, fintech has a favourable impact on women's use of financial services, thanks to mobile technology, internet access, and energy. This accessibility extends across income levels and religious backgrounds, encouraging financial inclusion and

minimising gender inequities. Yeyouomo et al. (2023) report that several research studies have confirmed fintech's availability and utilisation in these places, Click or tap here to enter text. but suggest that fintech's impact on financial inclusion and gender equity requires complementary policies, as supported by literature.

Organisational

The organisational context includes various factors such as the organisation’s size, structure, culture, and resources (Ali et al., 2020). Recognising these internal organisational dynamics is crucial for examining the way in which SMMEs in the mining industry engage with and embrace fintech solutions to enhance their financial accessibility.

While the adoption of fintech can increase organisational capacity, making organisations more competitive and sustainable in the market (Alzghoul & Al-kasasbeh, 2024), the adoption of fintech inside organisations is influenced by the organisational structure of the organisations themselves. The use of fintech inside SMMEs in the mining sector, for example, is heavily influenced by organisational structures (Moşteanu, 2020). The selection of organisational structure by a company can either enable or impede the implementation of financial technology. A decentralised structure can promote faster decision-making regarding technology adoption, which has the effect of increasing agility (Arokodare & Falana, 2021). In contrast, Moon et al. (2021) argue that vertical organisational structures, which have centralised power and inflexible communication routes, can hinder the necessary flexibility and agility needed for rapid fintech adoption. However, Alzghoul and Al-kasasbeh (2024) argue that incorporating fintech can improve a company's competitive edge by boosting its ability to compete and thrive in the market.

Furthermore, research conducted by Moreira-Santos et al. (2022) highlights that SMMEs are motivated to use fintech services owing to the significant benefits of internal cost reduction and ecological footprint reduction. This implies that organisations with systems that promote cost efficiency and environmental sustainability are more likely to adopt fintech solutions. In addition, integrating new fintech solutions requires resources such as financial capital, trained human

resources, and technology infrastructure (Coetzee, 2018). Research by Khuan (2024) highlights several aspects that have an impact on the adoption of fintech. These elements include the sustainability of technology, the quality of information technology (IT) infrastructure, the financial capacities of organisations, and the availability of human resources. All these factors are strongly linked to the organisational structures of companies.

Research conducted by Yaschenko et al. (2021) offers valuable insights into the organisational frameworks of mining corporations, highlighting the significance of understanding internal attributes and managerial approaches. Understanding the relationship between various organisational structures in SMMEs in the mining industry is essential for determining how the adoption of fintech might be influenced in terms of speed and efficacy. Furthermore, supportive management attitudes, particularly senior management's backing of and openness to new technologies, are critical for successful technology adoption (Ghobakhloo et al., 2012).

The size of a business also plays a key role in technology adoption; smaller companies may be more flexible but lack resources, whereas larger organisations may have more resources but longer decision-making processes (Mishra et al., 2021). The size of an SMME, thus, plays a crucial role in its ability to adopt fintech. While smaller enterprises may face challenges in the initial investment required for technology adoption compared to larger firms, their flexibility means that they may exhibit greater agility in implementing new processes (Sun et al., 2022).

Inyang (2013) examines the characteristics of SMMEs, which are defined by their revenue, total asset value, ownership composition, and number of employees. The size of these businesses presents unique challenges and potential in the adoption of technology. The firm size, be it small, medium, or large, is crucial in the adoption of Industry 4.0 technology-a term referring to the fourth industrial revolution, characterized by the integration of advanced digital technologies such as Internet of things, big data analytics and automation into industrial processes(Bekmurzaeva & Kovalev, 2023). This transformation emphasises the

need for understanding the distinct approaches of organisations of varying sizes towards advances in technology (Hizam-Hanafiah & Soomro, 2021).

Environmental

The market structure of the mining industry in South Africa has significant effects on the adoption of fintech within the sector. The mining sector in South Africa has traditionally played a vital role in the nation's economy (Marutle & Daw, 2017). South Africa has created a strong mining industry, which has led to the establishment of a leading industrial sector. These sectors are supported by a well-developed financial system and infrastructure (Jin, 2021). But challenges such as abandoned mines (Mhlongo & Amponsah-Dacosta, 2016), acid mine drainage (Matsumoto et al., 2016), and occupational health and safety concerns (Botha & Cronjé, 2015) have been common in the sector.

The legal framework, market dynamics, technological infrastructure, and economic conditions are all important elements in the adoption of new technologies, particularly in the financial sector. Fintech adoption can be strongly impacted by government policies and laws, such as South Africa's Financial Intelligence Centre Act (FICA) (Sanga & Aziakpono, 2023). Competition, desire for financial innovation, and the presence of fintech companies all generate pressure and incentives for SMMEs to adopt fintech solutions (Khuan, 2024). Furthermore, the external technological infrastructure, including internet connectivity and mobile penetration, is critical for the successful application of digital solutions in various industries (Alshubiri et al., 2019).

The rapid expansion of fintech has profoundly altered the financial landscape, especially in emerging nations such as South Africa. As the global financial community shifts toward technology-enabled financial solutions, the role of fintech in combating financial exclusion and poor financial growth in Africa has emerged as a major policy challenge. According to Okoli and Tewari (2020), fintech, with its potential to increase financial inclusion and generate economic growth, has received substantial attention from policymakers and regulators.

The fintech sector in South Africa has experienced substantial growth in recent years, fuelled by the country's large unbanked population and the extensive integration of mobile technologies (Okoli & Tewari, 2020).

Conclusion

The TOE framework provides a comprehensive lens for examining the adoption of fintech solutions by SMMEs in the South African mining sector. By analyzing the technological, organizational, and environmental contexts, this study aims to uncover the key drivers and barriers influencing fintech adoption. The technological context highlights fintech's potential to enhance financial inclusion, reduce costs, and improve access to capital. The organizational context emphasizes the role of internal factors such as structure, resources, and management support in shaping adoption decisions. Finally, the environmental context considers external influences, including regulatory frameworks, market dynamics, and technological infrastructure. Together, these dimensions offer a holistic understanding of how fintech can address the funding challenges faced by SMMEs in the mining sector, contributing to their growth and sustainability. This framework aligns with the study's goal of exploring fintech's role in promoting financial accessibility and innovation within the mining industry.

2.4 Conceptual Framework

A conceptual framework was developed based on the TOE theoretical framework to examine the role of fintech in financing SMMEs in South Africa's mining sector. Three distinct objectives guide the components included in the conceptual framework. The first objective is to investigate how fintech improves access to financial resources for these businesses, focusing on technological developments and their implementation. The second objective is to highlight organisational impediments to fintech adoption, such as internal structures and limited resources. Finally, the last objective is to investigate the environmental elements, such as laws and regulations and market conditions, that enable or limit the use of fintech solutions. The goal of this framework is to enable a comprehensive analysis of the various aspects that impact fintech adoption and its ability to improve financial accessibility for SMMEs in the mining sector.

The objectives established for the conceptual framework were set out as the study's formal research objectives and investigated in a literature review. The results are presented below.

2.4.1 *Research Objective 1: To investigate the role of fintech in promoting access to funding to SMMEs in the mining sector in South Africa.*

The availability of fintech solutions, such as mobile banking and blockchain technology, has greatly increased the accessibility of financial resources for both consumers and businesses. In addition, fintech platforms provide SMMEs with different options for obtaining funding, such as debt and equity financing. These platforms utilise advanced technology and a variety of business models (Dahi & Enweruzo, 2024).

Research has demonstrated that fintech has beneficial effects on financial well-being by granting users convenient access to information regarding money management, which encompasses real-time monitoring of income and expenses (Nathan et al., 2022). Moreover, fintech has been discovered to decrease the cost of corporate debt financing substantially, specifically by reducing the imbalance of information between businesses and financial institutions (Wang, 2024). Furthermore, advancements in financial technology, such as crowdfunding, mobile payments, AI-driven credit-assessment systems, and blockchain technologies, possess a great capacity to increase financial inclusivity and facilitate individuals and businesses in accessing financial services. This enables those without bank accounts to engage actively in financial markets (Rybakovas & Zigiene, 2022).

The COVID-19 pandemic has brought attention to the important role of fintech in improving financial inclusion. Fintech and digital finance solutions have allowed customers and businesses to access formal financial services remotely (Ozili et al., 2024).

In light of the above review, the following research question is proposed:

Research Question 1: What is the role of fintech in promoting access to funding for SMMEs in the mining sector in South Africa?

2.4.2 *Research Objective 2: To identify the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions.*

The adoption of fintech solutions by SMMEs in the mining sector is influenced by a range of barriers and challenges, which can be categorized into technological, organizational, and environmental factors, as outlined by the TOE framework. These factors collectively shape the ability of SMMEs to integrate fintech into their operations effectively.

Technological Context

The technological context highlights the role of fintech in transforming financial processes, but its adoption is often hindered by concerns related to security, privacy, and usability. Data security and privacy are critical challenges, as fintech relies heavily on digital platforms that are vulnerable to cyber threats (Adamek & Solarz, 2023; Stewart & Jürjens, 2018). The design of user interfaces and the level of trust consumers place in fintech solutions also play a significant role in their adoption (Bakhshi et al., 2024). Additionally, limited awareness and financial literacy among users can act as barriers, particularly in rural or underserved areas where fintech could otherwise promote financial inclusion (B. Setiawan et al., 2021). Technological infrastructure, such as internet connectivity and mobile penetration, is another key factor, as it directly impacts the feasibility and effectiveness of fintech implementation (Alzghoul & Al-kasasbeh, 2024).

Organizational Context

The organizational context focuses on internal factors that influence fintech adoption, such as the size of the SMME, its structure, and the availability of resources. Smaller SMMEs often face resource constraints, including limited financial capital, human resources, and technological infrastructure, which can hinder their ability to adopt fintech solutions (Coetzee, 2018; Khuan, 2024). Slack

resources defined as excess or underutilized resources within an organization can also impact adoption. SMMEs with slack resources are better positioned to invest in and experiment with new technologies, whereas those without such resources may struggle to allocate funds for fintech adoption (Alzghoul & Al-kasasbeh, 2024).

Organizational structure is another critical factor. Decentralized structures, which allow for faster decision-making and greater agility, are more conducive to fintech adoption compared to centralized structures, which may have rigid communication channels and slower response times (Arokodare & Falana, 2021; Moon et al., 2021). Furthermore, supportive management attitudes and a culture of innovation are essential for successful technology integration. Senior management's willingness to embrace new technologies and drive organizational change can significantly influence the adoption process (Ghobakhloo et al., 2012).

Environmental Context

The environmental context encompasses external factors such as regulatory frameworks, market dynamics, and societal influences. Government regulations, such as South Africa's Financial Intelligence Centre Act (FICA), play a pivotal role in shaping the accessibility and adoption of fintech solutions (Sanga & Aziakpono, 2023). Regulatory uncertainty can create barriers, as SMMEs may be hesitant to adopt fintech without clear guidelines or legal protections (Adamek & Solarz, 2023). Market competition and the presence of fintech companies also drive adoption by creating pressure and incentives for SMMEs to innovate and remain competitive (Khuan, 2024).

Societal factors, such as consumer attitudes and financial literacy, further influence fintech adoption. Fear of technology, lack of trust, and social influence can deter SMMEs and their customers from embracing fintech solutions (Abdul-Rahim et al., 2022). Maximizing the benefits of fintech adoption while mitigating its drawbacks such as cybersecurity risks and potential exclusion of less tech-savvy users requires a balanced approach that considers both technological advancements and consumer emotions (Abdul-Rahim et al., 2022).

Based on the above exploration, the following research question is proposed:

Research Question 2: What are the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions?

2.4.3 *Research Objective 3: To investigate the enablers of fintech adoption by SMMEs in the South African mining sector*

The adoption of fintech by SMMEs in the South African mining sector may be influenced by a range of factors that permit its implementation. First and foremost, the attributes of fintech are essential in enabling its widespread acceptance. The accessibility and usefulness of fintech to SMMEs are increased by user-friendly interfaces and compatibility with existing systems (Hu et al., 2019). Additionally, the availability of adequate financial and human resources is crucial for enabling the adoption of fintech. Allocating resources to develop digital infrastructure and guaranteeing inexpensive internet access can narrow the gap between those who have access to technology and those who do not. This will encourage the wider use of financial technology services, especially in places that are now lacking such services (Nnaomah et al., 2024).

Strong organisational structures are also vital for supporting fintech adoption. Implementing fintech can increase organisational capability, which can strengthen organisations' market competitiveness and improve their sustainability over time (Alzghoul & Al-kasasbeh, 2024). Furthermore, the existence of favourable regulations plays a vital role in promoting the use of fintech in the mining industry. The lack of clear laws may pose a barrier to the adoption of new practices, while well-defined and supportive regulations can create opportunities for improved operational efficiency and more customer engagement (Khuan, 2024).

The structure of the mining industry can have a substantial impact on the adoption of financial technology. Fintech has strongly affected the financial industry worldwide, and its acceptance can be influenced by features such as user-friendliness, cost-effectiveness, availability, and improved consumer satisfaction (Verma & Milam, 2023). Furthermore, fintech can play a crucial role in

accelerating financial inclusion in areas such as mining. Fintech can increase financial inclusion and help to expand the sector by providing data-driven insights and on-demand risk coverage (Thomas et al., 2023).

In accordance with the above findings, the following research question is proposed:

Research Question 3: What are the enablers of fintech adoption by SMMEs in the South African mining sector?

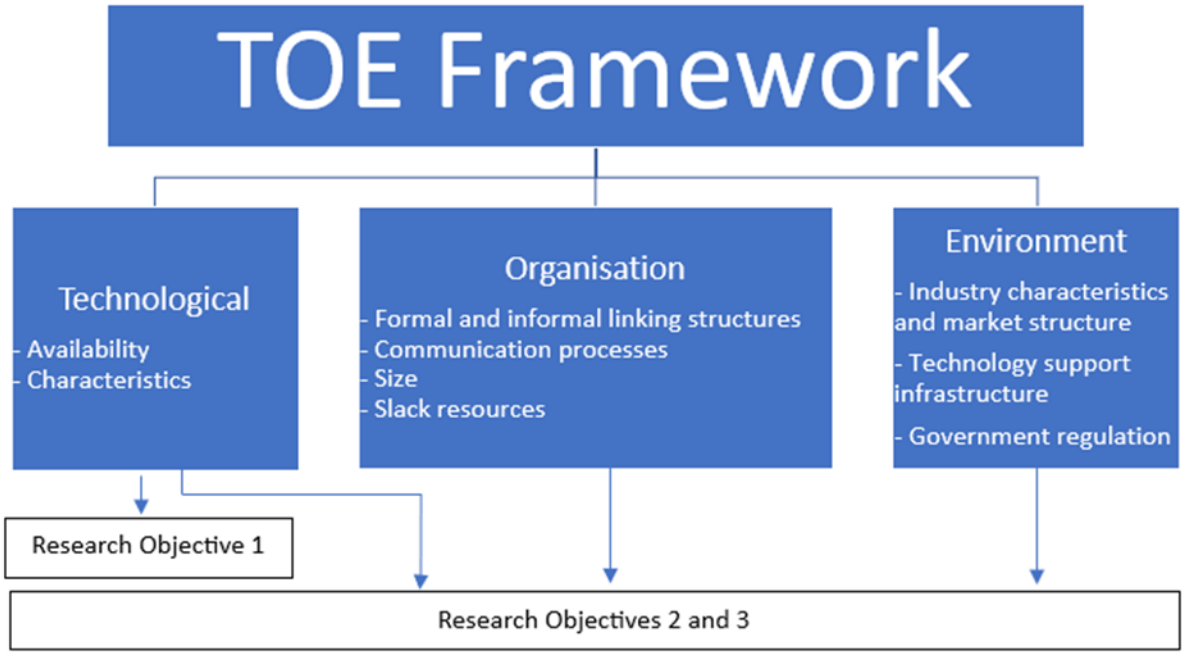

Figure 2: Conceptual framework

2.5 Conclusion

Chapter 2 provided a thorough review of literature on the emerging fintech landscape and its critical role in alleviating the financial limitations encountered by SMMEs, notably those in South Africa's mining sector. The chapter examined the evolution and forms of fintech and emphasised how technology breakthroughs and commercial models have transformed access to finance. It identified critical barriers to the full implementation of fintech solutions, including regulatory challenges, technology integration issues, and organisational

constraints. In contrast, highlighted enablers such as supportive legislation, technology improvements, and organisational preparation as factors that assist fintech adoption.

The literature reviewed not only explains the considerable economic impact of SMMEs on South Africa's GDP and employment rate but also outlines the financial and operational issues faced by these organisations. An exploration of the regulatory and policy frameworks revealed both potential for exploiting fintech and gaps in current legislation that must be addressed to promote a more inclusive financial environment.

Finally, by utilising the TOE framework, this chapter established a sound theoretical foundation for the empirical study. A conceptual framework was developed to guide the investigation of technological, organisational, and environmental factors that affect fintech adoption, with the goal of creating a greater understanding of how fintech may assist SMMEs in the mining sector to access funding. This approach promises not only to broaden the scholarly debate on fintech, but also to provide practical insights for governments, financial institutions, and SMMEs that seek to maximise the potential of fintech funding.

The research questions that resulted from this extensive review are as follows:

- RQ 1: What is the role of fintech in promoting access to funding for SMMEs in the mining sector in South Africa?
- RQ 2: What are the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions?
- RQ 3: What are the enablers of fintech adoption by SMMEs in the South African mining sector?

CHAPTER 3. RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the methods that were used to investigate the research questions that emerged from the literature review. The chapter provides details on the selected research paradigm, approach, and design. It then describes the research instrument and outlines the techniques used for data collection. Following this, it specifies the population and sample used and describes the data-analysis strategies chosen as best suited to the study. Finally, it lists possible limitations of the study, and sets out the quality assurance methods, and ethical issues considered in undertaking the study. The chapter concludes with a consistency table regarding the research questions, data collection and data analysis.

3.2 Research Paradigm

This section examines the research paradigm chosen for the study, which is the constructivist research paradigm. The constructivist paradigm, along with its underlying philosophical foundations, ontology, epistemology, and axiology shaped the researcher's comprehension of reality, knowledge, and values. These philosophies are central to understanding how knowledge is constructed and interpreted within this paradigm. Below is a compilation of the pertinent sources that provided evidence for the various components of the research paradigm used in the study:

- Ontology: In the research paradigm, reality was viewed as subjective, shaped and formed by the interactions and experiences of individuals (cf. O'Brien et al., 2014).
- Epistemology: Stakeholders' perspectives and experiences were reflected in the co-creation of knowledge (cf. Langhout & Thomas, 2010).

- Axiology: In accordance with the axiology philosophy, the research prioritised practical outcomes and enhancements for SMMEs and their communities (cf. Chimucheka, 2014).

The chosen research paradigm aligned with a qualitative enquiry based on the constructivist paradigm, as suggested by (Chung & Neuman, 2007). This paradigm prioritises the investigation of questions in an open and investigative approach, to enable the researcher to concentrate on understanding the subjective encounters and viewpoints of the individuals involved. By embracing this paradigm, the research process of the current study empowered and actively included the study participants, in this way increasing the comprehension of the topic being studied in a comprehensive and intricate manner.

3.3 Research Approach

A qualitative research approach was considered appropriate for examining the complex and diverse characteristics of fintech adoption among SMMEs in the mining sector of South Africa. Qualitative research involves exploring and understanding phenomena through non-numerical data, such as interviews, observations, and textual analysis, to gain in-depth insights into participants' perspectives, experiences, and contexts (Aguinis & Solarino, 2019). The research particularly concentrated on the SMME financing gap. The selection of a qualitative approach was suitable for various reasons, as discussed below.

Chimucheka & Mandipaka (2015) emphasise the usefulness of a qualitative research approach and extensive interviews to collect data from participants in an efficient way. This approach was chosen in line with the objective of obtaining a comprehensive understanding of the interrelationships among fintech, SMME funding, and the mining industry (cf. Chimucheka & Mandipaka, 2015). Ndlovu and Takawira (2023) used a qualitative research approach to study the issues faced by investment firms when financing small enterprises. Their research demonstrated the appropriateness of qualitative methodologies for exploring financial elements within business contexts. Polese et al. (2018) explored the use of a qualitative approach in understanding how technology and institutions

affected sustainable value co-creation in smart tourist ecosystems, highlighting the depth of insights that qualitative approaches could bring to the investigation of interrelated phenomena.

Using a qualitative methodology, the current study was able to delve into the complex connection between fintech adoption, SMME funding, and the mining sector. This created the potential to provide an in-depth knowledge that could inform policymakers and industry stakeholders of how to use fintech to support SMMEs and foster long-term economic growth in the mining sector.

3.4 Research Design

A case study research design was used to assess the impact of fintech on improved access to funding for SMMEs in South Africa's mining sector. Several factors made a case study design relevant to this subject:

- Case studies offer in-depth exploration of real-world events. The study's focus on a specific scenario in the South African mining sector provided important insights into the dynamics of fintech uptake and funding access for SMMEs.

- The case study design provided a comprehensive understanding of the context-specific factors influencing fintech uptake and funding availability in the mining industry. By focusing on a single scenario, the researcher was able to explore unique challenges, enablers, and outcomes relevant to SMMEs in the South African mining sector.

- The case study design enabled a focused exploration of fintech's role, adoption challenges, and enablers in the mining sector. A thorough analysis of a single case can produce nuanced responses to a study’s research questions.

A single-case study was adopted because the research question seeks context-dependent causality (i.e., how technological, organisational and environmental factors interact in a specific mining cluster). Case study allows “how” and “why” questions to be answered holistically, using multiple stakeholder perspectives

and triangulation of interview and documentary data (Creswell & Cresswell, 2018). The design therefore aims for analytic generalisation refining and extending the TOE framework rather than statistical representativeness. Section 3.10 and 6.7 outline how future multi-site replication will test external validity.

3.5 Data-Collection Methods

The data-gathering methods used for this study were document analysis, content analysis of textual data related to fintech and small-business funding, and semi-structured interviews held with SMME owners, fintech providers, and other stakeholders. This multi-method approach was guided by the research objectives and supported by existing literature, which highlights the value of combining different data sources to enhance the depth and reliability of qualitative research(Creswell & Cresswell, 2018).

Document and Content Analysis

Document analysis and content analysis were employed to gather secondary data on fintech solutions and their role in supporting SMMEs in the mining sector. This involved reviewing academic articles, industry reports, government publications, and policy documents related to fintech adoption, small-business funding, and the South African mining sector. The findings from this analysis were used to:

- Inform the literature review (Chapter 2) by providing a theoretical and contextual foundation for the study.
- Supplement the interview findings (Chapter 4) by offering additional insights and validating themes that emerged from the primary data.

For example, the analysis of industry reports and policy documents helped identify key trends and challenges in fintech adoption, which were later explored in greater depth during the interviews. Similarly, content analysis of academic articles provided a framework for understanding the barriers and enablers of fintech adoption, which informed the development of the interview guide and the interpretation of the findings.

Semi-Structured Interviews

Semi-structured interviews were the primary data-collection method for this study. This approach was chosen because it allows for flexibility in exploring participants' perspectives while maintaining a focus on the research questions (Alamri, 2019). The interview guide was developed based on insights from the document and content analysis, ensuring that the questions were aligned with the study's objectives and contextualized within the existing literature.

The use of semi-structured interviews was supported by the following research:

- Kallio et al. (2016) provided insights into the methodical construction of a qualitative semi-structured interview guide. This research emphasised the utility of semi-structured interviews as a common data-gathering approach in qualitative research.

- Naidoo et al. (2024) stressed the reliability and validity of semi-structured interviews as a data-gathering strategy in qualitative research and recommended its usage for eliciting rich and in-depth insights from participants.

- Eriksson-Liebon et al. (2021) explored the use of semi-structured interviews in a qualitative descriptive design, with their research demonstrating how this method could help to gain a thorough knowledge of participants' expectations and experiences.

The interviews were conducted with 20 participants, including SMME owners, fintech providers, and mining stakeholders, to capture a diverse range of perspectives. The data collected through these interviews formed the basis of the findings presented in Chapter 4.

By using document analysis and semi-structured interviews as data-collection methods, the researcher was able to collect the diverse range of textual and spoken data required for comprehensively answering the research questions. The use of these methods also enabled the study to provide a holistic view of the

fintech landscape in the context of SMME financing in the South African mining sector.

3.6 Population and Sample

3.6.1 Population

The study's population consisted of SMMEs that operate in the South African mining sector, fintech providers, and other relevant stakeholders. These stakeholders played critical roles in providing firsthand knowledge about fintech and SMME funding in the mining industry as discussed below.

- SMME owners: These stakeholders were selected for their ability to share insights into the obstacles to and potential for fintech adoption and financing in the mining sector.
- Fintech providers: These stakeholders were expected to be able to share insights about the design, implementation, and impact of fintech solutions for SMMEs in the mining industry.
- Other stakeholders: Regulatory organisations, financial institutions, and industry associations were selected for their ability to provide various perspectives on the ecosystem around fintech and SMME finance in the mining sector.

The case study technique, which focused on burgersfort, a mining town in the far eastern Limpopo Mines, to collect contextual material that appropriately depicted the unique challenges and opportunities in that location. This focused strategy allowed for a thorough grasp of the dynamics of fintech integration and SMME development in the mining industry.

3.6.2 Case Selection

This study employed a case study design, focusing on a specific mining town in South Africa (Burgersfort in the far eastern Limpopo Mines) to capture the unique

operational and financial challenges faced by SMMEs in a resource-intensive environment. Burgersfort was purposefully chosen due to its high concentration of mining activities, geographical remoteness, and the observable funding gaps among local SMMEs, factors that made it an illustrative setting for examining how fintech solutions could address financial constraints. Within this case context, individuals who had practical experience with fintech implementation and SMME funding were identified through purposive sampling. The goal was to include participants such as SMME owners, fintech providers, and relevant stakeholders who could offer detailed insights into how digital finance solutions intersect with mining-related capital demands, regulatory hurdles, and infrastructural limitations. A total of twenty participants were targeted, guided by the principle of data saturation, whereby interviews continued until no new themes emerged. This approach ensured a depth of understanding about fintech adoption within the chosen location. By focusing on Burgersfort as the case, the study could generate nuanced findings specific to rural mining conditions while still yielding broader implications for fintech-driven financing in similarly resource-intensive environments.

3.6.3 Rationale for country and single-site focus

South Africa was chosen because it is the largest mining economy in sub-Saharan Africa, contributes approximately R 202 billion to national GDP, and exhibits a documented SME-funding gap (Cowling, 2024). These characteristics create an amplified “stress test” for fintech: a sophisticated yet tightly regulated digital-finance market operating alongside a capital-intensive, ruralised extractive sector. Burgersfort, situated on the eastern limb of the Bushveld Complex, was selected as a critical case: within a 50 km radius it hosts more than 40 mining operations of South Africa’s junior chrome and platinum group metal producers, yet suffers from intermittent grid power and patchy broadband constraints that typify remote mining clusters across the SADC region (Jin, 2021; Malesa et al., 2025; Marutle & Daw, 2017). Demonstrating fintech viability under these least-favourable conditions strengthens the argument for its applicability in less-constrained localities.

Transferability and future research. Admittedly, a single-location design limits statistical generalisation, but it enhances analytic generalisation by enabling a deep, context-rich exploration of Technology–Organisation–Environment interactions (Younas et al., 2023a). To support transferability, the report provides “thick description” of setting, participants and financing processes (see 3.6 – 3.12). Chapter 6 explicitly recommends multi-site replications in Rustenburg, Witbank and comparable belts in Botswana or Zambia to test whether the Burgersfort-derived TOE factors hold across other platinum, coal and manganese regions. In this way, the South-African, single-site focus should be viewed as a theoretically purposeful first step, not an empirical endpoint.

3.7 Research Instrument

The study used a semi-structured interview guide (attached as Appendix C) to acquire information from SMME owners, fintech providers, and other stakeholders in South Africa's mining sector. The interview guide largely consisted of open-ended questions that were aligned with the study objectives and aimed to investigate the following major areas:

- **Objective 1: To investigate the role of fintech in promoting access to funding to SMMEs in the mining sector in South Africa.**

RQ 1: What is the role of fintech in promoting access to funding for SMMEs in the mining sector in South Africa?

Key Investigative Areas:

  - How SMMEs use fintech to acquire funds.
  - The effect of fintech on the funding process for SMMEs.
  - The challenges SMMEs face when using fintech solutions.
  - How these challenges impact their operational and financial performance.

- The factors influencing the effective adoption of fintech in the mining sector.
- How these enablers improve the integration and efficacy of fintech solutions.

- **Objective 2: To identify the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions.**

RQ 2: What are the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions?

Key Investigative Areas:

- The challenges SMMEs face when using fintech solutions.
- The impact of these challenges on their operational and financial performance.

- **Objective 3: To investigate the enablers of fintech adoption by SMMEs in the South African mining sector.**

RQ 3: *What are the enablers of fintech adoption by SMMEs in the South African mining sector?*

Key Investigative Areas:

- The factors influencing the effective adoption of fintech in the mining sector.
- How these enablers improve the integration and efficacy of fintech solutions.

The interview guide was organised so that each section covered a specific issue that was relevant to the research questions and theoretical framework. The semi-structured nature of the interviews allowed for greater freedom in examining participants' responses while ensuring that critical themes were thoroughly covered.

3.8 Procedure for Data Collection

The data-gathering process for this research included semi-structured interviews with SMME owners, fintech providers, and other stakeholders in South Africa's mining sector. These interviews were conducted in person or virtually via video conferencing platforms, depending on participants' availability and convenience. To ensure a structured and rigorous data-collection process, the following steps were followed:

Participant Recruitment

- Participants were identified through industry associations, professional networks, referrals, and direct outreach to ensure a diverse range of perspectives.
- A purposive sampling technique was employed to select individuals with direct experience in fintech adoption and SMME funding in the mining industry. This ensured that the participants could provide in-depth insights relevant to the research questions.
- Once identified, participants were formally invited to participate through emails or phone calls, where the purpose of the study and interview logistics were explained.

Informed Consent Process

- Before conducting the interviews, participants were provided with an informed consent form outlining:
    - The purpose of the study
    - Their rights as participants, including voluntary participation and the option to withdraw at any time
    - Confidentiality and data protection measures
    - How the data would be used in the research

- Participants were encouraged to ask questions before signing the consent form, ensuring informed and voluntary participation.

Data Collection Process

- Interviews were conducted using a semi-structured interview guide to ensure consistency while allowing flexibility for participants to elaborate on key themes.
- The interview questions were open-ended, enabling participants to share detailed insights into fintech adoption, SMME financing challenges, and enabling factors.
- With participants' permission, interviews were audio-recorded to ensure accurate data capture and minimize information loss.
- Field notes were taken to document non-verbal cues, contextual observations, and emerging themes during the interviews.

Data Management and Quality Assurance

- The audio recordings were transcribed verbatim for analysis, ensuring that no key details were omitted.
- To enhance data credibility, member checking was conducted where participants could review their transcripts to confirm accuracy and clarify any ambiguities.
- Triangulation was used by comparing interview data with findings from document and content analysis to enhance the validity and reliability of the study.

By following this structured data-collection approach, the study ensured that the perspectives gathered were comprehensive, credible, and aligned with the research objectives. This process contributed to a deeper understanding of fintech integration and SMME financing dynamics in the South African mining industry.

3.9 Data-Analysis Strategies and Interpretation

This study employed Thematic Analysis and Content Analysis as the primary methods for analysing qualitative data. Thematic Analysis was used to identify, analyze, and themes within the data (Braun & Clarke, 2006). This method allowed for the systematic categorization of recurring ideas and perspectives shared by participants, helping to uncover deeper insights into the role of fintech in SMME financing within the mining sector. The analysis followed a structured process: familiarization with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report.

Content Analysis, on the other hand, was employed to systematically analyze textual data, such as policy documents, fintech reports, and regulatory frameworks. This method involved identifying key concepts, categorizing text into predefined or emerging themes, and quantifying the presence of specific terms or ideas. By applying Content Analysis, the study was able to assess the frequency and significance of topics, providing a broader contextual understanding of fintech adoption and its impact on SMMEs in the mining sector.

To facilitate the analysis process, this study made extensive use of computer-aided qualitative data analysis software (CAQDAS), particularly the ATLAS.ti software program. The software was used to enhance data management, coding, and visualization. Its tools provided extensive features that streamlined the organization of large datasets, enabled systematic coding, and facilitated advanced theme identification. ATLAS.ti supported the creation of a thorough coding framework aligned with the study's objectives (cf. Salvador et al., 2019). Additionally, the use of CAQDAS improved transparency and traceability in the research process, which was crucial for ensuring the validity and reliability of the findings (cf. Salvador et al., 2019).

CAQDAS has several advantages over manual qualitative data analysis, including enhanced data-processing efficiency, the ability to conduct more sophisticated analyses, and improved consistency in coding and interpretation (Alamri, 2019). These features contribute to the credibility and replicability of qualitative research. The use of CAQDAS in this study ensured a systematic,

rigorous, and replicable methodology, strengthening the research's contribution to the fields of fintech, SMME financing, and mining industry dynamics. By leveraging modern technological tools, this approach enabled a more comprehensive assessment of fintech integration in the mining sector and provided critical insights into both the opportunities and challenges associated with fintech adoption by SMMEs (cf. Salvador et al., 2019) (cf. Salvador et al., 2019) (O'Kane et al., 2021).

3.10 Possible Limitations and Challenges of the Study

The study recognised the following possible issues that could affect the results:

- Potential bias: The study acknowledged that both the researcher and the participants could be biased. Researcher bias could occur where the researcher subjectively interpreted data or chose themes, while participant bias could occur where stakeholders tried to make themselves look good or hide private information. CAQDAS was used for data analysis to reduce the potential for bias, such as the subjective interpretation of data.
- Sample size: Limitations regarding the variety and size of the sample were also considered. Purposive sampling was considered useful for focusing on important experiences, but the resulting sample might not capture all the different points of view in the mining and fintech industries. Because of this, the study might only show a small part of the picture, based on the events and situations of a small group of people.
- Data access: Another substantial problem was that complete and accurate data might not have been attained. Important files or papers might not have been available because they were protected by intellectual property laws, Smme owners were worried about privacy, or stakeholders did not want to share information. This could have the effect of changing the scope and depth of the content analysis, making it more difficult for the study to investigate all the important themes in detail.

To address these issues, it was imperative that they were explicitly outlined in the study and thoroughly discussed in terms of their potential impact on the results.

Furthermore, potential avenues for future study were identified that could encompass strategies to circumvent these challenges, such as conducting larger-scale studies or employing other methods for data collection and analysis (see 6.7 in Chapter 6).

3.11 Quality Assurance

3.11.1 Transferability

In qualitative research, transferability has replaced the concepts of external validity and generalisability, which are associated with quantitative research. Transferability refers to how well the findings of a qualitative study may be applied or transferred to different contexts or situations (Younas et al., 2023). In the context of this research, the transferability of study findings was critical in establishing the relevance and applicability of insights obtained from South Africa's mining sector to other similar contexts or industries.

To improve the transferability of the research findings, the following strategies were used:

- **Rich description:** The study provided extensive and rich descriptions of the background, participants, and research methodology. By providing detailed information regarding the study setting and participants, the study enabled readers to compare the research context to other settings they were familiar with (cf. Shenton, 2004).

- **Thick description:** Using thick descriptions to explain qualitative findings enables a thorough comprehension of the data's nuances and complexities. A full description of the findings was provided in this study to help determine the applicability of the findings to other contexts or populations (cf. Younas et al., 2023).

- **Contextual understanding:** The study focused on understanding the context in which the research was conducted. By offering insights into the specific characteristics of South Africa's mining sector, readers could

assess the relevance of the findings to similar industries or sectors (cf. Kacen & Chaitin, 2015).

- **Member checking:** Preliminary findings were shared with participants to validate the researcher's interpretations and ensure that the findings were consistent with their experiences. This technique improved the credibility and transferability of the study findings (cf. Shenton, 2004).

- **Reflexivity:** Recognising and resolving the researcher's own biases and viewpoints were considered critical for improving the transferability of the study findings. The researcher's position was made clear in section 3.11.2 to enable readers to assess the transferability of the research (cf. Willig, 2019).

By adopting these strategies, the researcher aimed to increase the transferability of the study findings, allowing for careful evaluation of how the study's insights might be applied to other contexts or settings with similar qualities or situations.

3.11.2 Credibility

To ensure the credibility and reliability of the findings, the study concentrated on several essential areas aimed at enhancing both. The strategies employed to maximize the study's credibility also contributed to the reliability of the research, ensuring the findings were both accurate and trustworthy. The following strategies were used to maximize the study's credibility:

- **Methodological transparency:** The research report provides a detailed description of the research design, data-collection methods, and analysis procedures. The research procedure is clearly set out and explained so that readers can assess the study's rigour and reliability.

- **Member checking:** The participants were asked to validate the interpretations and findings regarding the information that they provided. This procedure entailed sharing the preliminary findings with the participants to ensure that their viewpoints were appropriately represented in the analysis, in this way increasing the study's credibility.

- **Peer debriefing:** The study findings were evaluated by peers or colleagues of the researcher who were knowledgeable about qualitative research methods. Peer debriefing provided an objective appraisal of the study's credibility as well as helpful feedback on data interpretation.
- **Reflexivity:** The researcher's reflexivity was highlighted throughout the investigation. By admitting and resolving their individual biases, assumptions, and views, researchers improve the trustworthiness of their data interpretations and conclusions.
- **Thick description:** The qualitative findings were accompanied by rich and thorough descriptions that offered context and depth to the data. Thick description added credibility to the study by allowing readers to grasp the complex and subtle nature of the research findings.

By using these strategies, the researcher sought to increase the study's credibility by ensuring that the findings were reliable, accurate, and indicative of the participants' experiences and viewpoints.

3.11.3 Dependability

Dependability in qualitative research refers to the consistency and stability of the research findings over time and under similar conditions. It is closely related to the concept of reliability in quantitative research, ensuring that the findings can be replicated or confirmed by other researchers in similar contexts. While credibility focuses on the accuracy and truthfulness of the findings, dependability emphasizes the reliability of the research process and the consistency of the results. In other words, dependability ensures that the research process is transparent and can be traced, allowing others to verify the findings through replication or comparison.

To ensure the dependability of the research, the study concentrated on several areas to increase the dependability of the findings. The following strategies were used to maximise dependability:

- **Methodological transparency:** The research report presents a full description of the research strategy, data-gathering methodologies, and analysis procedures. Readers are able to assess the rigour and dependability of the study by reading its research procedure.
- **Member checking:** The participants were asked to confirm the interpretations and findings of their inputs. This procedure entailed the researcher sharing the preliminary findings with the participants to ensure that their viewpoints were appropriately represented in the analysis. This strategy had the effect of increasing the study's dependability.
- **Peer debriefing:** The study findings were assessed by peers or colleagues of the researcher who were knowledgeable about qualitative research methods. Peer debriefing provided an objective assessment of the study's dependability.
- **Reflexivity:** The researcher practised reflexivity throughout the investigation. Acknowledging and resolving their own biases, assumptions, and views enable researchers to increase the trustworthiness of the data interpretations and conclusions of their research.
- **Thick description:** The qualitative findings were accompanied by rich and thick descriptions that provided context and depth to the data. Thick description added dependability to the study by allowing readers to grasp the complexity and nuance of the research findings.

By using these strategies, the researcher sought to increase the study's dependability by ensuring that the findings were reliable and accurate, and that they reflected the participants' experiences and viewpoints.

3.11.4 Ethical considerations

Ethical considerations are crucial in qualitative research to protect the rights of participants and uphold the integrity of the study. To ensure that ethical standards

were maintained throughout the research process, the following steps were implemented:

- Voluntary Participation and Informed Consent: All participants were informed about the purpose of the study, the nature of their participation, and the potential use of their data. They were also made aware that their participation was entirely voluntary, and they could withdraw from the study at any time without any consequences. Written informed consent was obtained from each participant before they provided any data.
- Confidentiality and Anonymity: The identities of all participants were kept confidential, and any identifying information was removed from the data. The study ensured that participants' personal information was protected and stored securely throughout the research process. Data was anonymized to prevent any individual from being identified in the findings.
- Ethical Clearance: The research was subject to ethical review and approval. An application for ethical clearance was submitted to the relevant institutional review board, where the study was reviewed to ensure that it complied with ethical guidelines. The ethical clearance certificate for this study is included in Appendix D.

By adhering to these ethical guidelines, the research aimed to protect participants' rights and ensure that the study followed proper ethical protocols. The study also ensured that all data was used responsibly and with respect for the privacy and dignity of the participants.

3.11.5 *Quality Assurance: Audit Trail*

In addition to ethical considerations, maintaining a comprehensive audit trail was critical for ensuring the transparency and repeatability of the research process. The audit trail involved documenting all aspects of the research procedure, from the initial concept and selection of the methodology to the data collection, analysis, and interpretation of the findings.

Key aspects of the audit trail included:

- **Documentation of the Research Process**: Every decision made throughout the research process was thoroughly documented, including the selection of participants, any modifications made to the methodology, and the procedures employed for data coding. This documentation ensured the reproducibility and transparency of the study.
- **Reflection on Challenges**: Any obstacles or challenges encountered during the research were also recorded, providing an honest account of the research process. This allowed for a thorough understanding of the research methodology and how it may have impacted the results.

The audit trail served as a key tool for ensuring the legitimacy of the research study. It enabled thorough scrutiny and validation of the methods and results, thereby upholding the integrity and scientific merit of the study.

3.12 Consistency Table

Table 2 provides a summary of the alignment between the research objectives, research questions, data-collection details, and data-analysis methods. This table ensures clarity and consistency in how each research objective is addressed through specific questions, data-collection tools, and analytical approaches.

Table 2: Consistency table: research objectives, questions, data-collection details, and data-analysis methods

RO#	Research objective	Research question (RQ)#	Research question	Data-collection detail	Data analysis method
1	To investigate the role of fintech in promoting access to funding to SMMEs in the mining sector in South Africa.	1	What is the role of fintech in promoting access to funding for SMMEs in the mining sector in South Africa?	Interview questions, 1.1, 1.2, 1.3, 1.4	Thematic Analysis, Content Analysis
2	To identify the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions.	2	What are the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions?	Interview questions, 2.1, 2.2, 2.3, 2.4	Thematic Analysis
3	To investigate the enablers of fintech adoption by SMMEs in the South African mining sector.	3	What are the enablers of fintech adoption by SMMEs in the South African mining sector?	Interview questions, 3.1, 3.2, 3.3, 3.4	Content Analysis, Thematic Analysis

In addition to the primary data collected through interviews, this study also incorporated secondary data from documents and textual sources. These included industry reports, government publications, academic articles, and fintech case studies relevant to the South African mining sector. The secondary data provided contextual insights and supported the triangulation of findings, enhancing the validity and reliability of the study. The analysis of these documents involved content analysis to identify recurring themes, trends, and patterns related to fintech adoption and its impact on SMME funding.

3.13 Conclusion

This chapter outlined the research methodology, emphasizing the constructivist paradigm and qualitative case study approach to explore fintech adoption by SMMEs in South Africa's mining sector. Data was collected through semi-structured interviews and document analysis, with thematic and content analysis used to analyze the findings. Ethical considerations and quality assurance measures ensured the study's rigor and credibility. The consistency table demonstrated alignment between research objectives, questions, and methods, providing a robust foundation for the study's findings.

CHAPTER 4. PRESENTATION OF FINDINGS

4.1 Introduction

This chapter presents the research findings derived from analysing the primary data collected from the research participants. The research aimed to investigate the role of fintech in supporting SMMEs to access funding in the South African mining sector. The three research questions developed for this study were:

- What is the role of fintech in promoting access to funding for SMMEs in the mining sector in South Africa?
- What are the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions?
- What are the enablers of fintech adoption by SMMEs in the South African mining sector?

The study aimed to address these research questions. The chapter begins with a summary of the research participants' demographic characteristics, which provides a critical background to the study. The data-analysis process is then described. This section is followed by the findings, which are divided into sections according to the study's research questions. The themes, subthemes, and supporting evidence for each of the research questions are also presented in these sections.

4.2 Demographics of the Participants

The study involved 20 participants with diverse professional backgrounds, responsibilities, and experiences. These participants were categorized into three groups: SMME entrepreneurs, fintech service providers, and financial advisors and mining consultants. Each group played a distinct role in the research, providing insights into the adoption of fintech solutions by SMMEs in the mining sector.

SMME Entrepreneurs

The sample included 10 SMME owners, all of whom operated in rural areas. These entrepreneurs ran small-scale mineral extraction and processing businesses, typically employing fewer than 50 people. Their businesses had been operational for periods ranging from 4 to 20 years. A common characteristic among these SMMEs was their limited access to traditional funding from commercial banks, which constrained their ability to expand or modernize their operations. Despite these challenges, these enterprises represented a critical segment of the mining sector, contributing to local economies and employment. Their reliance on alternative funding sources, such as fintech solutions, highlighted the importance of exploring how these technologies could address their financial needs.

Fintech Service Providers

The study also included 5 fintech service providers who offered a range of digital financial solutions tailored to the needs of SMMEs. These providers specialized in mobile finance, digital payment systems, and peer-to-peer (P2P) lending platforms. Their services were designed to enhance financial accessibility, particularly for underserved rural businesses. The fintech providers brought valuable perspectives on the challenges and opportunities associated with deploying fintech solutions in the mining sector, including issues related to infrastructure, user adoption, and regulatory compliance. Their insights were crucial for understanding how fintech could bridge the funding gap for SMMEs.

Hub managers

The final group of participants consisted of 5 hub managers. These professionals had extensive experience in the mining sector and provided strategic guidance to SMMEs on financial management, funding opportunities, and operational efficiency. Their expertise offered a broader perspective on the financial challenges faced by SMMEs and the potential role of fintech in addressing these challenges. By combining their knowledge of the mining industry with insights into financial innovation, these participants helped to contextualize the findings within the broader economic and regulatory landscape.

Table 3: Demographics of participants

Participants	Position in SMME	Nr of years in operation	Area	Gender	Nr of Employees
Participant 1	Director	4	Rural	Male	5
Participant 2	Director	12	Rural	Female	45
Participant 3	Director	16	Rural	Male	13
Participant 4	Director	4	Rural	Female	17
Participant 5	Director	4	Rural	Female	7
Participant 6	Director	6	Rural	Male	4
Participant 7	Director	20	Rural	Male	32
Participant 8	Director	14	Rural	Male	3
Participant 9	Director	7	Rural	Male	4
Participant 10	Director	10	Rural	Male	5
Participant 11	Hub Manager	5	Urban	Male	7
Participant 12	Hub Manager	3	Urban	Male	15
Participant 13	Hub Manager	8	Rural	Female	4
Participant 14	Hub Manager	10	Rural	Female	4
Participant 15	Hub Manager	14	Rural	Male	4
Participant 16	Fintech Provider	3	Urban	Male	6
Participant 17	Fintech Provider	2	Urban	Male	8
Participant 18	Fintech Provider	2	Rural	Male	5
Participant 19	Fintech Provider	2	Rural	Male	7
Participant 20	Fintech Provider	3	Rural	Male	12

The participants in this study reflected a varied cross-section of stakeholders involved in SMME operations and fintech solutions in the South African mining industry. The survey targeted 20 participants divided into three groups: directors of SMMEs, hub managers, and fintech providers. Their contributions and profiles provided valuable insights into the dynamics of fintech uptake, and the financing problems faced by SMMEs.

Half of the participants selected were SMME directors and represented businesses that had been in operation for between 4 and 20 years. These

directors operated in rural areas, with three females and seven males representation. The number of employees varied from 3 to 45, indicating different operational scales.

Five participants were hub managers who primarily assisted SMMEs in urban and rural locations. Their years of experience ranged from 3 to 14 years. The gender divide in this group were three males and two females.

The remaining five participants were fintech providers who represented businesses that provided financial technology solutions to small and medium-sized businesses. They were all males and three were rural based with fewer years of experience (2–3 years), which points to the fledgling nature of fintech in this industry. Fintech firms employed between 5 and 12 people.

Identifying the participants' various roles and geographical representation provided an in-depth understanding of the sector's challenges and prospects. Most participants were rural, emphasising the study's focus on undeveloped communities. This refined participant profile ensured that the findings accurately reflected the varied reality encountered by stakeholders in this ecosystem.

4.3 Data-Analysis Process

A deductive thematic analysis was used to analyse the responses and information provided by the study participants. Deductive thematic analysis, a method widely used in qualitative research, examines themes drawn from a predetermined framework (Pearse, 2019). This approach enabled the identification of important patterns and insights within the textual data, based on the research objectives and questions.

Prior to the analysis, the recorded interviews were transcribed and saved as textual data, with each participant uniquely labelled to ensure organisation and traceability. A rigorous transcription procedure was followed to minimise typographical errors while maintaining the content's authenticity and purpose.

The cleaned and organised data were then fed into ATLAS.ti for coding and analysis. ATLAS.ti was used to streamline the coding and analysis process. This

software, which was first designed for qualitative research, accepts a variety of data forms, including text documents, spreadsheets, pictures, and audio files (Ronzani et al., 2020). The data were carefully coded using ATLAS.ti, with pre-defined themes and categories influenced by the research framework. This deductive technique ensured a focused analysis, with findings that were closely related to the study's objectives.

This organised and software-assisted process was adopted for the data analysis to provide extensive insights into the role of fintech in funding SMMEs in the South African mining sector. The thorough and methodical approach improved the reliability and depth of the study's findings.

4.4 Findings Related to Research Question 1

Research Question 1 reads: *What is the role of fintech in promoting access to funding for SMMEs in the mining sector in South Africa*?

The following theme, sub-themes, and codes were identified from the interview data in relation to the first research question and are discussed below.

Table 4: Theme 1, sub-themes, and codes that emerged from Research Question 1

Theme 1	**Sub-themes (number of quotes)**	**Codes**
The role of fintech in promoting funding access	Access to financing (40)	Speed and efficiency
		Operational continuity
	Benefits of fintech (50)	Lower costs
		Accessibility
		Transparency
		Speed and efficiency
		Flexibility and adaptability
		Convenience
	Type of fintech used (40)	Digital lending platforms and online loans
		Mobile payment solutions and gateways

		Invoice financing
		Peer-to-peer (P2P) lending
	Emerging fintech solutions underutilised (36)	Emerging fintech solutions underutilised

4.4.1 Theme 1: The role of fintech in promoting funding access

The findings indicated that fintech plays a critical role in improving SMMEs' access to funds in South Africa's mining sector, highlighting that by leveraging technology, fintech platforms offer faster, more efficient, and more accessible funding solutions than traditional banking systems. Participants pointed to the transformative impact of quick approvals, often occurring within 24 to 48 hours, which allowed businesses to maintain operational continuity during financial difficulties. One participant noted, *"We recently secured a small loan in, uh, less than 48 hours, which wouldn't have been possible with a traditional bank. It's quite... transformative"* (Participant 6).

Fintech's affordability was presented as another advantage, with participants mentioning cheaper fees, flexible repayment options, and lower interest rates as key factors in alleviating financial strain on SMMEs. Participant 1 emphasised how fintech can ease financial burdens, stating: *"Many of these platforms have lower fees or more flexible repayment terms compared to banks."* Moreover, the simplicity and inclusivity of fintech services were seen as eliminating the bureaucratic barriers typical of traditional financing. As Participant 8 pointed out, *"You don't need to be this big player with assets or high turnover to get funding,"* showing that even smaller enterprises benefit from these digital solutions.

The findings showed that these fintech solutions also promote transparency, with real-time updates on loan applications and repayments, which in turn support better financial planning and decision-making. Participant 4 shared, *"Fintech platforms give real-time updates on loan statuses and repayments,"* reinforcing the role of transparency in building trust and improving financial management.

However, despite these evident benefits, the participants recognised significant untapped potential in fintech technologies. Several participants highlighted that

the underutilisation of emerging fintech technologies such as blockchain-based supply-chain financing; mining-specific insurance products; tailored crowdfunding platforms; and asset-backed digital loans represented for them an opportunity for further innovation and growth within the mining sector.

The overarching role of fintech in improving funding access is reflected in the sub-themes, which explore specific benefits, types of fintech solutions used, and the underutilisation of emerging technologies. These sub-themes further illustrate how fintech's impact not only spans the speed and efficiency of loan approvals but also addresses sector-specific challenges such as cash-flow management, financing gaps, and the need for specialised solutions such as blockchain and insurance products. The insights provided by the participants underscore the transformative potential of fintech in the mining sector while highlighting room for growth in harnessing more advanced solutions.

The sub-themes and their associated codes are discussed below.

a) Access to financing

The findings revealed that the participants saw fintech solutions as transforming how SMMEs in the mining sector accessed the financing they needed, offering faster and more efficient options compared to traditional banking systems. Participants consistently emphasised how these platforms significantly reduced the time and effort required for loan approvals, enabling businesses to address urgent financial needs promptly. Participant 1 explained, *"It's like, instead of waiting for weeks for traditional loans, you can apply online and get approved within... 24 hours or so."* Another participant highlighted the transformative impact of these rapid approvals, sharing that, *"We recently secured a small loan in, uh, less than 48 hours, which, uh, wouldn't have been possible with a traditional bank. It's quite... transformative"* (Participant 6). Similarly, Participant 8 reflected on their experience, stating, *"We've managed to, uh, get funding within 24 hours,"* a timeline that would have been unimaginable under conventional banking paradigms.

Beyond the speed of approvals, participants also underscored the importance of fintech solutions in maintaining operational continuity during critical moments. They recounted how these platforms provided timely funding, which ensured that business operations could proceed uninterrupted despite financial or logistical challenges. One participant recounted a pivotal experience, stating, *"…we needed some working capital—our bank took weeks to respond, but with Lulalend, we got feedback and the funds within 48 hours... fintech funding literally saved the day"* (Participant 15). Another participant described how a similar intervention helped them to navigate an urgent crisis, explaining, *"We had a major breakdown... and we were able to secure a short-term loan in less than 48 hours… It was a game-changer"* (Participant 18).

b) Benefits of fintech

Despite the challenges posed by mining's remote locations and traditional processes, participants consistently highlighted several advantages that fintech solutions offered them. These benefits included lower costs, heightened transparency, speed, efficiency, accessibility, flexibility, adaptability, and overall convenience. For these participants, fintech services are reshaping how mining SMMEs handle their finances, making funding more affordable, accessible, and responsive to rapidly changing business needs.

An advantage emphasised by a large number of participants as important was the lower cost of fintech solutions in comparison to traditional banking services. Listing the benefits of fintech, Participant 1 remarked, *"And lastly, I'd say the lower costs. Many of these, uh, platforms have lower fees or more flexible repayment terms compared to banks."* This perspective was echoed by Participant 2, who shared, *"Some of these fintech platforms have lower fees compared to traditional banks."* Participant 9 also confirmed this, stating, *"The cost is often lower to less fees."* Highlighting another dimension of affordability, Participant 11 added, *"Fintech companies charge less than, uh, conventional banks do."* Beyond lower fees, reduced interest rates were also noted as a key factor. Participant 13 explained, *"And another thing is the, uh, lower interest rates offered by some digital lending platforms. Uh, with banks, interest is often a burden, especially on smaller companies like ours."* These comments underscore how fintech platforms

alleviate financial burdens through reduced fees, manageable repayment terms, and lower interest rates, allowing SMMEs to allocate more resources toward growth and stability.

Accessibility was highlighted as another defining strength of fintech platforms. Participants noted that fintech services removed the complex requirements and procedures often associated with traditional banking, making funding more attainable for smaller enterprises. Participant 1 shared, *“Another thing is accessibility. Like, uhm, there are no long forms to fill out. It’s all digital."* This shift to digital onboarding eliminates bureaucratic friction, enabling businesses to enter the funding cycle swiftly. Participant 8 emphasised how fintech's inclusive funding criteria benefited SMMEs, explaining, *“You don’t need to be this big player with assets or high turnover to get funding."* This accessibility ensures that even smaller or less-established enterprises have a fair chance of securing financial resources.

The role of technology in enhancing accessibility was also noted, with Participant 12 stating, *“Oh, and the tech element too, um, like, mobile-based applications and online portals—they’ve made access and communication so much easier."* Instead of visiting physical branches, entrepreneurs can engage with fintech platforms directly from their smartphones or computers, reducing geographic and temporal barriers. Participant 16 highlighted the value of constant availability, adding, *“Fintech services are available, uh, 24/7, which means we can, uh, apply for funding anytime."* For the participants this continuous access ensured that they could address funding needs whenever they arose, whether during operational crises or to seize time-sensitive opportunities.

Speed and efficiency also emerged as transformative benefits of fintech. Fintech platforms were reported as significantly reducing the time required to secure funding, in sharp contrast to the lengthy processes of traditional banks. Participant 6 observed, *“Well, first of all, the speed and efficiency… that fintech offers is unmatched. I mean, it really cuts down on approval times and the reliance on collateral."* Participant 7 illustrated this by describing how fintech addressed urgent financial needs: *“When we need funds urgently… the traditional banks… ask for a mountain of paperwork and then take forever to*

process. But with fintech… we can just… apply online and get funds within 24 hours." Similarly, Participant 16 highlighted, *"You know, with fintech, we can get loans in hours instead of, uh, weeks."* Participant 18 reinforced this by adding, *"The paperwork alone could take weeks,"* while Participant 19 concluded, *"With fintech, we can get our funds in… less than a week sometimes."* These accounts demonstrate how fintech enables SMMEs to act quickly, addressing immediate financial challenges and seizing opportunities without delays.

Transparency was another critical benefit highlighted by participants. They reported that fintech platforms provided real-time updates on loan applications, repayments, and financial statuses, enabling their businesses to make more informed decisions. Participant 4 noted, *"I'd also add that transparency is a huge benefit... fintech platforms give real-time updates on loan statuses and repayments."* For the participants, this clarity fostered better financial management, as their businesses could anticipate obligations and adjust strategies accordingly. Participant 8 contrasted fintech with traditional banking, stating, *"With traditional finance, it sometimes felt like there were hidden fees everywhere. But, uh, with fintech, you know exactly what you're getting into. It's all there on your screen."* Similarly, Participant 9 added, *"You know, you get real-time updates on your applications and repayments, which is quite, uh, reassuring."* This transparency reduces uncertainties, builds trust, and helps businesses maintain financial stability.

Convenience emerged as a pivotal advantage, particularly for mining enterprises that operated in remote areas. Participants repeatedly highlighted how digital platforms simplified the financing process. Participant 2 explained, *"Well, the first thing that comes to mind is… uh… convenience, right? Like, um, I don't have to spend hours in a bank filling out forms. Everything is online."* Participant 10 added, *"The application process is online, so you don't have to, uh, travel back and forth to the bank."* Participant 11 shared, *"You can apply for funding from, uh, your office or home. It's not like… traditional banks where, uhm, you have to be physically present and go through all that paperwork."* Participant 16 noted, *"Oh, and another thing is that, um, fintech services are available, uh, 24/7, which means we can, uh, apply for funding anytime."* These observations underscore

how fintech platforms provide businesses with greater flexibility, enabling them to secure funding seamlessly and efficiently.

c) Type of fintech solutions used

Participants described their engagement with fintech services as a shift toward innovative financial tools that better align with the operational realities of small mining enterprises. The narrative that emerged from their accounts illustrates how digital lending platforms, mobile payment solutions, invoice financing, and P2P lending have collectively transformed how SMMEs in the mining sector manage their finances.

Digital lending platforms and online loans were among the most frequently mentioned tools and were praised for their provision of quick, trouble-free access to working capital. Participants highlighted the critical role played by these platforms in addressing the unpredictable cash flows that are characteristic of the mining industry. Participant 2 explained, *"We've mostly been using online lending platforms, you know, like Lulalend. They... make it really easy to apply for short-term financing, which is essential, especially in the mining sector, where cash flow is, uh, kinda unpredictable."* This speed and convenience were echoed by Participant 3, who noted, *"…we've mostly been using digital lending platforms, um, like RainFin and Lulalend. These platforms... well, they're convenient 'cause they don't require the kind of red tape you face at, uh, traditional banks."* Participant 6 further emphasised the streamlined nature of these services, stating, *"The main one, I'd say, is digital lending platforms, uh, you know, like Lulalend, where we get, um, quick access to loans without needing all that heavy paperwork."* Collectively, these platforms enable SMMEs to secure funding swiftly and without the administrative burdens associated with traditional banking.

Mobile payment solutions and gateways were another common fintech tool used by participants to reshape cash-flow management. By enabling digital and card payments directly at the mine site, these platforms helped maintain liquidity and facilitated smoother financial transactions. Participant 2 shared, *"I've also used payment gateways, um, like PayFast, for processing payments with suppliers and clients."* Participant 6 explained how these tools enhanced operational efficiency,

stating, *“We also utilize mobile payment solutions, uh—like Yoco for, uh, point-of-sale transactions, which helps us manage cash flows more efficiently."* Reinforcing this theme of convenience and speed, Participant 7 added, *“…we are using digital payment platforms like Yoco and SnapScan, um, mostly for, uh, receiving payments... It’s, uh, it’s quicker."* For the participants, these platforms simplify payment processing and ensure that businesses can handle transactions promptly and securely.

Invoice financing also emerged as a valuable tool for mining enterprises, particularly in mitigating the risks associated with long payment cycles. The participants reported that these platforms allow businesses to unlock funds tied up in outstanding invoices, providing much-needed liquidity. Participant 9 noted, *“Uh, we also use some invoice financing services, which let us, uh, get cash upfront against the unpaid invoices."* Participant 10 shared how these services alleviated financial pressure, stating, *“…invoice financing helps us, you know, not to wait for long payment cycles. We can use fintech services to, uh, access the funds tied up in invoices much faster."* Similarly, Participant 20 emphasised the impact of these tools, adding, *“…invoice financing platforms... let us access cash quicker... which is a big help when waiting on longer payment cycles."* Invoice financing has the potential to improve the financial stability of mining enterprises by filling the gap between billing and payment.

P2P lending was also highlighted as an alternative funding stream, although participants expressed mixed views regarding its applicability to the mining sector. For some participants, P2P lending offered advantages such as lower interest rates and direct investor relationships. Participant 4 explained, *“There are also peer-to-peer lending systems that we’ve explored... um, because they usually offer slightly lower interest rates compared to traditional banks."* Participant 11 added, *“Recently, we’ve started using crowd-lending platforms, which help us get funding directly from investors without going through traditional banks."* However, not all participants found P2P lending useful for their industry. Participant 9 noted, *“We tried it, but, uh, didn’t find it that useful for our industry."* These differing perspectives highlight the nuanced role of P2P lending as a solution that works for some but may not align with the specific needs of all mining enterprises.

d) Emerging fintech solutions underutilised

The participants identified several fintech avenues that were untapped or underdeveloped in the mining sector. These insights went beyond the standard lending and payment solutions, pointing toward more specialised tools that could profoundly benefit SMMEs if implemented effectively.

A recurring idea was the potential of blockchain-based solutions to resolve persistent supply-chain and financing inefficiencies. As one participant explained, *“I think, um, blockchain-based solutions could be quite useful, especially in securing and tracking supply chain payments. We face a lot of, um, delays and issues with supply chain financing, and having a transparent ledger might, uh, help with those”* (Participant 9). This statement underscores the sector’s need for more transparent, reliable systems that can streamline payment verification, reduce disputes, and enhance overall trust among stakeholders.

Crucially, this viewpoint supplements the "transparency" benefits discussed among the benefits of fintech described above. While digital platforms offer clarity on lending and repayment processes, Participant 9’s statement indicates that blockchain extends this transparency principle to supply-chain and financing flows, enabling near real-time verification of transactions with fewer intermediaries. Rather than challenging the notion that fintech promotes transparency, Participant 9's comment, "You *know, you get real-time updates on your applications and repayments, which is quite, uh, reassuring,"* demonstrates how developing technology can further reduce information asymmetries across a broader range of company activities.

Another key aspect of this sub-theme to emerge was the demand for mining-specific insurance products that directly address the industry’s unique operational risks. One participant noted, *“I think, uh, mining-specific insurance services could be a big game changer. Like automated digital insurance products that cover the various risks we face, uh, whether it’s equipment failure or operational downtime”* (Participant 10). This emphasis on tailored risk mitigation reflects a gap in current fintech offerings, where one-size-fits-all insurance does not fully protect against the unpredictable challenges inherent in mining.

Additionally, participants highlighted the absence of crowdfunding platforms tailored for the mining environment: *"…another thing is crowdfunding platforms specifically tailored for, um, SMMEs in mining. It's like, um, it's almost non-existent right now, and there's so much potential there"* (Participant 12). By expanding beyond conventional credit lines and venture funding, a specialised crowdfunding ecosystem could tap new investor pools and foster community-driven financial support.

Finally, rethinking collateral requirements through asset-backed digital loans emerged as an opportunity to unlock additional capital. One participant explained, *"If there were fintech services that could, uh, easily evaluate and accept our assets as collateral digitally, that would really, uh, open up financing options. Right now, not many digital lenders cater to, uh, mining-specific needs"* (Participant 13). Integrating digital asset evaluation tools could accelerate approvals, reduce paperwork, and make funding more accessible to enterprises that have valuable assets but lack a conventional credit history.

4.5 Findings Related to Research Question 2

Research Question 2 reads: *What are the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions?*

This section presents and discusses the theme, sub-themes, and codes related to the second research question.

Table 5: Theme 2, sub-themes, and codes that emerged from Research Question 2

Theme 2	Sub-themes (Number of quotes)	Codes
Barriers and challenges encountered by SMMEs in the South African mining sector	Infrastructure and connectivity (18)	Connectivity challenges
		Power constraints
	Digital literacy and skills gap (33)	Lack of training
		Resistance to change
	Trust and security concerns (8)	Fear of data breaches
		Scepticism toward new platforms
	Cost barriers (3)	Cost barriers
	Regulatory and compliance issues (7)	Regulatory and compliance issues
	Operational impact (9)	Delay in transactions
		Cash-flow disruptions

4.5.1 Theme 2: Barriers and challenges encountered by SMMEs in the South African mining sector

Participants' views shed light on multiple barriers that hinder the effective adoption of fintech by SMMEs in South Africa's mining industry. From an infrastructural standpoint, one participant said, "*Uhm, our mining sites are often in rural areas where internet access is not reliable*" (Participant 1), while another explained that "We can't always rely on, uh, consistent power supply... in rural mining regions" (Participant 17). Such conditions disrupt core financial activities: *"It becomes difficult to, uh, process payments or apply for loans*" (Participant 2) and compromise the usefulness of even sophisticated digital platforms, as

"*Without stable internet, even the best fintech platform, um, is useless*" (Participant 17).

Beyond infrastructure, a "*lack of digital literacy among some of our older employees*" (Participant 4) and a wide tendency to "*just roll out the service, but, uh, they don't provide, uhm, adequate training or customer support*" (Participant 1) were found to lead to underutilisation of fintech tools. Resistance to change compounded the problem: "*Some of our older staff weren't too keen on switching over from the banks."* (Participant 9) and "*We're, uh, used to doing things the old-fashioned way... I think that creates a mental block"* (Participant 10). Both comments capture how long-standing practices undermine a willingness to adopt new technologies. Even those who expressed an openness to embracing digital tools voiced trust concerns, with Participant 4 reporting, "*Some of these platforms have had, uh, breaches in the past, and... naturally, we're wary about that,"* and Participant 13 suggesting, "*It's difficult to, you know, trust a new platform without any, uh, established track record."* Cost constraints also surfaced frequently, with participants stating: "*Sometimes the, uh, transaction fees for digital lending are higher than traditional methods*" (Participant 18), and "*one of the main challenges is the, um, initial cost of integrating the fintech systems. It's, uh, quite hefty"* (Participant 19).

Tying these obstacles together were regulatory uncertainties and operational fallout from delays in financial transactions. Regarding regulatory uncertainties, Participant 2 pointed out: *"Well, right now, the regulatory environment is... not really geared towards fintech... This makes both the users and providers... a bit hesitant."* In terms of the operational fallout from delays in financial transactions, Participant 2 also stated: "*When the network is down, it basically shuts down our access to financial services. Payments are delayed, which affects our relationships with suppliers."*

Taken as a whole, these testimonies illustrate how infrastructural gaps, skills deficits, trust issues, financial burdens, regulatory constraints, and operational challenges form a web of barriers to fintech adoption in the mining sector. These sub-themes are discussed in the sections below, which examine each of these

obstacles in depth, drawing on the voices of participants to underscore the extent and urgency of these concerns.

a) Infrastructure and connectivity

The findings confirmed that mining sites are often situated in remote areas where unreliable internet connectivity and frequent power outages create substantial challenges for the effective adoption of fintech solutions. The interviews indicated that these infrastructural gaps hinder basic financial processes such as loan applications and mobile payments, with the result that even the most advanced digital platforms are less effective. These barriers need to be addressed for SMMEs in the mining sector to be able to benefit fully from fintech.

Connectivity challenges were a recurring theme in the interviews, with participants consistently highlighting the impact of poor internet access on their ability to leverage fintech services. Mining activities often take place in rural areas where network infrastructure is either inadequate or non-existent. Participant 1 captured this reality by stating, *"Uhm, our mining sites are often in rural areas where internet access is not, uh, reliable."* Participant 2 elaborated on how weak signals disrupted essential financial activities, explaining, *"You know, some of our mining sites are in remote areas, and... the network can be really bad. It becomes difficult to, uh, process payments or apply for loans."*

The participants reported that a lack of stable connectivity affected not only day-to-day transactions but also the broader adoption of digital services. Participant 3 emphasised, *"We work in remote areas where... the internet is not stable. It, um, affects the ability to use these digital services fully."* This challenge is compounded by the intersection of connectivity and other infrastructural issues. Participant 7 noted, *"We're in remote locations most of the time, and the internet and electricity issues make it difficult to rely on fintech solutions."* Summing up the importance of reliable connectivity, Participant 17 bluntly stated, *"Without stable internet, even the best fintech platform, um, is useless."* These accounts collectively underscore how patchy internet coverage undermines the transformative potential of fintech, in this way creating a roadblock to efficient

payments, short-term loan access, and cash-flow management for mining SMMEs.

Power constraints presented an equally large barrier to fintech adoption in remote mining regions. Many participants identified electricity shortages and an unpredictable power supply as critical issues that disrupted the use of digital platforms. Participant 7 pointed out, *"Electricity issues make it difficult to rely on fintech solutions."* The participants explained that even when internet connectivity was available, power outages could render card readers, computers, and mobile devices inoperable, halting transactions or interrupting funding applications mid-process. Participant 14 reinforced this reality, stating, *"Sometimes, even electricity can be, uh, a problem in rural areas."* These challenges were reported not as occasional inconveniences but as regular operational hurdles that severely limited the reliability of fintech solutions.

The gravity of these power constraints was succinctly summarised by Participant 17, who stated, *"We can't always rely on, uh, consistent power supply... in rural mining regions."* This highlights a deeper infrastructural issue: without dependable electricity, even the most advanced digital financial tools become inaccessible at critical moments. For SMMEs operating in areas where rapid financial assistance or payment processing is essential, the lack of reliable power severely diminishes the value and effectiveness of fintech solutions.

b) Digital literacy and skills gap

The study findings revealed that although fintech platforms offer more efficient and accessible financial solutions, many mining SMMEs struggle to take full advantage of these benefits owing to a lack of digital literacy and resistance to change. The participants' comments indicated that workers and management alike may lack the necessary skills to use new tools effectively, while traditional industry norms often discourage experimenting with unfamiliar technologies. These challenges, rooted in insufficient training and a reluctance to embrace change, significantly hinder the successful adoption of fintech in the mining sector.

A lack of training was frequently cited as a major barrier to fintech adoption. Many participants pointed out that insufficient digital literacy and limited exposure to fintech concepts resulted in underuse or outright avoidance of digital tools. Participant 1 highlighted the issue, stating, *“They sometimes just roll out the service, but, uh, they don’t provide, uhm, adequate training or customer support."* This lack of onboarding left users unprepared to maximise the potential of fintech platforms, with the challenge particularly pronounced among older employees. As Participant 4 explained: *“One of the biggest challenges we’ve faced is, um, digital literacy among some of our older employees... They often, uh, assume that everyone is tech-savvy, but that’s not really the case for us.”*

The mining sector’s reliance on traditional methods was found to complicate the transition to digital solutions further. Participant 5 observed, *“I think it’s mainly due to, um, lack of digital literacy and... lack of exposure to these solutions. Most mining operations in South Africa are still run using, uh, traditional methods, so there’s a steep learning curve."* Even managers, who were expected to lead by example, struggled without sufficient guidance. Participant 15 candidly admitted, *“Yes, um, we definitely have. Uh, for instance, the digital literacy of our staff and even... the managers, including me! (laughs) It’s an issue because these platforms are great, but if we don’t understand their features, we end up not using them to the fullest."* These accounts underscore the importance of targeted training and ongoing support to bridge the skills gap within the industry.

Resistance to change emerged as another substantial challenge, particularly among older or more traditionally minded workers. Despite the promise of more efficient financial processes, many mining SMMEs continue to rely on longstanding practices and are sceptical about adopting new methods. Participant 9 explained, *“Some of our older staff weren’t too keen on switching over from the banks,"* indicating that even when fintech solutions offer tangible benefits, workers accustomed to traditional systems often see no reason to disrupt the status quo. This sentiment was echoed by Participant 10, who noted, *“You know, many SMMEs in mining, we’re, uh, used to doing things the old-fashioned way... I think that creates a mental block.”*

The findings revealed that the deeply ingrained culture of manual processes and bank-centric approaches further promoted scepticism about fintech's relevance. Participant 12 described the challenge as an *"uphill battle",* stating, *"Convincing people to adopt new technologies that, uh, they don't fully understand or trust is, uh, an uphill battle."* The resistance was further reinforced by the generational gap. Participant 4 observed, *"Older workers tend to prefer, uh, manual processes that they're more comfortable with."* Even among those who were aware of fintech's potential, concerns about data security and a general unfamiliarity with digital tools contributed to hesitation. Participant 2 captured this apprehension, saying, *"A lot of us grew up relying on banks, so fintech is... it's new territory. Adapting to new tech can be, uh, intimidating."*

c) Trust and security concerns

The study found that while fintech technologies offer mining SMMEs the potential to simplify and improve their financial processes, trust and security concerns are considerable barriers to adoption. Participants expressed doubts about the reliability and safety of digital platforms, citing fears of data breaches and conveying scepticism about the credibility of newer providers. These issues were particularly pronounced among stakeholders that were accustomed to the perceived stability of long-established banking institutions. To build confidence in fintech solutions, it is critical to address fears about data security and demonstrate the reliability of digital platforms.

Fear of data breaches emerged as a recurring theme in participants' responses, which reflected widespread apprehension about the safety of financial information on digital platforms. Despite the advantages of rapid approvals and user-friendly interfaces, many participants were reluctant to entrust sensitive data to online applications. Participant 3 articulated this anxiety, stating, *"There's a bit of, uh, fear when it comes to putting your finances in an app. There's always that concern of, 'What if the platform collapses?'"* This comment highlights not only fears about financial losses but also doubts about the stability of fintech providers.

Concerns about cyberattacks and hacking further exacerbated these trust issues. Participant 4 noted, *"Some of these platforms have had, uh, breaches in the past,*

and, naturally, we're wary about that." Participant 9 added to this, emphasising fears of *"data breaches or, uh, losing money due to some tech glitch".* Similarly, Participant 11 remarked, *"Being online makes them... a target for cyber-attacks."* This participant pointed to the perceived vulnerability of digital financial solutions in an industry traditionally reliant on manual and offline processes. These concerns underscore the need for fintech providers to prioritise robust security measures and transparent communication to mitigate apprehension about data safety.

Scepticism toward new platforms also emerged as a key impediment to fintech adoption, with participants voicing concerns about regulation, security, and the lack of an established track record. Participant 10 explained, *"Some people are sceptical about, um, using these platforms because they think they're, uh, less secure or, uh, not regulated enough."* This hesitation was compounded by the absence of long-term performance data, as noted by Participant 13, who stated, *"It's difficult to, you know, trust a new platform without any, uh, established track record."* These doubts highlight how a lack of familiarity with newer fintech solutions creates a barrier to their widespread adoption, even when the potential benefits are clear.

The scepticism toward fintech platforms was particularly pronounced among older or more traditional stakeholders, who remained loyal to established banking institutions. Participant 20 observed, *"There's still a lot of scepticism about, uh, fintech services among some of the older stakeholders. They prefer the, um, established banks and aren't entirely confident about fintech's stability."* This preference for conventional financial providers reflects a broader resistance to change, where perceptions of fintech as unproven or inadequately regulated overshadow its potential advantages.

d) Cost barriers

While many participants reported that fintech offered them faster, more flexible funding, the cost factor emerged as a key obstacle that prevented broader adoption among mining SMMEs. High transaction fees, steep integration

expenses, and insufficient capital to invest in the necessary technology or infrastructure were recurring ideas.

One participant observed, *"Sometimes the, uh, transaction fees for digital lending are higher than traditional methods"* (Participant 18), suggesting that although fintech can outpace conventional banks in terms of speed, its services may come at a cost that some enterprises find prohibitive. Another participant pointed to the initial setup costs, stating, *"One of the main challenges is the, um, initial cost of integrating the fintech systems. It's, uh, quite hefty"* (Participant 19). For smaller mining operations already juggling slim margins, these upfront expenses can be difficult to justify.

Even beyond integration fees, limited financial capacity was found to prevent SMMEs from embracing fintech solutions. As Participant 19 explained, *"Many small mines don't have enough capital to invest in fintech solutions."* This comment underscores how cost barriers, including both one-time onboarding expenses and ongoing transaction fees, can counteract the potential efficiencies and benefits that fintech may otherwise provide.

e) Regulatory and compliance issues

Participants consistently voiced concerns that existing regulations and compliance demands created hurdles for fintech adoption in the mining sector. Many noted how ambiguous guidelines, high compliance costs, and outdated frameworks prevented smaller enterprises from seeking to make use of digital financial tools.

One participant observed, *"Well, right now, the regulatory environment is... not really geared towards fintech... especially when it comes to, uh, guidelines on data security and consumer protection. This makes both the users and providers... a bit hesitant"* (Participant 2). Another participant remarked that clearer, more explicit guidelines would foster trust and drive wider acceptance: "*I think if there were clearer guidelines or, uh, explicit support, it would create more trust among miners and... make adoption easier"* (Participant 15).

However, it is not just about clarity—burdensome red tape can discourage innovation. One participant underlined how this constrained fintech providers: *“There’s also a lot of, uh, red tape that makes it hard for fintech companies to introduce new products*” (Participant 16). Smaller mining operators, especially, struggled with complex compliance requirements that were ill-suited to their scale. As one participant put it, “*Compliance requirements can be quite, uh, complex, and not well-suited to smaller operators like us*” (Participant 18). Another participant pointed out that navigating licences and paperwork could be daunting for SMMEs without dedicated legal teams. “*The paperwork and, uh, licensing requirements are really... complicated. It's... hard for smaller mining companies to navigate*” (Participant 19).

Taken together, these insights depict a regulatory environment that, while meant to protect consumers and ensure stability, often hinders smaller mining SMMEs from fully embracing fintech solutions. Without streamlined frameworks and lower compliance costs, many SMMEs are wary of legal pitfalls or find the bureaucratic load too heavy to bear. This has the potential of stalling an industry-wide shift toward modern financial technologies.

f) Operational impact

The findings revealed that mining SMMEs depend on rapid and reliable financial transactions to sustain their operations. However, participants reported that connectivity gaps, outdated infrastructure, and user errors frequently disrupted these processes, causing costly delays that jeopardised essential supplier relationships and blocked critical market opportunities. These operational challenges not only delayed transactions but also disrupted cash flow, a vital element for balancing incoming funds with ongoing expenses. These issues collectively weaken the efficiency and stability that fintech solutions are intended to deliver.

Delays in transactions were a prominent concern shared by participants, with many emphasising how connectivity and infrastructure issues hindered time-sensitive financial activities. When internet speeds are slow or networks go offline, day-to-day operations in the mining sector can come to a halt. Participant

2 explained the immediate consequences of such downtime: *“Well, when the network is down, it basically shuts down our access to financial services. Payments are delayed... which affects our relationships with suppliers."* This comment highlights how even brief outages can erode supplier trust, undermining the smooth flow of goods and services that are essential for operations.

The impact of transaction delays was reported to extend beyond supplier relationships to missed opportunities in a fast-paced and volatile industry. Participant 8 noted, *“Sometimes, uh, we miss out on opportunities because we can’t complete transactions in time."* Delays in processing payments or securing funds can mean losing critical deals or failing to address urgent capital needs. Slow internet speeds exacerbate these challenges, as Participant 9 described: *“Tech barriers, like slow internet, cause delays in processing transactions or accessing real-time information."* These delays not only stall immediate payments but also block access to up-to-date market data, which hinders timely decision-making.

Cash-flow disruptions emerged as another major operational challenge, with participants stressing how stalled transactions had a ripple effect on their financial stability. For SMMEs, delayed payments mean deliveries arrive late, while late deliveries can strain customer relationships and jeopardise future sales. Participant 1 highlighted how even minor disruptions could have cascading effects: *“If someone can’t figure out how to use the platform, you know, payments get delayed, and, uh, that disrupts cash flow."* This underscores how a lack of training, user errors or brief technical glitches can hold up vital funds.

Network downtime was found to compound these issues; as Participant 3 explained: *“If a network outage happens, we can’t process payments on time, which causes delays in deliveries. That also affects our cash flow because we, uh, miss certain windows for, uh, making transactions."* These disruptions not only delayed critical payments but also impacted deliveries, creating a chain reaction that affected both operational efficiency and financial health. Participant 5 summarised the collective anxiety around transaction failures, stating, *“If a transaction fails because of a system error or... poor connectivity, it affects our cash flow”.* This sentiment underscores the delicate balance required to maintain

steady incoming and outgoing funds, which are essential for the financial health of mining SMMEs.

4.6 Findings Related to Research Question 3

Research Question 3 reads*: What are the enablers of fintech adoption by SMMEs in the South African mining sector?*

This section outlines Theme 3, and its associated sub-themes and codes related to the third research question.

Table 6: Theme 3, sub-themes, and codes that emerged from Research Question 3

Theme 3	**Sub-themes (Number of quotes)**	**Codes**
Enablers of fintech adoption by SMMEs in the South African mining sector	Technology and platform-related enablers (43)	Affordability and cost-effectiveness
		Flexibility in funding
		Widespread mobile adoption
		Peer influence and competitive pressure
		Speed and convenience
		Ease of use and simplicity
	Organisational and cultural enablers (11)	Leadership and investor support
		Positive operational outcomes
		Staff awareness
	Regulatory and government-related enablers (9)	Government policies and financial inclusion
		Regulatory and licensing requirements

4.6.1 Theme 3: Enablers of fintech adoption by SMMEs in the South African mining sector

The data demonstrated that a convergence of technological, organisational, and regulatory factors drives fintech adoption among mining SMMEs in South Africa. Participants repeatedly cited the affordability of fintech services, the flexibility of digital financing options, forward-thinking leadership, and an increasingly supportive regulatory environment as cornerstones of fintech integration.

Many underscored the importance of affordability, with Participant 1 expressing: "*One factor is definitely the, uh, affordability of these services... cost-effective compared to, uhm, traditional banks.*" Others noted flexibility of funding to be useful. In this regard, Participant 13 explained that "*having, uh, flexible lending terms really helped us. Uh, fintech platforms... are more, uh, accommodating to small businesses like ours.*" Beyond cost-effectiveness and flexibility, participants highlighted the role of speed and convenience, with one participant explaining, "*We've managed to, uh, get funding within 24 hours*" (Participant 8), a stark contrast to conventional banking timelines.

External influences, such as "*the government's… recent push for digital financial inclusion*" (Participant 6), also inspired confidence among the SMMEs. Participants stated: "*I think the government should really consider revising the current policies to, uh, encourage fintech innovation*" (Participant 2) and "*the government's—uh, relaxation of licensing requirements for digital lenders was a, uh, good move… it's created a… more competitive environment*" (Participant 6). Internally, a culture of openness to new ideas and supportive investment structures were found to dismantle adoption barriers further. Participants suggested: "*Our company's openness to innovation. The leadership here is pretty forward-thinking, so they actively encourage exploring new technologies"* (Participant 4), and "*Our investors... have been quite supportive of, uh, introducing these innovations, and, uh, that's helped build confidence among, uh, our team members"* (Participant 10).

Peer influence and competitive pressure also played a pivotal role. As one participant stated, "*When you see your peers successfully using these services, you're more inclined to give it a try*" (Participant 2). Another participant reflected

on how "*awareness campaigns from some of the fintech companies... have helped a lot. They, uh, came in and gave demonstrations*" (Participant 8). These comments underscore the impact of both external marketing and peer endorsement on fintech uptake. Taken as a whole, these perspectives illustrate how cost-effectiveness, flexible funding, progressive leadership, and regulatory incentives together form an ecosystem that is ready for digital financial innovation in the mining sector.

Below, the sub-themes of technology and platform-related enablers, organisational and cultural enablers, and regulatory and government-related enablers are used to explore these drivers of fintech adoption in greater detail, drawing on verbatim quotations to underscore the specific ways in which the drivers empower mining SMMEs to embrace digital financial solutions.

a) Technology and platform-related enablers

The interviews revealed that the rapid rise of fintech adoption in the mining sector has been driven by several technological advances that make digital financial services more feasible and appealing for SMMEs. Participants identified affordability, flexibility, widespread mobile adoption, peer influence, speed, and ease of use as factors that collectively encouraged mining SMMEs to integrate fintech into their operations. This in turn enabled them to overcome traditional barriers and streamline financial processes.

Affordability and cost-effectiveness emerged as decisive factors in the adoption of fintech solutions. Participants repeatedly highlighted how lower fees, affordable devices, and flexible lending terms made fintech a more accessible alternative to traditional banking. Participant 1 noted, *"One factor is definitely the, uh, affordability of these services... cost-effective compared to, uhm, traditional banks."* The availability of affordable technology was also emphasised, with Participant 2 stating, *"I'd say the availability of affordable smartphones."* Participant 12 reinforced the importance of cost savings, saying, *"Another factor is, uh, the lower costs compared to, um, traditional financial services... always a big incentive for an SMME like us."*

Additionally, fintech's flexible lending terms contribute to affordability by reducing financial barriers for small businesses. Unlike traditional banks, which often require high collateral and rigid repayment structures, fintech platforms offer alternative credit assessments and repayment plans tailored to the needs of SMMEs. Participant 13 highlighted this advantage, explaining, *"Having flexible lending terms really helped us. Uh, fintech platforms... are more, uh, accommodating to small businesses like ours."* These adaptable lending options lower the financial burden on mining SMMEs by making capital more accessible without the high costs associated with conventional loans. The combination of cost savings and flexible financing makes fintech platforms particularly attractive to smaller mining enterprises with limited resources

Flexibility in funding was another key advantage noted by participants. Fintech solutions offer alternative credit assessments and customisable financing options, which better align with the variable cash flows in mining. Participant 1 explained, *"And then, uh, there's the flexibility. Like, uh, the digital lending platforms offer more tailored loan products that suit our cash flow."* Participant 8 added, *"And, um, I think the flexibility of fintech platforms—they don't require a rigid, traditional credit history. That's been a relief. They offer custom services, which makes it easier to switch over."* Participant 20 further emphasised the operational benefit of this adaptability, saying, *"With these, uh, flexible financing options, we can, um, manage unexpected expenses... without having to halt operations. That's a big relief, honestly."* This flexibility provides mining SMMEs with financial solutions tailored to their unique challenges, which enables them to address operational uncertainties more effectively.

The widespread adoption of mobile technology was also found to play a critical role in enabling fintech integration. Participants highlighted how the increasing use of smartphones and mobile internet was reducing barriers to adoption and facilitating digital transactions. Participant 1 observed, *"The increased use of mobile devices in the workplace has made it easier for everyone to adapt."* Participant 2 noted how digital payments had become normalised, stating, *"People are more comfortable with using cards and mobile wallets now."* Participant 5 underscored the ubiquity of smartphones, saying, *"Almost all our employees, from, uh, managers to field workers, have a smartphone now."* This

accessibility allows mining SMMEs to incorporate fintech tools seamlessly into their daily operations, which improves efficiency and financial inclusion.

The findings revealed that peer influence and competitive pressure further motivate mining SMMEs to adopt fintech solutions. Participants consistently emphasised how observing the success of peers inspired confidence and drove experimentation. Participant 2 explained, *“When you see your peers successfully using these services, you’re more inclined to give it a try."* Participant 7 pointed to competitive dynamics, stating, *“When we saw other companies in the sector benefiting, we felt compelled to adopt as well."* Participant 9 echoed this sentiment, adding, *“When we saw other companies using these services and, uh, succeeding, it gave us more confidence to try them ourselves."* Additionally, Participant 11 highlighted how the growing fintech market drives down costs, saying, *“It has led to more affordable solutions, which is good for us small businesses."* Positive word-of-mouth also played a role, as Participant 15 noted, *“When other miners talk positively about a service, we’re more inclined to give it a try."* These influences collectively encourage mining SMMEs to explore and adopt fintech tools, in this way fostering a culture of innovation within the sector.

Speed and convenience were universally recognised as key enablers of fintech adoption. Participants emphasised how digital platforms drastically reduced waiting times and streamlined access to funds. Participant 1 observed, *“Now, with fintech platforms, uh, within a day or so, you can, you know, get the money."* Participant 2 shared a similar experience, saying, *“I applied online, and, uh, I think it was within 24 hours I had access to the funds."* Participant 8 contrasted this with traditional banks, stating, *“With traditional banks, you'd be waiting days, even weeks, for approval. But with, um, these fintech platforms, we’ve managed to, uh, get funding within 24 hours."* These experiences underscore how fintech’s speed and convenience provide a strong competitive advantage, particularly in industries where time-sensitive decisions are crucial.

Ease of use and simplicity emerged as another major factor that enabled fintech adoption. Participants highlighted the user-friendly design of fintech platforms as facilitating rapid uptake even among those with limited technical skills. Participant 2 explained, *“Many of the fintech platforms are designed with simplicity in mind,*

which makes them easy to use." Participant 3 noted, *“And, um, mobile apps are, uh, user-friendly, so even our team, who aren’t exactly tech-savvy, can figure them out with some help."* Participant 4 emphasised the intuitive design of these tools, recalling, *“Everyone was nervous, but it turned out to be quite simple. So that intuitive design has really helped ease adoption."* These observations demonstrate how straightforward interfaces and accessible customer support enable mining SMMEs to integrate fintech solutions into their operations with minimal friction.

b) Organisational and cultural enablers

The data showed that successful adoption of fintech in the mining sector relies heavily on organisational and cultural enablers. Collectively, forward-thinking leadership, investor support, visible operational benefits, and increased staff awareness were shown to foster a conducive environment for innovation. For the participants, these factors not only built trust in digital solutions but also helped teams to adapt and embrace fintech as a critical component of their financial processes.

Leadership and investor support emerged as pivotal drivers of fintech adoption, with participants emphasising the role of top-down advocacy in cultivating a culture of innovation. Participant 4 explained, *“Our company’s openness to innovation. The leadership here is pretty forward-thinking, so they actively encourage exploring new technologies."* Leadership openness to innovation was reported as not only inspiring confidence but also ensuring that resources were allocated to enable smooth adoption of new technologies. Participant 4 further noted, *“Having that, uh, leadership support means there’s always a budget for tech upgrades, and, uh, there’s no resistance to trying out new solutions."* Investor backing was also reported to play a critical role, as it provided the financial and psychological support needed to implement new technologies. Participant 10 shared, *“Our investors... have been quite supportive of, uh, introducing these innovations, and, uh, that’s helped build confidence among, uh, our team members."* These explanations illustrate how leadership and investor enthusiasm create a foundation where fintech solutions can take root and thrive.

Positive operational outcomes were another key enabler, with participants highlighting how fintech solutions improved cash-flow management, expedited projects, and streamlined financial processes. Participant 1 described how digital lending platforms addressed immediate financial needs, stating, *“Now, using a digital lending platform, we were able to secure a short-term loan to cover operational costs."* Participant 10 echoed this benefit, adding, *“We’ve been able to, um, smooth out cash flow issues and, uh, cut down on the time spent dealing with, uh, traditional lenders."* The combined impact of speed and usability was emphasised by Participant 14, who noted, *“The faster we get access to funding, the quicker we can, uh, move on, uh, projects... we’ve been able to, uh, train our staff quickly and, uh, get everyone on the same page. So, uh, it’s been, uh, really positive."* These perspectives underscore how apart from resolving immediate financial challenges, fintech adoption also increases overall productivity and team alignment, which enable mining SMMEs to focus on their core operations.

Staff awareness initiatives, including workshops, awareness campaigns, and fintech demonstrations, were also reported as instrumental in building confidence and facilitating seamless adoption. Participant 7 highlighted the importance of these efforts, stating, *“One big factor has been the, uh, growing awareness of digital solutions. Uh, through workshops and industry events, we learned about the, um, potential of fintech."* Participants stated that direct engagement from fintech companies further supported this process. Participant 8 noted, *“I think awareness campaigns from some of the fintech companies have helped a lot. They, uh, came in and gave demonstrations."* These initiatives helped teams to become more proficient and comfortable with using fintech platforms, leading to tangible operational gains. Participant 19 observed, *“And, uh, now that everyone on the team is more comfortable with using, uh, fintech, we’re seeing better overall productivity."* By demystifying digital tools and demonstrating their benefits, these programmes help mining SMMEs integrate fintech solutions effectively and maximise their potential.

c) Regulatory and government-related enablers

Government policies, financial-inclusion initiatives, and supportive licensing frameworks were reported as critical in promoting fintech adoption among mining

SMMEs. Clear and forward-looking regulations not only foster innovation and competition but also provide the necessary confidence for businesses to embrace digital financial solutions. This suggests that by streamlining licensing processes and offering targeted incentives, governments can play a pivotal role in driving fintech uptake within the mining sector.

Government policies and financial-inclusion campaigns were frequently highlighted by participants as essential drivers of fintech adoption. Participant 2 suggested the need for policy revisions to encourage innovation, stating, *"I think the government should really consider revising the current policies to, uh, encourage fintech innovation."* Participant 6 acknowledged the positive impact of digital financial-inclusion efforts, adding, *"The government's recent push for digital financial inclusion has also played a big role in... encouraging adoption."* These initiatives make fintech more accessible and relevant to mining SMMEs.

Participants also emphasised the need for more specialised support tailored to the unique challenges of mining SMMEs. Participant 14 proposed, *"I think, uh, the government should... streamline the regulations around, uh, fintech, especially for, uh, SMMEs in the mining sector."* Echoing this sentiment, Participant 17 noted, *"The government's, uh, initiatives on financial inclusion have made it more, um, accessible for us to explore and use these solutions."* Participant 20 suggested that additional protections and incentives could further encourage adoption, stating, *"If the government could, uh, offer some protections and incentives, then I think more SMMEs in mining would take the leap."* These comments underline the importance of targeted policies and measures that address the specific needs of mining-focused businesses.

The regulatory environment and licensing requirements also emerged as crucial determinants of fintech adoption. Participant 6 commended recent reforms, observing, *"The government's—uh, relaxation of licensing requirements for digital lenders was a good move... It's created a... more competitive environment."* However, challenges remain, as highlighted by Participant 9: *"The licensing requirements can be quite strict, which limits some of the innovative fintech companies from... expanding their services to mining-focused SMMEs."* Regulatory uncertainty was also a concern, with Participant 10 noting, *"Right now,*

I think the policies are... not very well-defined for sectors like mining... that... holds back adoption to some extent."

To address these barriers, participants proposed creating a more flexible and supportive regulatory framework. Participant 16 suggested, *"I think the government needs to... create a more... flexible regulatory environment for... fintech companies. Maybe... introduce incentives for... startups and SMMEs that... adopt fintech services."* Such measures would not only reduce barriers to entry for fintech providers but also encourage mining SMMEs to integrate digital financial solutions into their operations.

4.7 Conclusion

Chapter 4 presented the findings obtained from analysing the data derived from the semi-structured interviews with the study participants, who represented mining SMMEs, fintech service providers, and financial advisers and mining consultants. The findings were organised according to the study's three research questions, which aimed to assess the role of fintech in promoting funding access for mining SMMEs; the barriers encountered by these SMMEs in adopting fintech solutions; and the enablers of fintech adoption for the SMMEs.

The study findings indicated that fintech solutions are increasingly influencing how SMMEs in South Africa's mining sector obtain and manage funds, answering the first research question about fintech's function in facilitating access to finance. Mining companies can secure finance faster, often in 24 to 48 hours, using digital loans, mobile payments, invoice financing, and P2P platforms, which allows these companies to sustain key operations and act on unexpected possibilities. Furthermore, cheaper fees, less paperwork, and more transparent terms demonstrate fintech's ability to provide a cost-effective, flexible alternative to traditional banking.

Despite these advantages, the findings revealed large barriers and challenges to widespread adoption, which directly addresses the second research question. Owing to infrastructural challenges in remote mining areas, internet connectivity and power supply are often unstable, which reduces the effectiveness of digital

platforms. SMMEs also face digital literacy gaps, a reluctance to abandon traditional banking systems, and ongoing trust and security worries. High transaction costs on some platforms, along with complex or ambiguous regulations, discourage several mining companies from fully adopting fintech solutions.

Nonetheless, in addressing the third research question, the study found that the enablers of fintech adoption highlight potential solutions to these challenges. Widespread mobile device use, supportive leadership within mining enterprises, and the peer influence of competitors that have effectively integrated fintech have all been demonstrated to increase acceptability. Clearer government policies that promote financial inclusion, more flexible licensing regulations, and improved regulatory guidelines for consumer protection can all help to boost confidence. In conjunction, organisational initiatives such as staff training sessions and clear demonstrations of fintech's benefits are critical for altering traditional thinking and for fostering trust.

Finally, these findings highlight fintech's revolutionary impact on SMMEs in the mining sector while also clarifying what needs to be achieved to assure its long-term success. Resolving connectivity gaps, improving digital skills, and fine-tuning regulatory frameworks are critical stages for fintech in increasing financial inclusion and mining operations' competitiveness. As new technologies such as blockchain-based supply-chain solutions and industry-specific insurance products emerge, SMMEs stand to benefit even more, provided that they obtain the necessary infrastructure, regulatory, and organisational support to capitalise on these advances.

CHAPTER 5. DISCUSSION OF FINDINGS

5.1 Introduction

This chapter provides a comprehensive discussion of the findings presented in Chapter 4. The discussion is structured around the study's three research questions, with an in-depth analysis of how fintech affects financial access for SMMEs, the obstacles that hinder fintech adoption, and the factors that promote its use. Drawing on insights from the participant interviews and existing literature, the chapter identifies key trends, highlights sector-specific nuances and in South Africa's mining industry.

5.2 Discussion Pertaining to Research Question 1

Research Question 1 reads: *"What is the role of fintech in promoting access to funding for SMMEs in the mining sector in South Africa?"* In response to this question, the interview questions elicited responses that led to the identification of Theme 1: The role of fintech in promoting funding access. The data presented in Chapter 4 indicate that fintech solutions that encompass rapid loan approvals, flexible lending products, and simplified digital platforms are particularly important for SMMEs that operate in the mining sector. This is because this sector is marked by high capital requirements and volatile revenue streams, which can disrupt operational stability.

This discussion section focuses on how these fintech features address the unique liquidity pressures faced by smaller mining operations. It compares the speed, accessibility, and cost-efficiency of fintech-based financing against traditional banking processes, offering evidence that mining SMMEs stand to gain from the increased flexibility and inclusivity of digital finance. The ensuing analysis explores Theme 1 in detail, drawing on both participant testimonies and existing scholarly works to illustrate fintech's transformative influence on funding access within this capital-intensive and risk-prone industry.

5.2.1 Theme 1: The role of fintech in promoting funding access

The findings related to this theme demonstrate that fintech solutions hold considerable potential for transforming access to funding among SMMEs in South Africa's mining sector. Participants consistently highlighted the speed at which fintech platforms approved loans, frequently within hours or a few days, contrasting this with the weeks-long processes used in conventional banking. Apart from being a convenience, rapid approvals are a critical advantage in mining, where sudden machinery breakdowns, delayed payment cycles, and volatile revenue streams can jeopardise production. Scholars explain that fintech providers use automated assessment algorithms and digital verifications, which enables them to evaluate creditworthiness more swiftly and facilitate faster inflows of working capital (Setiawan & Maulisa, 2020; Wang, 2022). Building on these studies, the present findings indicate that while speed benefits most small enterprises, it is particularly important for capital-intensive operations such as mining SMMEs, where any delay in financing can substantially disrupt operational continuity (Bu et al., 2024).

Beyond the dimension of speed, participants emphasised that using fintech models often led to lower administrative overheads, fewer collateral demands, and greater transparency in the lending process. These attributes align with extant research on cost savings and reduced procedural bottlenecks associated with fintech models, which can expand financial inclusion for smaller companies that operate on tight profit margins (Marina et al., 2023; Mah et al., 2022). Mining SMMEs face substantial up-front costs related to equipment, regulatory compliance, and staffing. This means that being able to access funding with limited collateral requirements often determines whether an enterprise can sustain its extraction and production activities through cyclical downturns (Matekenya & Moyo, 2022). Moreover, accessibility improvements that are facilitated by digital applications appear to bridge the gap in regions with limited physical banking infrastructure. This observation is corroborated by work on mobile-based solutions that reach underserved areas (Etudaiye-Muhtar et al., 2024). Participants confirmed that simple online onboarding processes and prompt feedback from fintech providers helped them to optimise cash-flow

planning, which enabled them to address urgent expenses such as machinery repairs or environmental assessments without enduring the protracted response times customary in traditional lending.

Notably, the array of fintech tools adopted by participants, which include digital lending platforms, mobile payment gateways, and invoice financing, contributes to earlier findings that highlight how such services address liquidity gaps by reducing bureaucratic complexities (Karim et al., 2022). Invoice financing has been recognised in several studies as a practical avenue for turning pending receivables into immediately available capital, in this way stabilising the cash flow of mining SMMEs that are faced with extended billing cycles (cf. Setiawan & Maulisa, 2020).

P2P lending emerged as a contested option. Although its capacity to connect borrowers and lenders directly can lower interest rates and simplify approval, participants cited investor scepticism and the sector's perceived riskiness as reasons for their hesitation to make use of this option. This stance reflects partial alignment with the broad support for P2P lending for SMME financing (Putri Rusadi & Benuf, 2020), but highlights the unique uncertainties in mining, where geological surveys, environmental liabilities, and volatile market demand complicate credit assessments and deter many prospective lenders.

Despite these reported successes, the study also uncovered substantial underutilisation of more advanced fintech mechanisms, such as blockchain-based financing, specialised insurance products for mining, and crowdfunding geared to high-capex projects. Literature proposes that distributed ledger technologies and mining-specific insurance schemes can streamline supply-chain oversight, reduce transaction fraud, and facilitate risk-sharing arrangements aligned with the industry's unique cost structures (Chen, 2024; Prodanova & Bondarenko, 2023). However, participants emphasised that limited awareness, insufficient marketing, and a lack of tailored regulations hinder the adoption of these emerging solutions. While blockchain, for instance, promises improved traceability and secure record-keeping, many mining companies appeared uncertain about the practical steps needed for its implementation and expressed their apprehension about data security and long-term platform

viability. These concerns mirror the general caution toward novel digital ecosystems that has been observed in other resource-dependent sectors, where pilot projects and policy clarity are often prerequisites for robust uptake (Marina et al., 2023).

Overall, Theme 1 aligns with the broader literature in confirming that fintech promotes faster disbursements, reduced borrowing costs, and broader inclusion. At the same time, it extends the existing discourse by underlining the heightened stakes faced by mining SMMEs. Unlike service-oriented or retail-based enterprises, mining companies operate in an environment where operational halts caused by insufficient capital can undermine long-term viability. Consequently, the immediacy and flexibility afforded by fintech are considered most important, while any perceived gaps in product suitability or regulatory backing reduce the chances that advanced innovations such as blockchain or customised insurance will be used widely. Thus, although fintech fills critical funding gaps in the mining domain, the industry's risk profile and cyclical nature demand more nuanced, sector-specific efforts that span user education, policy interventions, and specialised service offerings to make full use of the advantages of digital financial platforms.

When mapped against the TOE model, our speed–cost–transparency triad suggests that technology pull (perceived usefulness) outweighs organisational push for early-stage adopters, supporting Urumsah et al. (2022) contention that technological attributes dominate in emerging-market SMMEs. Yet two Burgersfort firms with identical cash-flow volatility rejected invoice-discounting because the owners' risk calculus was shaped by prior experiences with "discounted" factoring in 2016. This anomaly indicates that organisational memory a factor rarely modelled in TOE, can suppress adoption even when environmental and technological conditions are favourable. By integrating organisational-learning theory Creswell & Cresswell (2018) with TOE, we contribute a boundary condition: fintech's perceived relative advantage must exceed the negative valence of past financing encounters to trigger adoption in risk-intensive sectors.

5.3 Discussion Pertaining to Research Question 2

Research Question 2 reads: "*What are the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions?"* This question aligns closely with the second theme of the study's findings, "Barriers and challenges encountered by SMMEs in the South African mining sector." As outlined in Chapter 4, participants highlighted several interrelated constraints that ranged from infrastructural deficiencies, such as poor internet connectivity and unstable power supply, to digital literacy gaps, trust and security concerns, high costs, and regulatory complexities.

In the mining context, where remote working conditions and capital-intensive operations are the norm, these barriers take on a heightened significance that differentiates mining SMMEs from more conventional SMMEs. The discussion below explores how and why these challenges arise, comparing participant experiences with existing research on fintech adoption. The extent and interplay of these obstacles are examined to establish how the mining sector's unique environment can compound typical fintech adoption hurdles. From this, practical and policy-oriented strategies for more inclusive digital transformation can be formed.

5.3.1 Theme 2: Barriers and challenges encountered by SMMEs in the South African mining sector

This theme identified a range of multifaceted obstacles that hinder the effective adoption of fintech by SMMEs in South Africa's mining industry. These obstacles encompass infrastructural and connectivity shortfalls, digital literacy and skills gap, trust and security concerns, cost barriers, regulatory and compliance issues, and operational impact.

Participants consistently highlighted connectivity issues, citing weak or non-existent internet coverage in remote regions and frequent power outages as primary impediments. These findings reflect prior research that points to insufficient technological infrastructure in rural areas as impeding broader fintech adoption (Setiawan et al., 2021). Mining operations are especially affected by

such disruptions, as extended downtimes in internet or electricity can stall crucial tasks, including loan applications and payment processing. This has the effect of undermining the efficiency gains that fintech is intended to deliver (Karim et al., 2022). The dependence of these SMMEs on digital connectivity for real-time transactions and data exchange increases the adverse impact of infrastructural shortcomings. This finding aligns with observations that resource-intensive industries face heightened risks when the environments in which they operate lack reliable utilities (Matsumoto et al., 2016).

Another barrier that surfaced among participants' concerns related to limited digital literacy, particularly among older employees that were accustomed to traditional banking and manual record-keeping. While literature underscores the importance of user education for seamless fintech adoption (Sahabuddin et al., 2023), the findings of the present study go further to suggest that the absence of structured training programmes can stall or even reverse fintech implementation within mining operations. Participants noted that insufficient onboarding efforts often lead to misunderstandings regarding digital platforms' functionalities and fears about data-entry errors. Both issues can result in delayed transactions and increased reliance on manual processes. Such resistance to technological change also stems from long-standing industry norms and generational habits that perpetuate a preference for established banking institutions. These insights converge with broader research findings that point to a lack of clear guidance, coupled with users' fear of making mistakes on unfamiliar platforms, as curbing the willingness of SMMEs to migrate fully onto digital systems (Moşteanu, 2020).

Trust and security concerns further compound these barriers, with participants expressing apprehension about data breaches, cyberattacks, and the perceived instability of newly introduced fintech platforms. While existing research shows that scepticism toward digital finance is common among businesses with substantial assets at stake (Stewart & Jürjens, 2018; Adamek & Solarz, 2023), the mining sector's high-value outputs magnify the potential repercussions of financial mismanagement or unauthorised transactions. Additionally, participants indicated a bias toward long-established banking institutions, signalling a preference for familiar processes that offer assured stability. This pattern

resonates with studies that emphasise trust as an important consideration in the adoption of innovative financial services, particularly in environments where the cost of errors may be prohibitive (Varma, 2019). Overcoming these trust-related challenges will require not only robust security protocols and transparent risk-mitigation strategies but also explicit demonstrations of fintech's reliability and compliance with regulatory standards, industry-specific requirements, and legal frameworks governing financial transactions and data protection.

Cost emerged as another limiting factor. Participants reported high transaction fees and integration costs, and slim operating margins that discouraged SMMEs from making full use of fintech's advantages. These observations align with discussions that highlight how resource-constrained businesses struggle to justify the upfront expenses involved in new technology adoption (Nathan et al., 2022). Mining firms often manage volatile revenue flows that make additional recurrent fees and technology investments harder to absorb. Consequently, fintech solutions that are perceived as imposing high transaction or licensing costs become less attractive. This scenario underscores the necessity for tiered fee structures, subsidies, or customised pricing models that better align with irregular mining income streams (Bu et al., 2024).

Participants' concerns about ambiguous regulations and costly compliance processes confirm the importance of policy environments in shaping fintech adoption (Sanga & Aziakpono, 2023). While South Africa's financial sector regulations have evolved, the findings suggest that guidelines and licensing requirements are still not sufficiently attuned to the scale and realities of smaller mining operators. This mismatch fosters a reluctance among SMMEs to engage in digital finance, as they may lack the legal expertise or dedicated personnel required to navigate complex processes. Without clear directives and user-centric frameworks, fintech adoption remains fraught with uncertainty and perceived legal risks. The operational impact of this uncertainty is evident in participants' experiences of delayed transactions, stalled supplier payments, and missed business opportunities. These consequences illustrate how regulatory, and compliance burdens directly affect day-to-day operations.

Overall, the ideas explored under Theme 2 indicate that while fintech holds transformative potential for the mining sector, a confluence of infrastructural, cultural, financial, and regulatory challenges undercuts its seamless integration. Connectivity gaps, skills shortages, and trust deficits create a context where the benefits of fintech, such as speed, cost savings, and transparency, may be overshadowed by logistical or perceptual hurdles. These findings thus corroborate prior research that identifies the importance of robust infrastructure, adequate training, confidence-building measures, and supportive policies for fintech acceptance to flourish (Marina et al., 2023). By situating these insights within the capital-intensive realm of mining, the study expands on existing literature. It also emphasises that unlocking fintech's full potential requires not only technical improvements but also comprehensive strategies that address the social, economic, and regulatory dynamics specific to this industry.

Although participants ranked infrastructure as the dominant barrier, pattern matching revealed that digital-skills gap codes co-occurred with connectivity in 65 % of segments (see table 5). To rule out mere reporting bias, we compared two mines with identical 3 G coverage: Firm A (skills training provided) reported no connectivity-related downtime in six months, whereas Firm B (no training) logged three payment failures. This counterfactual check indicates infrastructure alone is insufficient to explain barriers; human-capital deficits magnify the functional impact of weak networks, echoing Chatterjee et al. (2021) TOE interaction thesis. Regulators should therefore twin spectrum-allocation policy with mandatory digital-literacy programmes to achieve material uptake.

5.4 Discussion Pertaining to Research Question 3

Research Question 3 reads: *"What are the enablers of fintech adoption by SMMEs in the South African mining sector?"* This question directly relates to Theme 3: Enablers of fintech adoption by SMMEs in the South African mining sector. The data presented in Chapter 4 show that a range of technological, organisational, and regulatory factors facilitate the implementation of fintech solutions. These factors include affordable, user-friendly digital platforms;

supportive leadership within mining enterprises; and streamlined government policies aimed at promoting financial inclusion.

These enablers are particularly meaningful in a high-pressure environment such as mining, where operational continuity often hinges on accessible and flexible sources of funding. The discussion that follows delves into each enabling factor, examining the ways in which they mitigate the structural, cultural, and cost-related obstacles highlighted in Theme 2. It draws connections to scholarly work on fintech and technology adoption theories. In this way, it illustrates how targeted interventions, from robust digital infrastructure to forward-thinking leadership, can elevate fintech from a theoretical solution to a practical catalyst for greater financial inclusion and innovation within South Africa's mining industry.

5.4.1 Theme 3: Enablers of fintech adoption by SMMEs in the South African mining sector

This theme underscores the multifaceted factors that facilitate the successful uptake of fintech among mining SMMEs in South Africa and highlights how affordability, institutional support, and favourable policies converge to overcome persistent barriers. Participants repeatedly cited cost-effectiveness, flexible lending frameworks, and intuitive platform designs as decisive reasons for embracing digital financial tools. This finding aligns with prior studies that emphasise fintech's affordability and user-friendliness as diminishing entry hurdles for resource-constrained enterprises (Marina et al., 2023; Mah et al., 2022). For SMMEs in capital-intensive industries such as mining, lower fees and minimal collateral demands can prove pivotal, especially when high upfront costs and cyclical revenues make conventional bank loans cumbersome or inaccessible. Additionally, participants noted that widespread mobile adoption further promotes fintech integration. This corroborates research findings that mobile-based applications, 24-hour availability, and the elimination of extensive paperwork enable SMMEs to pursue critical funding with greater speed and flexibility (Karim et al., 2022).

An apparent contradiction in the findings between Themes 2 and 3 was initially discovered, where Theme 2 identified cost as a key barrier to fintech adoption

owing to steep transaction fees or licensing expenses, while Theme 3 highlighted “affordability” as an enabler. An analysis of these themes reflected how cost can function in two contrasting ways, depending on whether fees and repayment schedules are adapted to a mining enterprise’s irregular cash flows. When fintech pricing is misaligned with mining’s volatile revenues, SMMEs perceive these platforms as being too expensive. Conversely, once providers tailor cost structures through flexible repayment plans, lower collateral demands, or subsidies, fintech tools can become substantially more affordable than traditional banking channels. In this sense, cost is context-dependent: it can be a barrier if not managed carefully, or an enabler if it suits the operational realities of capital-intensive mining.

Participants also identified organisational dynamics as central to fintech uptake, underscoring how forward-thinking leadership teams, supportive investors, and actively engaged employees collectively forge an environment where digital solutions can flourish. These observations align with literature that suggests that top-management advocacy, sufficient resource allocation, and targeted capacity-building programmes are vital for organisational readiness (Coetzee, 2018; Ghobakhloo et al., 2012). The present study found that when leaders endorse technology initiatives and invest in staff training, concerns about inadequate technical skills, data security, or the relevance of new tools are more effectively dealt with. Positive operational outcomes, such as improved cash-flow management or faster project execution, reinforce staff acceptance of fintech platforms, which mirrors the notion that tangible benefits create trust in digital innovations (Alzghoul & Al-kasasbeh, 2024). This sense of alignment and enthusiasm at the organisational level enables SMMEs to transition more seamlessly from traditional processes to integrated fintech systems.

External influences further encourage fintech adoption, as participants noted government incentives, streamlined licensing structures, and broader financial inclusion drives as critical catalysts. These positive findings regarding policy-level interventions corroborate research that posits that a supportive regulatory climate can reduce legal ambiguity, spur innovation, and instil confidence among prospective adopters (Okoli & Tewari, 2020; Sanga & Aziakpono, 2023). In the

mining context, specifically, participants emphasised that policies tailored to high-capital, high-risk operations can meaningfully increase the adoption of fintech-driven services, particularly when explicit guidelines clarify data-security obligations and consumer safeguards. When SMMEs perceive these frameworks as stable, they become more inclined to explore non-traditional financial channels. By reducing compliance burdens and offering incentives for innovative solutions, policymakers can create a competitive climate that encourages fintech firms to design sector-specific products for mining. This will have the effect of expanding digital finance offerings beyond generic lending or payment services.

Taken as a whole, these findings reveal how technological attributes, organisational cultures, and policy frameworks converge to promote deeper fintech integration among mining SMMEs (Arokodare & Falana, 2021). Cost-efficiency and a user-centric design meet the immediate operational needs of smaller enterprises, while top-down leadership support and continuous staff training overcome cultural resistance to unfamiliar tools. Clear government directives and incentives eliminate uncertainties around regulatory compliance. This makes it less daunting for mining businesses to transition from conventional funding avenues to digital platforms (Chong & Olesen, 2017; Etudaiye-Muhtar et al., 2024; Ghobakhloo et al., 2012). By highlighting and discussing these enablers, the study complements existing literature on fintech's role in fostering financial inclusion. It also demonstrates that mining SMMEs benefit most when fintech providers, industry leaders, and policymakers coordinate efforts to address sector-specific challenges. As a result of interventions that respond directly to the mining sector's scale, risk, and strategic imperatives, the use of digital finance to reshape funding access in this industry becomes increasingly attainable.

Leadership endorsement emerged as a pivotal enabler, but its effect was contingent on firm size. In micro-mines (< 10 employees) owner-manager advocacy translated directly into platform adoption, whereas in medium mines (> 30 employees) endorsement mattered only when paired with *slack resources* (unused cash or IT capacity). This finding refines Coetzee (2018) argument that managerial support suffices for fintech success: in capital-intensive settings,

leadership must be complemented by resource buffers to unlock technology routines across multi-layered hierarchies. Accordingly, supplier-development schemes should bundle executive coaching with revolving-credit lines to create the dual conditions required for adoption.

5.5 Conclusion

The discussions in this chapter underscore the transformative potential of fintech to address funding challenges for SMMEs in South Africa's mining sector. Fintech platforms offer speed, accessibility, and affordability, which are critical for operational continuity and financial inclusion. However, major barriers, such as infrastructural deficiencies, digital literacy gaps, trust and security concerns, cost constraints, and regulatory challenges, persist. These obstacles limit the broader application of fintech solutions and hinder their ability to achieve maximum impact.

At the same time, several enablers, such as technological advancements, leadership support, and favourable government policies, highlight opportunities to drive greater adoption. Addressing the identified barriers through targeted interventions, such as improved infrastructure, training programmes, and tailored regulatory frameworks, can unlock fintech’s full potential for mining SMMEs. Together, these insights provide a roadmap for stakeholders to harness fintech as a tool for fostering financial resilience and growth in South Africa’s mining sector.

Cross-RQ synthesis. Placing the three research questions side-by-side highlights a tiered pattern in how adoption unfolds: (i) technology attributes (speed, cost flexibility) create initial interest; (ii) organisational capabilities (leadership backing, digital skills, slack resources) determine translation from interest to trial; and (iii) environmental levers (connectivity, policy sandboxes) govern scalability. This sequencing corroborates but also elaborates Ahmed (2020) TOE postulate that the three contexts operate in tandem: our evidence shows a temporal ordering: TOE within high-capex, rural industries.

Theoretical extension. We thus extend TOE in two ways: first, by inserting organisational memory and resource slack as moderating variables that dampen or amplify technology pull; second, by specifying a contingency pathway in which environmental factors exert maximal influence *after* organisational routines are routinised. This layered model offers a transferable template for scholars examining fintech in other extractive economies, and it aligns with Etudaiye-Muhtar et al. (2024) call for sector-specific fintech theorisation.

Managerial implication. Practitioners should stage fintech rollouts accordingly: begin with highly visible, quick-win tools (mobile POS) to build positive organisational memory; follow with skills training and buffer-fund creation; and only then lobby for policy concessions. This phased roadmap operationalises the analytic trends surfaced in Chapters 4 and 5, translating them into a pragmatic change sequence for mining-sector decision makers.

CHAPTER 6. CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter begins by presenting the conclusions drawn from the main findings of the study and shows how the findings address the three research objectives, as set out in Chapter 1. The chapter describes the contributions of the research in terms of each research objective. It then provides detailed recommendations for stakeholders, such as policymakers, fintech providers, and mining companies, and concludes with suggestions for future research.

6.2 Conclusions Pertaining to Research Objective 1: To investigate the role of fintech in promoting access to funding to SMMEs in the mining sector in South Africa

The research question related to this research objective is Research Question 1: *What is the role of fintech in promoting access to funding for SMMEs in the mining sector in South Africa*?

The study findings reveal that fintech offers faster and more convenient financing solutions to SMMEs in the mining sector by streamlining loan approvals, providing flexible repayment structures, and enabling digital interfaces that reduce the bureaucratic load of traditional banking. Participants reported that decisions were often finalised within one to two days, an exceptionally valuable turnaround time in an industry where sudden operational costs such as urgent equipment repairs can interrupt or stall production. This swift response not only ensures business continuity but also underscores how technology-driven lending platforms can serve as a crucial financial lifeline.

Beyond speed, the capacity of fintech to adapt is essential in a sector that is defined by high capital expenditures and volatile revenues caused by fluctuating mineral prices. The study shows that digital platforms that accommodate cyclical cash flows become indispensable for SMMEs when they are faced with unpredictable income patterns. While prior research recognises the efficiency of

fintech for general SMMEs, this investigation goes further to highlight its increased importance in a mining environment. The study findings indicate that timely and flexible funding options often mean the difference between halted operations and ongoing productivity. In this way, the findings confirm previous findings that fintech can be a targeted and vital instrument for bridging complex funding gaps.

6.3 Conclusions Pertaining to Research Objective 2: To identify the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions

The research question related to this research objective is Research Question 2: "*What are the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions?"*

A variety of barriers were found to hinder the effective use of fintech by mining SMMEs. Infrastructure is a major issue in remote sites, where weak internet connections and inconsistent power supplies disrupt the basic activities required for digital finance. These logistical shortcomings create uncertainty about fintech platforms, as even short downtimes can delay essential tasks such as loan applications or payment authorisations. Participants also identified limited technical skills and a preference for manual banking processes among older employees as barriers to fintech adoption. Participant comments revealed that without adequate training, digital platforms are underutilised and can worsen mistrust in new technologies.

Aside from infrastructure and cultural factors, concerns about cost and regulatory complexity further discourage SMMEs from embracing fintech. Participants felt that high fees, integration expenses, and complex compliance regulations are especially burdensome for smaller mining operators, who already juggle tight margins and unpredictable revenues. This environment makes SMMEs cautious about using emerging digital finance channels. Taken together, these constraints increase the challenges typically noted in fintech adoption research and illustrate

how resource-heavy industries, such as mining, require nuanced strategies that address both technical and human elements of digital transformation.

6.4 Conclusions Pertaining to Research Objective 3: To investigate the enablers of fintech adoption by SMMEs in the South African mining sector

The research question related to this research objective is Research Question 3: *What are the enablers of fintech adoption by SMMEs in the South African mining sector?*

Several technological, organisational, and policy factors facilitate fintech adoption among mining SMMEs. Participants praised the simplicity and flexibility of fintech platforms that consider cyclical revenue streams as an approach that reduces the rigid collateral requirements and excessive paperwork often found in traditional banking. Moreover, leadership support and clear directives from top management or investors create a culture in which employees are more receptive to learning digital tools, which makes internal adoption less stressful. Government policies and incentive programmes provide further inducement by reducing uncertainties around compliance and offering guidance that is tailored to the high-risk profile of mining.

Although Theme 2 described high transaction fees and licensing charges as major barriers, participants in this study also recognised that cost can be an advantage when fintech products are priced in ways that accommodate mining's fluctuating revenues. Flexible fee schedules, lower collateral demands, and potential subsidies can transform what may appear expensive in one setting into an affordable alternative in another. Thus, even though cost emerged as a challenge for many SMMEs, it was also identified as a key enabler when providers align pricing models with the operational realities of the sector. This duality explains why cost is seen as both an obstacle and a benefit in different parts of the analysis. It also indicates that fintech solutions need to be strategically adjusted to suit mining-specific conditions.

6.5 Contribution of the Research

This study makes a dual contribution, it advances fintech-adoption scholarship by extending the TOE framework to capital-intensive, rural mining SMMEs, and it supplies practitioners with an evidence-based roadmap for closing the sector's persistent working-capital gap.

6.5.1 Contribution to the Literature

This study extends fintech-adoption theory by applying the Technology–Organisation–Environment (TOE) lens to South African mining SMMEs a context almost invisible in previous work that concentrates on retail and urban-service businesses with short cash-conversion cycles and reliable infrastructure. Analysing twenty qualitative cases from remote, high-capex operations, the research (i) surfaces mining-specific technological and environmental antecedents of adoption (e.g., pit-head connectivity, grid-power reliability, mineral-rights compliance), (ii) shows how cyclical revenue streams transform "cost" from a barrier into an enabler when repayment schedules are indexed to commodity-price fluctuations, and (iii) enriches the fintech-benefit taxonomy by documenting under-examined tools such as invoice-discounting for 90-day payment lags, blockchain-based supply-chain finance, and parametric micro-insurance for shaft downtime. These insights refine TOE constructs for capital-intensive, rural industries and provide a transferable framework for scholars examining digital finance in other extractive-economy settings.

6.5.2 Contribution to Practice

Practically, the report offers an evidence-based roadmap for shrinking the working-capital gap that constrains mining-linked SMMEs. It quantifies the efficiency gains of digital micro-loans (24–48 hour disbursement versus 4–6 weeks through legacy banks), specifies fee and repayment structures that remain viable under volatile ore prices, and proposes a three-step "connect–train–de-risk" model: (1) target broadband and mini-grid investments at mine hubs; (2) embed fintech-driven digital-literacy programmes in supplier-development

pipelines; and (3) pilot regulatory sandboxes for blockchain invoice financing and downtime insurance. Anchored in empirically validated TOE levers, these recommendations equip policymakers, lenders, and enterprise supply development managers with actionable interventions rather than generic prescriptions to unlock liquidity, stabilise cash flows, and deepen inclusive participation in South Africa's mining value-chain economies.

6.6 Recommendations

Practical recommendations for policymakers, fintech companies, and mining companies were developed from the study conclusions and are presented below.

Policymakers should concentrate on improving internet connectivity and power stability in remote mining areas, which will ensure that fintech platforms are always usable. Furthermore, a clearer regulatory framework, particularly one that acknowledges the revenue uncertainties of smaller mines, could reduce compliance burdens and foster greater trust in fintech offerings. Providing incentives or subsidies for digital finance adoption may also encourage SMMEs to explore fintech without the heavy cost concerns that initially deter them.

Fintech developers can strengthen industry buy-in by tailoring fee structures, repayment schedules, and training modules to reflect the cyclical nature of the income of mining enterprises. Transparent cybersecurity standards and real-time troubleshooting support for errors may alleviate concerns about data breaches and unfamiliar platforms. Partnerships with local educational institutions or mining associations can boost digital literacy, in this way elevating both the acceptance and day-to-day functionality of fintech tools within resource-heavy enterprises.

Mining companies can increase their readiness for fintech by designating cross-functional teams or innovation champions that guide technology rollouts and communicate potential operational gains. Engaging managerial staff and investors in proactive discussions about digital transformation, reinforced by examples of successful usage, can reduce internal resistance and ensure resource allocation for training. By fostering a culture that views fintech as a

strategic advantage rather than a risky experiment, these enterprises stand to improve cash-flow management and long-term competitiveness.

6.7 Suggestions for Further Research

This study demonstrates how fintech can address the funding challenges of mining SMMEs. From the study findings, a need was identified for deeper investigation into the long-term effectiveness of fintech, cross-sector comparisons, emerging digital technologies, the role of leadership and organisational culture, and an ethnographic or action-based approach to fintech implementation. These identified topics and approaches inspired the following suggestions for further research:

6.7.1 Longitudinal studies of financial stability

Future studies could track how fintech adoption influences the financial resilience and operational continuity of mining SMMEs over longer periods. This research could help to clarify whether initial benefits persist in the face of shifting market and regulatory conditions. Such longitudinal studies would help to determine the sustainability of fintech-driven solutions in this high-pressure environment.

6.7.2 Cross-sector exploration

Comparing fintech adoption in the mining industry with similar capital-intensive industries, such as agriculture or heavy manufacturing, could reveal best practices and universal barriers. This broader lens may refine general fintech adoption models by indicating which strategies work across multiple resource-dependent sectors.

6.7.3 Advanced technologies in mining

Research on emerging technologies such as blockchain or AI in mining may reveal improved methods for addressing challenges such as fraud detection, real-time asset monitoring, and environmental compliance. This type of research

could show how cutting-edge tools further reduce costs and operational uncertainties.

6.7.4 Role of leadership and organisational culture

Research into how different leadership styles and organisational cultures influence fintech uptake would clarify why some mining enterprises adapt smoothly to digital systems while others resist change despite its evident benefits. Such insights could guide the design of more effective training programmes and communication strategies.

6.7.5 Ethnographic or action-based studies

Future research that documents each step of fintech implementation within selected mining SMMEs could reveal valuable details about real-world obstacles and enablers, from initial scepticism to routine usage. This “on-the-ground” approach would supply richer, more nuanced insights than broad surveys or interviews on their own.

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APPENDIX A: Participant Information Sheet (PIS)

Dear Sir / Madam)

My name is Mr Lebogang Brian Ngweye I am a Masters student in Master of Management in the field of digital business at the University of the Witwatersrand, Johannesburg. My supervisor is Dr Manessah Alagbaoso. I am conducting a research study about the role of fintech in addressing SMME financing gap in the south african mining sector.

I am inviting you to take part in an interview. If you decide to take part, your participation in this research study will last about 30 Minutes. The interview will take place online during work hours.

With your permission, I would like to audio record the interview. This data will be stored in password protected computer for 5 years or deleted after 5 years. Only the researcher will have access to the data.

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

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

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

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

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

Yours sincerely,

Researcher:

Lebogang Brian Ngweye

Supervisor:

Dr Manessah Alagbaoso,

APPENDIX B: Consent Form

Title of project: The role of Fintech in addressing smme financing gap in the South African mining sector

Name of researcher:

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

I agree to the following:

(Please circle the relevant options below)

The research study was explained to me. I understand what this study is about.	YES	NO
I understand that I can volunteer to take part in the study	YES	NO
I agree that the interview may be audio recorded	YES	NO

I agree that direct quotations from my interview may be used by the researcher in their research report	YES	NO
I agree that my participation will remain anonymous (my name or other identifying data will not be used by the researcher in their research report	YES	NO
I agree that other researchers may use the information I provide in my interview (depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on	YES	NO

…… (signature)

…… (name of participant)

…… (date)

…… (signature)

…… (name of researcher/person seeking consent)

…… (date

APPENDIX C: Instrument (Interview Guide for Qualitative Studies)

Semi-structured Interview Guide

- Introduction:
- Background information:
- **Section 1: Fintech's Impact on SMMEs**

➢ **Objective 1: To investigate the role of fintech in promoting access to funding to SMMEs in the mining sector in South Africa**

➢ Questions:

1.1 What fintech services do you now use or have utilized to facilitate funding?

1.2 How do fintech solutions affect your access to financial resources? Can you give particular examples?

1.3 What are the primary benefits of employing fintech solutions over traditional finance methods?

1.4 What fintech services do you believe may benefit the mining sector but are now underutilized or unavailable?

- **Section 2: Barriers and Challenges**

➢ **Objective 2: To identify the barriers and challenges encountered by the mining sector SMMEs in adopting fintech solutions.**

➢ Questions:

2.1 Have you encountered any issues or challenges when adopting fintech solutions in your operations?

2.2 What do you think are the key reasons for these challenges?

2.3 How do these challenges impact your business operations and finances?

2.4 What support is needed to overcome these challenges?

- **Section 3: Enablers for Fintech Adoption**

➢ **Objective 3: To investigate the enablers of fintech adoption by SMMEs in the South African mining sector.**

➢ Questions:

3.1 What factors have eased the adoption of fintech solutions in your company?

3.2 How do these enablers impact the success of fintech integration in your business?

3.3 How do regulatory frameworks and government policies influence fintech uptake in the mining sector?

3.4 Do you have any suggestions for improving or changing present regulations and frameworks to promote fintech adoption?

APPENDIX D: Ethical Clearance Certificate

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg

Wits Business School

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

Ethics Clearance Certificate

Ethics protocol number:	WBS/DB2526167/895

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

This certificate is only valid if accompanied by formal permission from the relevant stakeholder(s).

Project title	The role of fintech in financing SMMEs in the South African mining sector
Investigator / Researcher	Mr Lebogang Ngweye
Nature of Project	MM (Digital Business)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed confidentialty.
Issue Date of Certificate	06/02/2025
Expiry date	Date of submission of the project / research report
Chairperson	Dr Ayanda Magida ☎ +27 11 717 3953 ✉ ayanda.magida@wits.ac.za

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Declaration by Researcher

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

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

Signature

6/02/2025
Date: