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Participation in supply chains and the performance of SMEs in mining industry in Mpumalanga, South Africa

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PARTICIPATION IN SUPPLY CHAINS AND THE PERFORMANCE OF SMES IN MINING INDUSTRY IN MPUMALANGA, SOUTH AFRICA

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

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ABSTRACT

The participation of Small and Medium businesses (henceforth SMEs) in the supply chains in the mining industry has received less attention in research work for a long time in South Africa. There are challenges faced by many SMEs venturing into business through participating in the supply chains in the mining industry. The overarching objective of this study was to investigate the key factors that influence the participation of SMEs and performance in the supply chains in the mining industry in Mpumalanga, South Africa. The research was anchored on the resource-view based (RBV) and the theory of planned behaviour (TPB) as applied in supply chain management and entrepreneurship.

A quantitative approach involving a cross-sectional technique was applied. The data was collected using the online software known as Qualtrics. The SmartPLS, version 3.0 Software was utilized to analyse the data using the partial least squares structural equation modelling (PLS-SEM model). The results showed that technology, human capital (skills) and human capital (lack of experience) are key barriers and with insignificant effects. Financial constraints and economies of scale were found to be the major non-barriers but also have insignificant effects. The results show that SMEs' participation in supply chains as a strategy positively influences business performance in the mining industry. This study contributes to the body of knowledge on supply chain management and entrepreneurship. Owners and managers of SMEs will find useful data and analysis presented in this research on the key barriers and pragmatic strategies on how to overcome them. The effective strategies that enhance business performance in Mpumalanga, South Africa are presented. Policy-makers are urged to curtail barriers and create better business environments for SMEs that are engines of economic development.

Keywords: ***SMEs' participation in supply chains, Supply chain management, barrier, business performance, SMEs, PLS-SEM.***

DECLARATION

I, *Ronald Chibanda*, 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 Entrepreneurship and New Venture Creation in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

_____ _____

RONALD CHIBANDA **DATE**

DEDICATION

I would like to dedicate this work to Maria Chibanda, my lovely wife, my daughter, Ropafadzo and my sons, Dumisani and Anesu. Thank you for your endless support in a moment like this.

I also dedicate this thesis to my parents, Monica and Langton Chibanda for instilling in me good discipline and cultivating an interest in long- life learning.

I salute all entrepreneurs, young and old, especially those in SMEs in mining sector who stay focused on their dreams and have passion to advance entrepreneurial goals beyond their current generation.

Lastly, I also dedicate this study to the Freedom Foundation at Valley Forge in Pennsylvania, United States of America for sponsoring me to attend an educators' entrepreneurship seminar in July 2019 where a desire and journey to venture into entrepreneurship studies was birthed.

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CHAPTER 1: INTRODUCTION

1.1. INTRODUCTION

Small and Medium Enterprises (SMEs) play a pivotal role in the growth and development of the South African and global economies (Olawale & Garwe, 2010; Namagembe et al., 2016; Muriithi, 2017; Silva et al., 2021). SMEs have a distinct economic impact through employment creation, wealth creation, poverty alleviation, and income generation (Chimucheka, 2013; Mafini & Loury-Okoumba, 2018). In the South African context, unemployment is rising from 32.6% in the first quarter to 34.4% in the second quarter of 2021(Statistics South Africa, 2021b). Compounding this challenge is the high failure rate of SMEs at about 70% to 80% (Olawale & Garwe, 2010; Cant & Wiid, 2013), resulting in a significant setback in creating employment and other economic development prospects.

Considering how well SMEs perform as commercial entities, a business as usual strategy is unsustainable. Consequently, SMEs are "under pressure to adopt and implement more successful business models," which have been tried out and shown to be viable in the global market (Mafini & Loury-Okoumba, 2018, p.1). If the broader definition of unemployment is used, which considers the category of discouraged people, the unemployment rate in Mpumalanga is 33% and 42.4%, respectively (SOPA, 2021; Statistics South Africa, 2021b).

Numerous businesses, especially SMEs, have adopted supply chain management (SCM) to get around many supply chain (SC) obstacles to gain a competitive edge and improve corporate performance internationally in this generation (Quayle, 2003; Hsu et al., 2011; Al Zaabi et al., 2013; Lee, 2021). Morris et al. (2015) found that there are many business opportunities in the South African mining sector for the involvement of SMEs in supply chains, including in the Mpumalanga province where local SMEs are not actively involved because of a number of obstacles, some of which are discussed in this study.

The theoretical backdrop, setting, problem description, purpose, research questions, objectives, conceptual definition of terminology, and study contribution are all covered in this chapter.

1.2. CONTEXT OF THE STUDY

South Africa is a mineral resource-rich country (Department of Mineral Resources, 2011). The mining and quarry industry are one of its primary sectors, with a growth rate of 1,9% in the second quarter of 2021 and contributing 0,1% to the country's Gross Domestic Product growth (GDP) (Statistics South Africa, 2021a). It is envisaged as the gear of economic growth and industrial development (Morris et al., 2015). Mpumalanga province has mainly coal, which constitutes 83% of the country, which makes it the third largest producer of coal in the world, but also has other minerals like gold, vanadium, platinum, chrome, zinc, copper, iron, and manganese (Young, 2013; SOPA, 2021). The Mining industry in Mpumalanga contributes 25,9% to the gross domestic product and employs about 53 000 out of a population of about 4 million (SOPA, 2021).

The Minerals Council South Africa (2020) reported that mining in Mpumalanga contributed above 20% to the provincial economy in 2020. Table 1.1 below gives the mining contributions of the Mpumalanga Province since 2009 to 2021:

Table 1.1: Mining sector contribution to the Mpumalanga Economy (GDP basic prices)

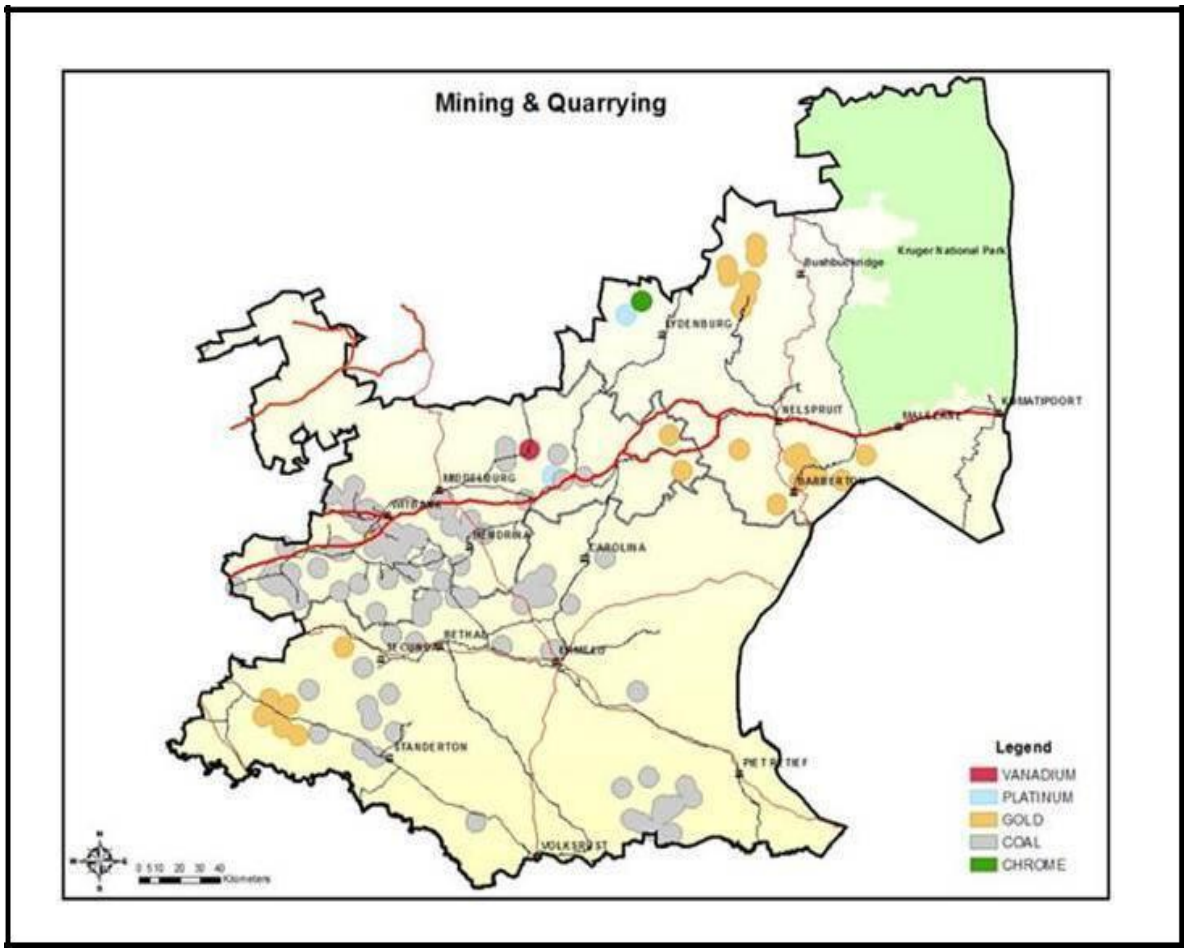
Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contribution to GDP as %	18,5	19.1	20,6	21,5	20,1	18,9	17,9	18,2	18.1	18,5	19,5	23,6

Source: Minerals Council South Africa (2020)

Mining contributes between 8 and 10% of the overall South African economy's GDP, depending on economic prevailing conditions (Mparutsa, 2021). The

number of SMEs/SMMEs in the mining sector in South Africa (2016: 2199; 2020: 2188) is very low, but their mining contribution to the GDP is significant (SEDA, 2016; 2021).

It extracts and exports most of the mining products as raw materials (Department of Mineral Resources, 2011). Figure 1.1 below is a map showing key minerals extracted in the Mining and quarrying processes in Mpumalanga.



Source: (MEGDPv4, 2011)

Figure 1.1: Mpumalanga Mining and Quarrying

The Mpumalanga Province's main economic activities include manufacturing, mining, agriculture, tourism, small-scale trading, and commercial business (REB, 2016; DEDT, 2021). According to the DEDT report (2021, p.29), "Mpumalanga produces about 90% of the country's coal, with the bulk of it

being used by Eskom for electricity generation. Sasol uses coal for synfuel production and the rest is exported." Other mining operations are gold (Barbeton, Evander, Pilgrim's Rest and Balfour), nickel (Nkomati Nickel Mine near Machadoorp), platinum, chromite (with ferrochromite Smelters in eMalahleni, Middleburg, Mashishing and Machadodorp, and stainless-steel production in Middleburg by Columbus), vanadium and magnetite. The mining industry is an extractive process that is capital-intensive and uses highly sophisticated technology. The life span of most mines is limited, hence involving mine closure and rehabilitation programmes. This underpins the significance of addressing key factors influencing participation and the business performance of SMEs in the mining sector in Mpumalanga, like technology.

Politicians and regulators are pressuring mining corporations to expand their local content in order to provide SMEs with economic prospects (Morris et al., 2015). Some pertinent rules and regulations in South Africa encourage SMEs to participate in the supply chain of mining enterprises. These include the Broad-Based Black Economic Empowerment (BBBEE) Act-Socio-Economic Development and Enterprise Development and Procurement, the Social and Labour Plan (SLP), the Mineral and Petroleum Resources Development Act (MPRDA) Act-Mining Charter, and Section 9 of the Constitution of South Africa Act (equality clause) (Bag in Dubey, 2016; Moagi, 2015).

SMEs have an obligation to expand their businesses in order to add value and advance the South African economy. Therefore, SME participation in SCM techniques in the mining sector is essential as an entrepreneurial approach for building a competitive advantage and improving performance. Consequently, a large number of SMEs in South Africa do not actively participate in supply chains and do not follow the necessary set standards (Sommer, 2017). This phenomenon is related to a number of significant obstacles they encounter in the mining industry, including financial limitations, outdated technologies, a lack of human resources, and other issues with standards, taxes, and registration (Muduli et al., 2013; Thakkar et al., 2013; Kanyinji, & Tembo, 2019). If they do, SMEs succeed as a result of using SCM methods (Mafini & Loury-Okoumba,

2018). The goal of this study is to comprehend and provide an explanation for the low level of participation by SMEs in the mining industry supply chains as well as the performance of these supply chains.

1.3. THEORETICAL BACKGROUND TO THE STUDY

The study is centred on a resource-based view (RBV) (Alvarez & Busenitz, 2001; Clark, 2007) and the theory of planned behaviour (TPB) (e.g., Urban and Venter, 2015). The chosen theories are ideal for understanding and explaining SMEs' participation in supply chains, SCM practices, SCM entrepreneurial strategies, and business performance.

The RBV highlights three types of resources: tangible, intangible assets, and organizational capabilities (Ehlers et al., 2004). According to RBV, SMEs with adequate, unique, inimitable, and diverse resources possess more competitive advantages and sustainable growth (Ehlers et al., 2004). The RBV has the advantage of explaining the link between the strategic resources of the SME as an organization and its capability to gain a competitive advantage (Shibin et al., 2020). RBV is popular among researchers on SCM (e.g., Filho & Moori, 2020; Shirin et al., 2020; Gligor & Holocomb, 2014; Hunt & Davis, 2012; Taylor & Taylor, 2009; Rungutusanatham, et al., 2003; Bowel et al., 2001). A similar approach to adopting a resource-based view is supported by researchers on SCM (Silva et al., 2021). RBV explains the benefits of engaging in SCM practices that lead to environmental and economic benefits (Asif et al., 2020).

Similarly, to this, the theory of planned behaviour enables us to comprehend the variables that encourage SME owners or entrepreneurs to engage in SCM (e.g., Urban and Venter, 2015; Lee, 2008). For instance, Lee (2008, p. 193) described "a newly constructed construct, the willingness to participate in SC activities" that is made up of "four components, including level of understanding and awareness of SC initiatives, intention to join, and expectation of benefits." This concept is an attitudinal element that affirms the entrepreneurial intents of SME owners and managers that see and take advantage of business opportunities in supply chains (Urban & Venter, 2015).

The entrepreneur's perceptions of SCM practices and entrepreneurial strategies at a personal level tend to guide their participation in supply chains in any innovative scheme made available to them (Siebert et al., 2006; Charatsari et al., 2018). Arguably, SME owners' or managers' "participation decisions" in SC initiatives "are often affected by social and personal factors," as Breetz et al. (2005) observed with farmers' participation in short supply chains (Charatsari et al., 2018, p.2). Those entrepreneurs who "feel socially embedded (Breetz et al., 2005) and enjoy higher levels of intra-community social capital (Mathijs, 2003) are more likely to participate in various alternative forms of social organisation" (Charatsari et al., 2018, p.2).

1.4. RESEARCH PROBLEM

The main problem is that there are many barriers that limit SMEs' participation and performance in the supply chains (Al Zaabi et al., 2013; Muduli et al., 2013; IFC, 2014; Kaur, 2016; Kaur et al., 2018; Kanyinji and Tembo, 2019; Mahmud et al., 2021).

Public sector barriers have a significant impact on "SME inclusion in the mining chains" in Zambia, according to Kanjinji and Tembo (2019, p.1), who ranked the barriers as follows: "registration process, followed by financial, technology, and tax barriers," with "licensing and standards" having an insignificant impact.

According to Durant, McFaul, and Nava (2017, p. 3), the South African government has enacted legislation to promote local procurement in lieu of foreign imports in the mining sector, with procurement conducted by Historically Disadvantaged South Africans who are preferred suppliers of capital goods, services, and consumables (HDSA). The Mining Charter Act and Broad-Based Black Economic (BBB-EE) Act are intended to expand chances for HSDAs to enter the mining sector as SMEs (Durant, McFaul & Nava, 2017). Large mining businesses form joint ventures with the HDSA to improve supply chain management through discretionary procurement, but many small and medium-sized enterprises (SMEs) remain non-participants due to a number of obstacles

(Muduli et al., 2013; Thakkar et al., 2013; Durant, McFaul & Nava, 2017; Setyaningsih, Kelle & Maretan, 2020).

Opportunities in the mining industry extend beyond the purchase of equipment and replacement parts, consumables and services such as hazardous waste management or disposal solutions and mining tyre recycling services (Morris et al., 2015). To leverage their entrepreneurial prospects in the mining sector (Morris et al., 2015), SMEs lack collaboration with foreign businesses with advanced technology, particularly in Mpumalanga, a province rich in mineral resources. Through participation in supply chains as an entrepreneurial strategy, small and medium-sized enterprises (SMEs) must investigate ways to create value by engaging in internationally competitive SCM practices in order to overcome the most significant obstacles in the mining industry.

1.5. THE PURPOSE OF THE RESEARCH AND RESEARCH QUESTION

The purpose of the study is to investigate the key factors (specifically, financial, technology, tax legislation, standards and regulation, technology and information technology, human capital (lack of experience and skills), and economies of scale) that influence SMEs' participation and performance in supply chains in the mining industry in Mpumalanga, South Africa.

The primary research question of this study is: what are the key factors influencing SME participation and performance in the supply chain in the mining industry of Mpumalanga, South Africa?

Secondary research questions:

RQ1: To what extent do a) finance, b) standards and regulation, c) technology and information technology, d) human capital (lack of experience and skills), and e) economies of scale influence SME participation in the supply chain in the mining industry of Mpumalanga, South Africa?

RQ2. To what extent does SMEs' participation in supply chains as a strategy influence the business performance of SMEs?

1.6. CONCEPTUAL DEFINITION OF TERMS

SMEs' participation in supply chains as a strategy refers to the willingness of SMEs to tactically engage in entrepreneurial development activities, which are part of supply chain management practices. These activities include strategic partnerships, customer relationships, integration, information flow across supply chains, entrepreneurial education and training, coaching or mentoring, and innovation (Lee, 2008; Li et al., 2006; Reklitis et al., 2021; Qrunfleh & Tarafdar, 2013).Kanyinji and Tembo (2019) say that SME participation is a chance for SME as a supplier to give mines what they need..

A supply chain "A system is defined as a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer" (Mentzer et al., 2001, p.4). It can also be thought of as a network of organizations that are connected upstream and downstream and take part in the different activities and processes that create value in the form of goods and services for the final consumer (Christopher, 1992).

Supply chain management is "the systemic, strategic coordination of the traditional business functions within a particular company and across businesses within the supply chain, to improve the long-term performance of the individual companies and the supply chain as a whole." (Min et al., 2019, p.45)

Barriers are factors that limit SMEs' participation in supply chains and their performance, like finance; standards and regulations; technology and information technology; human capital (experience and skills); and economies of scale, among others (Kaur et al., 2018; Mahmud et al., 2021).

SMEs' performance is related to financial terms (revenue or income) and non-monetary terms (number of employees). It relates to SMEs' degree of efficiency and effectiveness in providing a service or product (Naude, 2007). Financial performance includes the growth of sales, growth in return on investment, the profit margin on sales and net profits, whereas market performance rates to market share, market share growth, firm's reputation, and brand name (Li et al., 2006; Reklitis et al., 2021).

Small Medium Enterprise is defined quantitatively, as shown in Table 1.2 below:

Table 1.2: Classification and definition of Small and Medium Enterprises (SMEs) in South Africa.

Sector	Size	Number of Employees	Maximum Turnover
Mining and Quarrying	Medium	51-250	Less than R210 million
	Small	11-50	less than R50 million.
	Micro	0-10	less than R15 million

Source: Government Gazette of the Republic of South Africa (2019)

1.7. CONTRIBUTION OF THE STUDY

Overall, the work will advance theory and have applications in real world situations. The supply chain management, TPB, and RBV theories are all strengthened by the findings of this study. There is a research gap, specifically, in identifying the most important or significant factors among the many listed (finance, standards and regulation, technology and information technology, human capital (experience & skills), and economies of scale) that affect SMEs' participation and performance in the supply chains in the mining industry in Mpumalanga. In South Africa's mining industries, particularly in Mpumalanga, "there is no study to identify the key elements" affecting SMEs' participation and success in supply chains at the moment (Al Zaabi et al., 2013, p.897).

There are few studies on SMEs and supply chain management (Epoh & Mafini, 2018), particularly in the mining sector in South Africa, and involvement in supply chains lags major companies (Mafini & Loury-Okoumba, 2018; Silva et al., 2021). According to Setyaningsih, Kelle, and Maretan (2020), SMEs lack interest in joining supply chains as a strategy due to a number of obstacles, including a lack of human capital (both experience and skills), a lack of power, and a lack of trust. As a reference source for supply chain management research on SMEs, this study fills a gap in the literature and provides data that paves the way for future research in the field (Ong, 2017).

Both management and policy approaches will be affected in practice. At the managerial level, it is crucial for owners and managers to know how to improve SMEs' engagement in supply chains and performance in the mining sector in Mpumalanga despite several obstacles. Therefore, it is hoped that this research's findings will alter professional practice by identifying and outlining entrepreneurial tactics that owners and managers of SMEs can employ to improve the effectiveness of their companies' participation in mining supply chains. Importantly, SMEs are the main forces behind South Africa's economic growth and success (Urban & Naidoo, 2012). In order to advocate for meaningful policies, planning, strategy implementation, and response with targeted interventions, policyholders will benefit from a better understanding of the key factors influencing SMEs' participation in the supply chains of the mining industry as a result of the findings.

1.8. DELIMITATIONS

The focus of this study was the Mpumalanga mining industry's supply chain participation and company performance. This suggests that because the subject of study would be rather broad, the focus was solely on the supply chains in the mining industry in Mpumalanga and not any other supply chains in other sectors (Ong, 2017). A SME's willingness to participate "in supply chains (referred to as "SC participation") by SMEs, which is comprised of four items, including (1) level of understanding, (2) awareness of supply chain initiatives,

(3) intention to participate, and (4) expectation of benefits" is the only way to define their involvement in the mining industry's supply chain (Lee, 2008, p.193).

The criteria that have an impact on how SMEs in the mining industry participate in supply chains are considered influencing variables. Finance, norms and regulations, technology and information technology, human capital (lack of expertise and skills), and economies of scale are the study's most important considerations (Kaur et al., 2018; Mahmud et al., 2021).

Financial performance that is focused on market share, return on investment, sales growth, market share growth, return on investment growth, profit margin on sales, and overall competitive position is referred to as "market performance" (Li et al., 2006; Reklitis et al., 2021).

The respondents are restricted to owners or managers, as well as other designated officials in control of registered small and medium enterprises (SMEs) involved in mining supply chains in Mpumalanga. The acronym SME is used internationally, however in South Africa, the term small, medium, and micro enterprises (SMMEs) is more frequent (Galawe, 2017).

1.9. ASSUMPTIONS

During this research, the following assumptions were made:

(i) All respondents are able to read, understand, and write in the English language to adequately respond to the questions presented in the questionnaire.
(ii) The respondents are in charge of SMEs as owners, managers, or any other designated official post to fully represent the SME and are responsible for key decision-making in the business.
(iii) The respondents are SMEs operating in Mpumalanga, South Africa, and are participating in mining supply chains.

(iv) All respondents are professional in their business conduct to give correct, relevant and accurate business information as required in this survey.

1.10. STRUCTURE OF THESIS

Six chapters make up this study, which is outlined as below in Table 1.3.

Table 1.3: Outline of the Organisation of the Thesis

Chapter-Topic	**Concepts covered in the respective chapters**
Introduction to Chapter 1	The introductory chapter focused on the context and theoretical background; the problem statement, purpose, and objective; research questions; the definition of terms; the contribution of the study; the delimitation of the study; assumptions; and the structure of the thesis.
Chapter 2: Review of Literature	Detailed literature review and analysis of the research topic, relevant variables of the study, and existing literature. Key concepts discussed include supply chain management, SMEs' participation in the supply chains in the mining industry, key factors that influence their participation in supply chains, and the business performance of SMEs. The conceptual framework of hypotheses: key factors that influence SMEs' participation and business

	performance in supply chains in the mining industry, which in turn positively The conclusion of the literature review is the last part of chapter 2.
Methodology of research (Chapter 3)	Research paradigms and philosophies; research design and instrumentation the sampling methods, sample size, and data collection. Data screening and data analysis; Validity and reliability of research instruments; Ethical considerations.
Chapter 4: Presentation of Results	PLS-SEM results using SmartPLS 3.0, respondent demographic profile, and variable percentage distribution; Results of the hypotheses tested: CFA, SEM, reliability analysis, correlations, and validity; Summary of results.
Chapter 5: Discussion of the Results	Discussion of the findings of the study, comparison of existing theories and literature. Conclusion.
Chapter 6: Conclusions, implications and recommendations:	The summary of findings and conclusions, The implications of the study, the theoretical and practical contribution of the research, The limitations and future research recommendations

CHAPTER 2: REVIEW OF LITERATURE

2.1. INTRODUCTION

This chapter summarizes the relevant literature for this study. Theoretical background, key constructs and sub-concepts, concepts, and hypotheses are discussed as part of the literature review. The following is the presentation's outline: SMEs' participation in supply chains; influences on SMEs' participation in supply chains; business performance; conceptual framework; and conclusion of the literature review.

2.2. SUPPLY CHAIN MANAGEMENT

A supply chain is a link that involves directly or indirectly all parties involved in fulfilling a customer's request (Acimovic, 2006). All parties in the supply chain include suppliers, customers, distributors or wholesalers, retailers, and manufacturers. The various definitions of supply chain management (SCM) are shown in Table 2.1 below.

Table 2.1: Definitions of Supply chain management

Source	Definition
Bowersox et al., 2010, p.4	"Supply chain management consists of firms collaborating to leverage strategic positioning and to improve operating efficiency." Therefore, the supply chain relationship reflects a strategic choice for each firm involved. "
Chopra and Meindl (2007), p. 6	"Effective supply chain management involves the management of supply chain assets and products, information, and fund flows to maximise total supply chain profitability."
Christopher, 2005, p. 5.	“The management of upstream and downstream relationships with suppliers and customers to

	deliver superior customer value at less cost to the supply chain as a whole.”
Cooper et al., 1997, p. 1	"The process of planning, implementing, and controlling the efficient, cost-effective flow and storage of raw materials, in-process inventory, finished goods, and related information flows from point-of-origin to point-of-consumption to conform to customer requirements."
Gibson et al., 2005, p.17	"Supply Chain Management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities." It also includes coordination and collaboration with channel partners, suppliers, intermediaries, third-party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies. "
Lummus and Vokurka, 1999, p. 17	"Supply chain management: Planning and controlling all of the business processes—from end-customer to raw material suppliers—that link together partners in a supply chain to serve the needs of the end-customer."
Harrison and van Hoeck, 2008, p. 6.	"All the activities involved in delivering a product from raw material through to the customer, including sourcing raw materials and parts, manufacturing and assembly; warehousing and inventory tracking; order entry and order management; distribution across all channels of delivery to the customer; and the information systems necessary to monitor all of these

	activities. Supply chain management coordinates and integrates these activities into a seamless process. It links all of the partners in the chain, including departments within an organization and the external partners, including suppliers, carriers, third-party companies, and information systems providers."
Mentzer et al., 2001, p. 18	"(supply chain management is defined as the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain to improve the long-term performance of the individual companies and the supply chain as a whole."

Source: (Fleschhut, 2012, p.15-16)

Researchers show that SCM is derived from different perspectives and disciplines through various definitions, as presented in Table 2.1 above. The supply chain depicts business networks, whilst SCM reveals the management of the business networks in the supply chains. Participation in the supply chain and SCM practices by firms assists in achieving efficient management of supply chains, leading to a highly competitive advantage, especially for SMEs (Manchisi, 2018).

Reklitis et al. (2021) confirmed the strategic role of SCM, giving a competitive advantage in the process, similar to the findings of Fleschhut (2012). If SMEs participated and implemented entrepreneurial strategies in supply chains, they reduce costs, raise flexibility, enhance performance, and uphold customer loyalty, hence achieve more competitiveness (Reklitis et al., 2021).
Participation in supply chains in the mining sector is hard to achieve despite the benefits perceived and is not necessarily guaranteed. There are vital factors that influence the progress that this study will pursue.

The constructs and sub-constructs presented in this study are briefly explained in Table 2.2 below:

Table 2.2: Summary of Constructs and Sub-constructs.

Construct and sub-construct.	**Explanation**	**Source**
SMEs' participation in supply chains as a strategy.	Presented as "a newly developed construct, the willingness to participate" in supply chains (referred to as "participation “supply chains), which comprises "four items, including the level of understanding and awareness of supply chain initiatives, intention to participate, and expectation of benefits". "Chance to supply to the mines by SME as a supplier" and participation in the mining supply chain is realised by supplying and earning an income.	Lee (2008, p.193) Kanyinji & Tembo (2019), p.68.
Influencing factors	These factors increase or decrease SMEs' participation and performance in the supply chains, including a lack of economies of scale, poor	Dubihlela (2014) Theng & Boron (1996).

	organizational structures, and technological challenges in government regulation.	
(i) Finance	It relates to financial constraints SMEs face in accessing funding due to a lack of credit facilities, collateral, and other existing and perceived financials associated with SMEs.	Tan (2015) Kanyinji & Tembo (2019)
(ii) Rules and regulations	Standards are quality requirements that SMEs must comply with and often lead to implementation and certification costs. Standards can be regarded as the authenticity of the quality of products or services as per pre-established norms. Regulation refers to legislative requirements that SMEs must meet. Stringent requirements may overburden SMEs, stifling their growth, especially in the early stages of business establishment.	Sommer, (2017) (Dashore & Sohani (2013) Kanyinji & Tembo (2019)
(iii) Technology and Information Technology	Technology includes automation and digitalisation that drive innovation and technopreneurship. Information technology is information management through digitalisation platforms to enhance data	Ozkan-Ozen et al. (2020) Kanyinji & Tembo (2019)

	management and decision-making. SMEs tend to fall behind in adopting advanced technologies and information management. SMEs lack access to the Internet of things (IoT) or have limited use of IoT facilities.	
(iv) Human capital-lack of experience	Human resource problems emanate if the SMEs over-recruit inexperienced human resources.	Fleschhut (2012) Yu & Hui (2008) Kanyinji & Tembo (2019)
(v) Human capital abilities	Human resources constraints like A lack of skilled technicians or skilled management and competent workers.	Kanyinji & Tembo (2019)
(vi) Economies of scale	Lack of economies of scale in implementing SCM. high cost of implementing SCM and the potential negative economic impact	Farooque et al. (2019, p.18)

Business Performance	SMEs performance is measurable outputs that include sales growth, market growth, market share, and profitability presented as market, operational, and financial performance. Therefore, the study will focus on market and financial performance only.	Li and colleagues (2006) Reklitis et al. (2021) Hsu et al. (2011) Lee (2021)
(i) Market performance	measures market share, market share growth, a firm's reputation, and brand name.	Li and colleagues (2006) Reklitis et al. (2021)
(ii) Financial performance	It measures the growth of sales, growth in return on investment, the profit margin on sales and net profits.	Li and colleagues (2006) Reklitis et al. (2021)

Insights from the RBV theory were used in this study because it correlates well with participation in SC, SCM, key factors, and organizational performance (Okoumba, 2018). Moreover, RBV has a substantial effect on SCM and the operations of companies such as SMEs (Shibin et al., 2020). According to Dhliwayo in Delener (2012), Dhliwayo (2014), and Hisrich (2017), the following are the primary competitive characteristics of RBV:

(i) Firms like SMEs have competitive superiority as a resource that enables them to address the requirements of customers better than their rivals, providing them a competitive edge. However, SMEs often lack resources. However, if they use involvement in supply chains as an entrepreneurial opportunity, opportunity, and strategy, they may overcome this limitation (Guyen & Mekdes Belihu, 2010; Dhilwayo in Delener, 2012; Fleschhut, 2012; Dhliwayo, 2014; Hisrich, 2017).

(ii) Small and medium-sized enterprises (SMEs) may have a scarce resource, such as flexibility, which gives them a competitive edge over their big and small rivals (Guyen & Mekdes Belihu, 2010; Dhliwayo in Delener, 2012; Fleschhut, 2012; Dhliwayo, 2014; Hisrich, 2017).

(iii) SMEs may have unique rights, contracts, or legal protection that cannot be reproduced, such as patents and mineral rights (Guyen & Mekdes Belihu, 2010; Dhliwayo in Delener, 2012; Fleschhut, 2012; Dhliwayo, 2014; Hisrich, 2017). According to the Miles and Snow model (Maniora, 2018), this enables SMEs to function as defenders strategically.

According to RBV, there are six categories of resources: physical, human, organizational, technical, financial, and reputational (Filho & Moori, 2020).

Small and Medium-sized enterprises (SMEs) with the dynamic capabilities to manage the aforementioned resources adequately and effectively will not only outperform their competitors but also implement superior entrepreneurial strategies that result in the achievement of their goals, mission, and vision (Ong, 2017). SCM resources also provide commercial value for SMEs (Sarkis, 2009).

Challenges posed in RBV in gaining access to resources are strongly related to variables affecting involvement in supply chains and SME success in the mining sector. The market position of a company is established by how well it uses its resources to maximize market opportunities and avoid challenges or competition from competitor enterprises (Ong, 2017). Shepherd and Wiklund (2013) stated that SMEs have little marketing capacity to sustain a competitive edge over rivals and clients. Participation in supply chains in the mining sector as an entrepreneurial approach in SCM aligns SMEs to achieve supply movement that results in customer or client satisfaction within supply networks that add value altogether (Filho & Moori, 2020).

RBV's incapacity to "reach beyond the features of the resources and resource markets to explain the firm's lasting heterogeneity" is one of its weaknesses (Oliver, 1997, as cited by Shibin et al., 2020, p.303). It disregards the social environment in which decisions about resource selection are made (Shibin et al., 2020). Okoumba et al. (2018) have deemed RBV the best explanation for their findings on supply chain management in firms and how they efficiently use resources to achieve high performance.

The Ajzen Theory of Planned Behaviour (TPB) proposed by Ajzen (1991), Shepherd and Wiklund (2013), and Urban and Venter (2015) describe the attitudes of SME owners and managers operating in supply chains. In addition, Li et al. (2021) said that TPB takes into account the internal and external behaviours of the predictor of intention (Ajzen, 1985, 1991), hence enhancing the predictability of SMEs' intention to engage in SCM.

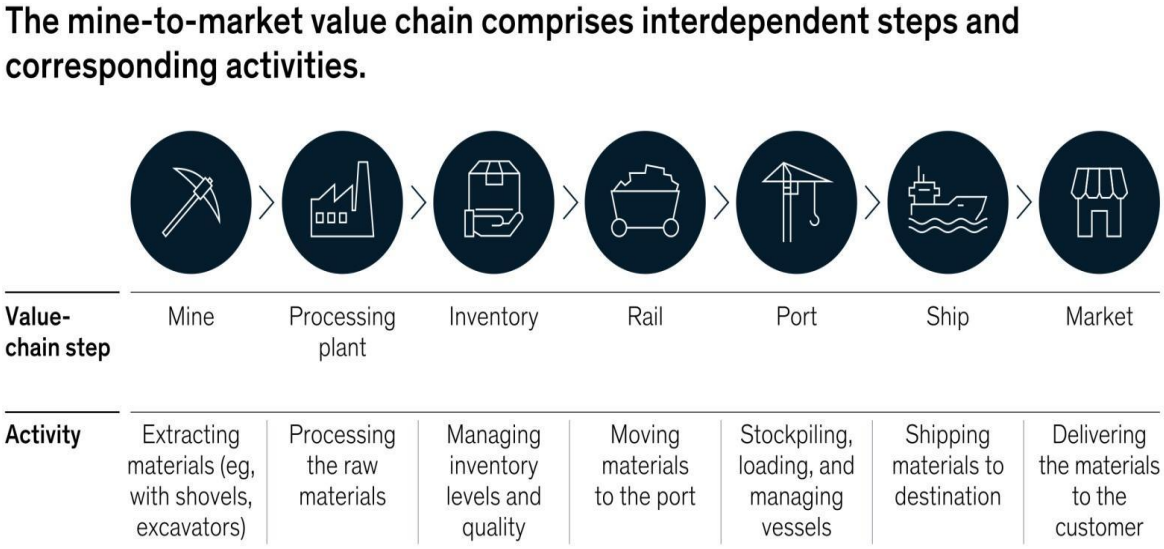
In SMEs, decisions are often made by the owners/managers; hence, it reflects their behaviour (Li et al., 2021). According to Ajzen (1991), as referenced by Li et al. (2021, p.25), "the resources and opportunities accessible to an individual must, to some degree, determine the possibility of behavioural performance." The more the "intention" of SME entrepreneurs to engage in the supply chains, the greater the likelihood that the SMEs will operate more effectively (Ajzen, 1991, p.181).

The competitive advantage that results from the capacity of owners or managers to identify and utilize entrepreneurial possibilities in mining supply chains is enhanced company performance (Urban et al., 2015; Namagembe, 2017).

2.3. SUPPLY CHAIN MANAGEMENT AND MINING SMALL BUSINESSES

Previous research has established that a SME's supply chain operations are a vital component of a company's value chain (Thakkar et al., 2012; Malakoti-Negad, 2016).

As depicted in Figure 2.1, Gorner et al. (2020, p.2) note that "the mining value chain" encompasses extraction to market delivery. They distinguish supply chains as management of "inbound and outbound logistics and warehousing" from "value chains, which are comprised of integrated end-to-end processes."



Source: (Gorner et al., 2020, p.3)

Figure 2.1: The mine-to-market value chain

SMEs participating in the above-illustrated mine-to-market value chain encourage the mining sector to create more competitiveness advantages and value addition,

whilst those that fail in this regard encounter more obstacles in their value chain (Gorner et al., 2020). This strategy will significantly enhance mining supply chains and the performance of SME participants in them. Mining operations were treated as a guiding principle by Gorner et al. (2020), although this method may have inherent limitations outside the scope of this study.

In a UNDP report, Wairimu (2015) stated that the formation of numerous linkages between SMEs and mining entities would allow the former to supply goods and services. The three broad groups of linkages as observed by (Wairimu, 2015; Ramdoo, 2013; ILO, 2014; McMahon, 2010; Bebbington, 2011) are as follows:

(i) These include donations to exploration or the provision of equipment or services that help in the extraction or production phases of mining (ILO, 2014). These endeavours need capital-intensive and high-tech apparatus (McMahon, 2010). The needed products and services tend to favour regional vendors and are context-dependent (Ramdoo, 2013).

(ii) Forward/downstream activities/links include the processing and refining of raw materials into completed or semi-finished goods. This region offers prospects for the development of industrial activities. The primary worry is that the vast majority of raw minerals mined in resource-rich African nations are often refined overseas. In certain instances, processing occurs in-country when the final product has substantial local market potential (McMahon, 2010). However, even in these instances, the processing location is still geographically far from the extraction site (Bebbington, 2011). Therefore, it may become important to provide incentives if local SME suppliers are to reap the advantages (Ramdoo, 2013). This must be counterbalanced by more cost-effective techniques that enable them to stay competitive with global suppliers.

(iii) Horizontal/side-stream linkages: These are commodities and services that are not directly tied to core mining operations but have the potential to provide indirect business and employment possibilities in other industries. These include financial services, logistical providing, distribution services,

and the development of talents and technologies (ILO, 2014). Wairimu (2015) advocated strongly for the implementation of this relationship among less developed nations since it enables greater job creation and contracts for local SMEs. In addition, governments prefer to favour this connection owing to its direct advantages to the mining industry's local communities (Ramdoo, 2013).

The SMEs involved in the mining supply chains in Mpumalanga must prepare for the possibility of mine closures in their areas.

2.4. SMES' PARTICIPATION IN SUPPLY CHAINS

Tanda and Mohanty (2013) researched SCM in SME merchants and found that their participation in supply chains was prompted by motivational factors. These include "cost advantage, capacity utilization, quality, seamless flow of supply information, and a growth in knowledge" (Tanda & Mohanty, 2013, p.28)

Participation in supply chain management is seen crucial for sustaining a competitive advantage. Researchers highlighted cost reduction in distribution operations as an example of a common benefit (Tanda & Mohanty, 2013, Setyaningsih, Kelle & Maretan, 2020). Participants in supply networks find advantages in integrating their duties with those of others (Tanda & Mohanty, 2013).

Awareness and comprehension of supply chain initiatives are crucial for SME supply chain engagement (Lee, 2008). Then it is crucial that "participants perceive competitive advantages via customer orientation, product quality, service quality, degree of customer satisfaction, quicker and more accurate delivery, and synergy due to integration" (Tanda & Mohanty, 2013, p.29).

Participation of SMEs in the mining supply chain boosts their long-term income (IFC, 2014; Ata et al., as cited in Kanyinji & Tembo, 2019). Integrated approaches to value chains result in win-win scenarios (Kanyinji & Tembo, 2019). Greater "market access, higher product yields, access to funding due to better management systems, and longer contracts, among others, will benefit SMEs,

particularly in South Africa, by generating a sustainable income and contributing to localized efforts to create employment opportunities, thereby reducing inequality (Ngarachu et al., 2017, p. 33). Omoruyi and Dhurup (2016) said that supply chain networks maximize the competitive advantage and performance of small and medium-sized enterprises. Local small and medium-sized enterprises (SMEs) in Mpumalanga confront obstacles in realizing the present entrepreneurial prospects in the mining industry, notwithstanding the expected advantages associated with involvement in supply chains.

2.5. FACTORS INFLUENCING SMES' PARTICIPATION IN SUPPLY CHAINS

There are two kinds of endogenous (internal) elements that drive SME entrepreneurship: (i) human traits and deficiencies; and (ii) flaws in financial and operational management inside the company organization (Theng et al., 1991). The influencing variables may affect the engagement of SMEs in the supply chain favourably or adversely. Due to a lack of economies of scale and insufficient organization, there are negative repercussions. A lack of productivity, an inability to innovate or react to market circumstances, inadequate resources, a lack of skill and knowledge, a lack of financial resources, insufficient processes and procedures, and a lack of strategies to successfully engage major enterprises in the supply chain (Rahman, 2012; Malakoti-Negad, 2016; Galawe, 2017). "SMEs' lack of awareness of standards, lack of technical assistance and training, expensive implementation and certification, contractual agreements, lack of adequate financing, and changing sustainability standards, structures, and market structures that comprise the SME landscape" are the most significant disadvantages of SMEs' participation in the value chain and supply chains (Ngarachu et al., 2017, pp. 24-28). In addition, the majority of small and medium-sized enterprises fail owing to their own neglect to embrace and implement current and well-established excellent business practices such as supply chain management (Epoh & Mafini, 2018; Mafini & Okuomba, 2018).

Exogenous elements arise from the macro-environment (external components of the business environment) and have an effect on small and medium-sized enterprises (SMEs), such as high interest rates, inflation, taxation, competition, and government regulation (Theng & Boron, 1996).

According to Ngarachu et al. (2017), the most significant barriers inhibiting SME involvement in value chains in South Africa and Kenya are the severe requirements of major corporations. Sommer (2017) argued that SME difficulties include insufficient capacity, productivity, a skilled labour force, and management and entrepreneurial abilities. Ngarachu et al. (2017, 23-30) listed the impacts as "lack of knowledge, limited technical help and training, expensive implementation and certification, lack of suitable finance, and changing voluntary sustainability norms and market structure" Studies conducted in Zambia by Kanyinjii and Tembo (2019, p.520) and Chisala (2008) identified "tax, licensing, registration procedure, financial and skills constraints" as restricting SMEs' involvement and development. These papers support the emphasis of this investigation on the research questions-identified contributing variables.

Fleschhut (2012) argued that the position of SMEs in the supply chain is affected by the management practices of those SMEs that tend to place a restricted emphasis on company location and participation. Human capital may be badly impacted by managerial actions. For instance, while having cheap human resource expenditures in the near run, SMBs may only be able to recruit fewer experienced and skilled workers, hence lowering productivity.

Herrington and Coduras (2019) identified the lack of access to capital, government policies, rules, and procedures for entrepreneurs, and inadequate levels of entrepreneurship education as the four most influential determinants on entrepreneurial growth. These four crucial criteria influence supply chains involvements as an entrepreneurial approach, particularly in the mining sector. Oladapo (2019) emphasized that entrepreneurs may choose necessity-driven rather than opportunity-driven small and medium-sized enterprises (SMEs),

particularly in the informal sector, when confronted with employment losses due to mine closures, which is typical in the Mpumalanga region.

In the literature, there is a vast array of variables that influence SME involvement in supply chains and performance that go beyond the scope of this study.

Setyaningsih et al. (2020) identified five crucial effects on involvement in supply chains: organisational, financial, knowledge, technological, and outsourcing factors, which are presented in Table 2.3.

Table 2.3: Summary of critical influences on SMEs' participation in supply chains

Factor	Sub-factor	Literature/source
Organisational	Inadequate involvement of top management in adopting SCM	Govindan et al. (2013); Majumdar & Sinha (Shah (2016); Zaabi et al., (2013); Gupta et al. (2020); Manzouri et al., (2014); Salami e tal. 2018); Ozen et al. (2020); Parmar et al. (2015); Gorane & Kant (2014); Jayant & Azhar (2014); Rahman et al. (2011); Kumar et al. (2015)
	Lack of management capacity	Govindan et al. (2013); Parmar & Shah (2016)
	Considerable effort to change organisational strategy	Majumdar & Sinha (2018); Mafini (2016), Manzouri et al. (2014); Salami et al. (2015); Gorane & Kant (2014); Masete & Mafini (2018)
	Unclear organisation objective	Parmar & Shah (2016); Zaabi et al. (2013); Majumdar & Sinha (2018); Dubihlela & Omoruyi (2014); Gorane & Kant (2014)
	Inadequate performance measure	Manzouri et al. (2014); Masete & Mafini (2018)
Financial	Financial constraints	Govindan et al. (2013); Majumdar & Sinha (2018); Parmar & Shah (2016); Sajjad et al. (2019); Gorane & Kant (2014); Jayant & Azhar (2014); Mafini & Omoruyi (2013); Katunzi & Zheng (2011)

	High investments and less ROI (Return on Investments)	Govindan et al. (2013); Ozen et al. (2020); Majumdar & Sinha (2018); Gupta et al. (2020); Mafini & Omoruyi (2013)
	Superior execution and preservation cost	Govindan et al. (2013); Majumdar & Sinha (2018)
Knowledge	Inadequate SCM system exposure to experts	Govindan et al. (2013); Gupta et al. (2020); Jayant &Azhar (2014); Rahman et al. (2011); Ahweda et al., (2016); Masete & Mafini (2018); Katunzi & Zheng (2011)
	Lack of awareness and participation on SCM	Govindan et al. (2013); Majumdar & Sinha (2018); Ozen et al. (2020); Parmar & Shah (2016); Majumdar & Sinha (2018); Salami, et al. (2015); Sajjad et al. (2019); Farooque et al. (2019)
	Lack of motivation and employee involvement	Parmar & Shah (2016); Majumdar & Sinha (2018); Mafini (2016); Sajjad et al. (2019); Gorane & Kant (2014); Rahman et al. (2011)
Technological	Lack of new technology, materials and processes	Govindan et al. (2013); Majumdar & Sinha (2018); Ozen et al. (2020); Parmar & Shah (2016); Zaabi et al. (2013); Majumda & Sinha (2018); Gupta et al. (2020); Dubihlela & Omoruyi (2014); Gorane & Kant (2014); Quayle (2003); Chand et al. (2018); Jayant & Azhar (2014); Katunzi & Zheng (2011)
	Recent exercise inadequate of the flexibility to change into new system	Govindan et al., (2013); Jayant & Azhar (2014)
	Lack of human resources	Govindan et al. (2013); Majumdar & Sinha (2018); Ozen et al. (2020); Rahman et al. (2011)
	Fear of failure	Govindan et al. (2013); Majumdar & Sinha (2018); Sajjad et al. (2019); Jayant & Azhar (2014)
Outsourcing	Lack of standard SCM system to collabourate with	Ozen et al., (2020); Parmar & Shah (2016); Manzouri et al., (2014); Salami et al. (2015); Switala (2016)

	suppliers	
	Lack of Customer Satisfaction Index Lack of Trust among SCM partners	Parmar & Shah (2016); Mafini (2016); Gupta et al. (2020); Garuna & Kant (2014); Ahweda et al. (2016) Majumdar & Sinha (2018); Mafini (2016); Gupta et al. (2020); Manzouri et al. (2014); Sajjad et al. (2019); Gorane & Kant (2014); Rahman et al. (2011)
	Unwilling to share risk and rewards between SCM partners	Govindan et al. (2013); Ozen et al. (2020), Manzouri et al. (2014); Sajjad et al. (2019)

Source: Setyaningsih, et al., (2020, p.244)

The financial and technological aspects mentioned in Table 2.3 have a clear relationship with the factors that this research focuses on. Knowledge as a factor is indirectly related to human capital (skills) and affects the involvement of SMEs in supply chains. There is no correlation between outsourcing and organizational characteristics and any of the variables examined in this research.

According to Mahmud et al. (2021, p. 1), there are four primary kinds of key effects of SCM encountered by SMEs, as illustrated in Table 2.4 below: information-related, communication-related, intra-organizational, and inter-organizational obstacles.

Table 2.4: List of critical factors faced by SMEs

Category of factors	Factor Name	Reference
Information-related	Reluctance to share information Poor information quality	Anbanandam et al. (2011); Huo et al. (2015); Cai et al. (2010) Chen et al. (2011); Linton (2018).
Communication-related	Lack of communication Poor system connectivity	Forslund & Jonsson (2009) Fawcett et al. (2015)
Intra-organizational	Intra-organizational weak	Barratt (2004); Butt

	relationships Decision desynchronisation Incentives obstacles Opposition to change Territoriality Leadership deficit	(2019) Simatupang & Sridharan (2005) Chopra & Meindl (2019) Fawcett et al. (2015) Fawcett et al. (2015) Fawcett et al. (2015)
Inter-organizational	Lack of trust Short-term relationships Behavioural uncertainty Cultural difference Different goals Non-standardised performance Lack of commitment Small firms Government interventions Pricing obstacles Lack of resource sharing Lack of adaption Late delivery	Anbanandam et al., (2011); Huo et al., 2015; Kwon & Suh (2004) Hou et al. (2018) Prajogo & Olhager (2012); Anbanandam et al. (2011); Ramanathan & Gunasekaran (2014) Chopra & Meindl (2019); Chen et al. (2011); Zhang & Cao (2018); Barratt (2004); Cai et al. (2010) Forslund & Jonsson (2009); Shaw et al. (2021) Anbanandam et al. (2011); Huo et al. (2015); Kwon & Suh (2004) Forslund & Jonsson (2009) Cai et al. (2010 (Wu & Chiu, 2018) Chopra & Meindl (2019) Barratt (2004); Kumar & Banerjee (2014) Fynes et al. (2005); Huo et al. (2015; Forslund & Jonsson (2009);(Tan et al. (2006)

Source: Mahmud et al. (2021, p. 5)

During COVID-19, Mahmud et al. (2021, p.18) suggested that communication-related variables, such as "lack of communication," are the most crucial obstacles for SME managers to address, followed by information-related aspects. In Table 2.4, there is a fine line between communication-related and information-related aspects. Nonetheless, these elements are directly tied to the technological and information technology issues discussed in this study paper. Under intra-organizational variables, the leadership deficiency was a significant contributor to the lack of experience (human capital) construct. Inter-organizational variables had no impact on the factors examined in this research. Chisala (2008) asserted that Zambian SMEs acknowledged that public issues, such as taxes, licensing, and registration, inhibit their expansion. Small- and medium-sized enterprises (SMEs) in Zambia participated poorly in mining value chains due to "registration procedures, financing, technology, and tax," whereas licensing and standards had a minor effect (Kanyinjii & Tembo, 2019, p.8). This study's stance on money, technology, and standards as crucial influencing elements is supported by the viewpoint of previous studies.

The research investigated the most significant elements affecting the involvement and performance of SMEs in the supply chains of the mining sector. This analysis ranks money, norms and regulation, technology and information technology, human capital (lack of expertise and skills), and economies of scale as the most important crucial elements. On the basis of the current literature research, the following hypothesis is formulated about the six (6) variables and subfactors:

Hypothesis 1*: Finance, standards & regulation, technology & information technology, human capital (lack of experience & skills), and economies of scale are the factors that influence SMEs' participation in the supply chain in mining in Mpumalanga South Africa*.

2.5.1. FINANCE

Financial restrictions are one of the most important concerns impacting South African SMEs (Abor & Quartey, 2010; Mahembe, Chiumya & Mbewe, 2011;

Fleschhut, 2012; Sommer, 2017; Abbasi et al., 2018). Many small and medium-sized enterprises fail to fulfill the standards established by banking institutions, making it difficult to secure SME loans (Fleschhut, 2012; Sommer, 2017; Abbasi et al., 2018). Gumboh and Gichira (2015) found that small and medium-sized enterprises in Kenya without access to credit lines borrow from loan sharks with high interest rates or turn to pyramid schemes. Both of these practices are comparable to those that South African SMEs may encounter. As a consequence, the majority of entrepreneurs use bootstrapping in the early phases of firm development (Harvard Business Review, 2018; Abbasi et al., 2018).

Considering the high percentage of application denials, many SMBs seek bank funding (Sommer, 2017). Government and agency funding is the second most common choice, with the Department of Commerce and the Department of Small Business Development being important contributors (Sommer, 2017). Industrial Development Corporation and Small Enterprise Finance Agency are the most important government institutions that support SMEs (Mahembe et al., 2011; Sommer, 2017). Limitations associated with government and agency financing include partial funding and bureaucracy (Mahembe et al., 2011; Sommer, 2017).

Microfinance is an alternative option with greater interest rates and new financing possibilities, such as angel and venture capital firms (Mahembe et al., 2011; Sommer, 2017). Due to their limited financial literacy, small and medium-sized enterprises in the mining sector face comparable finance issues (Abbasi et al., 2018). The majority of SME owners and entrepreneurs lack financial knowledge. Consequently, they lack attempts to address them, resulting in insolvency and firm closures due to financial irresponsibility and commercial acquaintance (Abbasi et al., 2018).

According to Tan (2015, p. 87), "the biggest hurdles to bank lending to SMEs include banks' financing conditions, inadequate capital, and, most crucially, poor risk perception among customers." Muduli et al. (2013) suggested that the enormous financial expenditures required by the mining sector in India to adopt SCM, including environmental challenges, are the major capacity limitations faced

by SMEs. The poor financial situation of SMEs caused them to "operate with a tight budget," to have a short "cash to cash cycle," to incur high transaction costs, and to lose the capacity to invest in vital assets (Fleschhut, 2012, p.29-30). Thakkar et al. (2009) argued that the lack of financial resources in SCM and short-term dependency on cash is a key hurdle for small and medium-sized enterprises. In addition, SMEs face financial obstacles such as the expensive implementation and certification costs of SAB-established standards (Sommer, 2017). Abor and Quartey (2010) said that the absence of financing for SMEs' development programs in Ghana and South Africa is detrimental. These financial restrictions inhibit the involvement of SMEs in the mining industry's supply networks. In Mpumalanga, the Zimele Anglo-American business project, which was designed to help SMEs in mining supply chains, was discontinued in the Secunda business region owing to the financing mechanism and insufficient management skills of SME participants, resulting in a poor return on investment (Oladapo, 2019).

In a research conducted by Donga et al. (2016) on the perceived hurdles to the growth of SMMEs in Thulamela Municipality, Limpopo Province, South Africa, lack of capital was ranked first, followed by market access, obsolete equipment and technology, bad infrastructure, and lack of training. Despite the fact that the above-mentioned research was not focused on the engagement of SMEs in supply chains, the observed criteria are important and have a major impact on such participation. The mining industry is a very capital-intensive industry, necessitating more financial clout if SMEs are to increase their involvement in supply chains.

This study proposes this hypothesis:

Hypothesis 1: (a) Finance influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa**.**

2.5.2 STANDARDS AND REGULATIONS

South African SMEs seem uninformed of the usefulness of supply chain standards and their influence on their businesses (Sommer, 2017). Meeting standards

established by SABs and other similar bodies adds value to supply chains and aids businesses in reaching and extending their market base (Sommer, 2017). However, SMEs lack standard certifications like as ISO 14000/ISO 14001 due to the prohibitive expense of getting such certifications (Dashore & Sohani, 2013; Sommer, 2017). Small and medium-sized mining companies in South Africa are now eligible for an incentive program to pay certification expenses, consequently reducing the costs suffered by SMEs from SABs (Sommer, 2017). Furthermore, weak law hinders the execution of standards. Consequently, SMEs fail to adhere to voluntary standards that are more stringent and include substantial transaction costs, such as membership fees, auditing fees, and training expenses (Sommer, 2017).

Government regulation may have an enabling or disabling influence on the SCM of small and medium-sized enterprises (Luthra et al., 2011; Niemann et al., 2017). The disabling effect may be caused by administrative bureaucracy, rule complexity, or working procedures (Narimissa et al., 2020). Participation in supply chains by SMEs is sometimes impeded by a dearth of government support mechanisms, such as advantageous tax incentives, and the retention of antiquated and duplicate processes (Luthra et al., 2011; Niemann et al., 2017). Furthermore, inadequate laws, government taxes and levies, and time-management restrictions have a detrimental impact on SMEs (Luthra et al., 2011). The facilitative effects of government regulation may promote the efficacy and efficiency of SME involvement in supply chains (Niemann et al., 2017).

Government regulation may have an enabling or disabling influence on the SCM of small and medium-sized enterprises (Luthra et al., 2011; Niemann et al., 2017). The disabling effect may be caused by administrative bureaucracy, rule complexity, or working procedures (Narimissa et al., 2020). Participation in supply chains by SMEs is sometimes hampered by the absence of government support mechanisms, such as advantageous tax incentives, and the continuation of obsolete and obsolete systems (Luthra et al., 2011; Niemann et al., 2017). Furthermore, inadequate laws, government taxes and levies, and time-

management restrictions have a detrimental impact on SMEs (Luthra et al., 2011). The facilitative effects of government regulation may promote the efficacy and efficiency of SME involvement in supply chains (Niemann et al., 2017).

Broad-Based Black Economic Empowerment (BBBEE), the most contentious policy in South Africa, is a good example of legislation that experts contend has either an enabling or a debilitating influence on SMEs' involvement in supply chains (Korinek & Ramdoo, 2017; Niemann et al., 2017; Sibiya & Barnard, 2020; PRS Group, 2020). Sibiya and Barnard (2020, p.7) "examined Broad-Based Black Economic Empowerment Enterprise and Supplier Development (B-BBEE ESD) programs on Small Medium and Micro Enterprises (SMMEs) and discovered that financial and non-financial" beneficiaries depend "on both organizations' commitment and philosophical views on the imperatives of B-BBEE." In addition, the researchers argued that monitoring and analysing B-BBEE is loose. Consequently, there is inadequate data management on its implementation (Sibiya & Barnard, 2020). Niemann et al. (2017) emphasized that the South African government has supported the inclusion of SMEs in supply chains via infrastructure, laws, and Broad-based Black Economic Empowerment (BBBEE) criteria. The South African government's BBBEE regulations have a poor reputation in the corporate community.

According to the Political Risk Service (PRS) Group report (2020, p.25), "The BEE program has been heavily criticized, with many companies complaining about the difficulty of meeting the requirements and widespread reports of various "fronting" schemes to create the appearance of compliance without actually adhering to the rules. The administration has pledged change, but has so far only made minor adjustments."

Abor and Quartey's (2010) research on SME growth in Ghana and South Africa reveals that licensing, company registration, property rights, and obstructions in quality control and product standardisation are among the regulatory obstacles impeding SME entrepreneurship and supply chain management.

Korinek and Ramdoo (2017) argued that the local content regulation on mining in South Africa is complex, convoluted, and difficult to comprehend for all actors, especially small and medium-sized enterprises (SMEs) in the mining industry. The same research highlighted a reversal of the good intentions of BBBEE to promote local content via the use of local inputs by increasing imports obtained by BBEE-compliant enterprises (Korinek & Ramdoo, 2017). According to Korinek and Ramdoo, the same law has increased the cost of conducting business in South Africa, so discouraging prospective investors and boosting procurement and employment rather than fostering a climate conducive to entrepreneurship (USAID/SPEED, 2017).

Poor governance standards and regulations constitute a significant barrier to involvement in supply chains and the performance of SMEs in the mining industry, notably in Mpumalanga.

As evidenced by the preceding literature analysis, stringent requirements and inadequate laws are among the most important hurdles to SME involvement in supply chains, particularly in the mining industry.

This study suggests the following hypothesis:

Hypothesis 1(b): Standards & Regulations influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.

2.5.3. TECHNOLOGY AND INFORMATION TECHNOLOGY

Vasili, Popovi-Panti, and Semenenko (2020) claimed that the inaccessibility of technology was a crucial factor impacting the involvement of SMEs in supply chains. "SMEs have limited access to innovation, which may lead to misallocation of resources, poor performance, and a value-based centre with inadequate administration" (Vasili et al., 2020, p.418). Numerous SMBs rely on human labour, which slows down the process, hence becoming it pricey and extremely difficult to manage, which disrupts their cash flow (Abbasi et al., 2018; Vasili et al., 2020). Fleschhut (2012) said that the usage of information technology in small and

medium-sized enterprises (SMEs) is protracted and largely restricted to administrative and operational tasks. Therefore, the use of IT for business intelligence in decision-making processes is restricted. To contact consumers and clients in the supply chain, SMEs choose direct connection over IT (Fleschhut, 2012).

According to Niemann et al. (2017, p. 226), "South African supply networks are regarded immature in comparison to European supply chains in terms of cooperation, infrastructure, and technical advancements." Muduli et al. (2013) suggested that managers in the majority of Indian mining sectors lack knowledge of new technology and its applications. Abor and Quartey (2010) stated that the development of small and medium-sized enterprises (SMEs) in Ghana and South Africa was influenced by inadequate or limited access to appropriate technology and information technology, confirming the technological challenges faced by SMEs' participation in the supply chains of the mining industry, particularly in Mpumalanga.

Utilizing IT, SMBs dramatically reduce their paper use, so making an environmental contribution (Luthra et al., 2011). Due to the immense burden of a few individuals allocated to IT problems, the absence of information exchange and the inability to routinely update databases is a significant obstacle to the supply chain operations of SMEs (Fleschhut, 2012). Resistance to new technology and IT is prevalent in small and medium-sized enterprises and is a regressive phenomenon in terms of technopreneurship and organizational transformation (Luthra et al., 2011; Fleschhut, 2012). This undermines the central role of IT in decision-making, information storage, retrieval, and interchange (Fleschhut, 2012). The Internet of things (IoT), artificial intelligence (AI), automation, and other modern digital technologies, which are essential to the fourth (4th) industrial revolution, are not prioritized and utilized by the majority of small and medium-sized enterprises (SMEs) in the mining industry's supply chains, thereby acting as barriers (Ozkan-Ozen et al., 2020).

Abbasi et al. (2018) was of the view that technology is a kind of knowledge. Consequently, small and medium-sized enterprises (SMEs) that avoid technological progress undermine the entrepreneurial qualities of invention, information exchange, technical or digital expertise, and change management. This aspect is directly related to financial restrictions, since small and medium-sized enterprises (SMEs) may be hesitant to invest extensively in IT and technological innovation owing to limited financial resources (Fleschhut, 2012). Inadequate technology and information systems have an impact on the SCM operations of SMEs and paralyze the data network systems required to run supply chain networks (Gumboh & Gichira, 2015).

Dashore and Sohani (2013, p. 2025) identified "lack of adoption of advancements in new technology and lack of integration of information technology" as significant problems affecting the involvement of SMEs in supply chains. Consequently, the "SMEs may be unable to engage in SCM projects if they lack the appropriate IT" (Thakkar et al., 2008; Fleschhut, 2012, p.56). When the question of technical elements emerges, Schumpeter's conception of the disruptive role of entrepreneurs as imaginative and proactive (Urban, Boris, and Venter, 2015) becomes a nightmare for SME owners in the mining industry.

This study, therefore, proposes the following hypothesis:

Hypothesis 1 (c): Technology & Information technology influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.

2.5.4. HUMAN CAPITAL - LACK OF EXPERIENCE

In the supply chains of SMEs, the lack of knowledge and expertise among human resources is one of the most influential elements (Yu, Hui & Ho, 2008; Dashore & Sohani, 2013). Fleschhut (2012, p. 31) highlighted that managers of small and medium-sized enterprises (SMEs) know based on acquired professional touch, also known as "hands-on experience" in the company, or obtained "management knowledge through academic education." In addition, owners or managers of

SMEs often have various duties across several divisions, necessitating multitasking and a balanced approach to managing and leading a broad variety of company or work-related difficulties (Fleschhut, 2012). The inability of human resources to achieve this high standard of duties and expectations impedes the efficient operation of and participation in supply chains by SMEs.

Human personnel tend to play a defensive role based on resistance to change and retain a business-as-usual attitude in all aspects of the business's fundamental operations, which has a considerable negative impact on the involvement of SMEs in the supply chains of the mining sector (Ab Talib, Hamid & Thoo, 2015). Due to a manager's lack of vision, the supply chain vision will not be communicated to the workforce, resulting in an integration disaster (Fawcett et al., 2008; Ab Talib et al., 2015). In SMEs, the formation of a vision and purpose is an uncommon tactic. In order to promote SME engagement in supply chains, strategic development is a non-formal process inside SMEs, since management may lack knowledge or exposure in this area (Fleschhut, 2012).

The inability of owners or managers to comprehend SCM practice or participate in supply chains is connected to their lack of vision (Fawcett et al., 2008). As an essential approach, SME leadership articulates the SMEs' vision (Fleschhut, 2012). However, leadership may lack the knowledge to manage SCM processes, as seen by a lack of proactivity in addressing various supply chain concerns (Fleschhut, 2012). This lack of leadership expertise is the primary obstacle to SME engagement in supply chains. Therefore, "a small company with substantial knowledge-based resources is likely to increase firm performance, but these resources will be underused if the small business does not also have an entrepreneurial orientation" (Shepherd & Wiklund, 2013, p.224) and vice versa.

Poor coordination, planning, and risk management impede the flow of supply chains in their upstream and downstream activities (Alhashim, 2018). This may be caused by the employment of inexperienced individuals in SMEs. Therefore, the lack of experience of SME owners and workers significantly impacts their daily company operations and reduces their tolerance for business failures and risks.

Based on a literature analysis investigating the influence of lack of experience as a component of human capital on SME involvement in supply, the following hypothesis is proposed:

Hypothesis 1(d): Human capital (lack of experience) influences SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.

2.5.5. HUMAN CAPITAL - SKILLS

Inadequate availability or insufficient human resources stem from a shortage of human capital, i.e. talents in addition to the experience previously described. According to Mangla et al. (2018), worsening human resource quality has a detrimental impact on SME involvement in supply chains, and vice versa. This is exacerbated by budgetary restraints, which restrict training and education programs designed to upskill human resources (Fleschhut, 2012; Muduli et al., 2013; Dashore & Sohani, 2013; Stentoft et al., 2019; Mahmud et al., 2021). Gumbo and Gichira (2015) suggest that SCM operations are successful when there is continuous staff development and innovation and entrepreneurial capacity building. According to a research by Gumboh and Gichira (2015, p.227), the large number of inexperienced SME managers and owners in Kenya, which adversely impacts their involvement in supply chains, is "mainly attributable to a lack of strategic awareness of supply chain participation advantages." Moreover, financial difficulties impact the recruitment of highly competent people and the utilization of sophisticated technologies and information technology (Fleschhut, 2012; Muduli et al., 2013; Dashore & Sohani, 2013; Stentoft et al., 2019; Mahmud et al., 2021).

Gumboh and Gichira (2015) noted that, in Kenya, most SMEs are established and run by entrepreneurs with limited technical and business skills due to inadequate education levels to run the whole enterprise entirely. South African SMEs face challenges, including the lack of a skilled workforce, resulting in low productivity (Urban & Naidoo, 2012; Sayed & Sunjka, 2016; Masete & Mafini, 2018). This has

perpetuated "human resource risks" besides other risks like “financial, strategic, operational, technological, reputation, and legal risks" that influence the participation of SMEs in supply chains (Sayed & Sunjka, 2016, p.125). SMEs often struggle to implement SCM strategies on their own in the supply chain due to the lack of skills and influence (Meehan & Muir, 2008). There is a critical shortage of skilled workers and a deficiency in know-how in SMEs, which affects their participation in supply chains (Glass et al., 2018).

Due to lower levels of education that result in disregard for safety and security issues throughout supply chains, SMEs, particularly in the mining sector, have inadequate employee understanding of occupational health dangers (Muduli et al., 2013; Gumboh & Gichira, 2015; Sayed & Sunjka, 2016). Low safety and health situations for human resources impede SME involvement in the supply chains of the mining sector.

The resistance of workers to use new and sophisticated technologies as a result of their low skill levels is a major element impacting the involvement of SMEs in supply chains (Fleschhut, 2012; Mangla et al., 2018; Stentoft et al., 2019; Mahmud et al., 2021). Fear of failure by workers and their lack of motivation are correlated with poor skills and low levels of education, which impacts the involvement of SMEs in supply chains (Meehan & Muir, 2008; Stentoft et al., 2019; Setyaningsih & Kelle, 2021; Komlosi, Kelle & Djukec, 2020). Lack of motivation is a major element determining SME involvement in supply chains, and it is also connected to workers and their incentives (Al Zaabi et al., 2013).

The lack of desire on the side of SME personnel to participate in SCM programs or meetings hinders SME involvement in supply chains. Meehan and Muir (2008) stated that SME disinterest in SCM involvement was a significant issue. "The lack of interest and engagement at the management level" in supply chain participation "may be a barrier," although Glass et al. study's "did not confirm" this (Glass et al., 2018, p.4).

The inability of SMEs to advertise the advantages or results of SCM initiatives is a significant element in their involvement in supply chains. This is due to the fact

that it "involves the fear of failure when implementing a supply chain, which might result in monetary losses for the company or the fear of product failure, thereby resulting in the loss of competitive advantage" (Mathiyazhagan et al., 2013, p. 286).

Participation in supply chains by SMEs is impacted by SCM programs' lack of communication skills. Mahmud et al. (2021) propose that poor communication and unstable connection inside systems are well-known communication-related obstacles. Incomplete communication in SCM is a vital aspect of supply chains (Al Zaabi et al., 2013). Lack of communication is intimately tied to cultural, linguistic, and technological limitations. The employment of obsolete technology for information exchange and communication in small and medium-sized enterprises results in poor system connectivity (Mahmud et al., 2021), so compromising the operation of supply chains, particularly during the current COVID-19 outbreaks. Poor communication and connection between SMEs and other stakeholders exacerbate the lack of information exchange, which hinders the involvement of SMEs in supply chains. Muduli et al. (2013) argued that a lack of knowledge causes key stakeholders to pay less attention to occupational health threats. Due to poor information on mining operations in supply networks, illegal mining is expanding. In SME supply chains, a lack of communication weakens the decision-making processes.

The management team's engagement in supply chains is impacted by their lack of SCM-related entrepreneurial ability. According to Akbar et al. (2014, p. 39), "innovation orientation, risk-taking qualities, relational capital, and coordination capacity have a substantial association with entrepreneurial SCM competency and SCM strategies among manufacturing SMEs." This applies to SME supply chains in the mining industry. According to the study, an entrepreneurial supply chain connects "customers and suppliers based on new ideas" (Akbar et al., 2014, p.39). Participation in the supply chain is impeded by the managerial ineptitude, lack of brand identification, and limited amount of finances and other resources of small and medium-sized enterprises (SMEs) (Akbar et al., 2014). Lack of training of employees by management is correlated with entrepreneurial ineptitude and

small and medium-sized enterprises (SMEs) prefer to engage already-trained professionals to carry out specialized skill development inside the organization. This strategy fails to develop human capital with in-demand skills in the South African economy (Mathiyazhagan et al., 2013; Akbar et al., 2014).

Mafini and Muposhi (2017) highlighted that a variety of obstacles, such as a lack of operational skills and the difficulty in recruiting and maintaining talented staff, continue to threaten the existence of small and medium-sized enterprises (SMEs) in South Africa. Critical skills shortages in South Africa frequently interrupt corporate operations, and Mpumalanga's SMEs in the mining sector are not exception.

This research, thus, formulates a hypothesis to the effect that:

Hypothesis 1(e): Human capital (skills) influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.

2.5.6. ECONOMIES OF SCALE

Numerous scholars claim that SMEs lack economies of scale (Julien, 1993; Zehrer, 2009; Thakkar et al., 2009; Abdul-Halim et al., 2012; Dubihlela & Omoruyi, 2014). Then, SMEs are restricted to purchasing huge quantities of assets or multiple services, resulting in lost market prospects (Thakkar et al., 2009). They pay high expenditures if they attempt to create sophisticated systems comparable to those of major corporations due to their restricted resources (Abdul-Halim et al., 2012). The answer to their restricted size is synergy, integration, and cooperation throughout supply chains (Zehrer, 2009). Small and medium-sized businesses are more flexible than huge corporations, which compensates for their lack of economies of scale (Julien, 1993). Financial limits, a dearth of cutting-edge technologies, and a deficiency in information technology are correlated with their limited-scale difficulties (Dubihlela & Omoruyi, 2014). Owing to their smaller size, SMEs struggle to acquire inputs such as raw materials, financing, machinery, equipment, and consulting services due to a lack of economies of scale (Thakkar

et al., 2009). Scale economies are one of the most significant impacts on SME supply chains.

This study, therefore, proposes the following hypothesis:

Hypothesis 1(f): Economies of scale influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.

2.6. BUSINESS PERFORMANCE

As in prior research, Li et al. (2006) propose using both market and financial performance to quantify firm success. Additionally, the researcher says that any organizational endeavour including the inclusion of SMEs in supply chains and SCM should result in enhanced company or organizational performance (Li et al., 2006).

2.6.1. MARKET AND FINANCIAL PERFORMANCE

The market performance of a small and medium-sized enterprise is "the firm's success as assessed by sales revenue, market share, profitability, competitive advantage, customer happiness, and loyalty" (Jayapal & Omar in Ahmad et al., 2017, p.207). Market performance involves both short- and long-term objectives, such as a supply chain market share (Li et al., 2006).

Financial performance relates to the profitability of a business, which includes return ratios, earnings, and profit (Schmidt et al., 2017). Other scholars have provided contradictory perspectives on financial performance based on neoclassical economics (Schmidt et al., 2017). Nonetheless, Laari (2016)'s study reflects the tendency of the vast majority of academics demonstrating a favourable correlation between SME engagement in supply chains and financial success. A few researchers support traditional views of financial statements on financial performance that emphasize return on assets (ROA), return on earnings (ROE), return on capital employed (ROCE), and earnings before interest and taxes (EBIT-percent), while the majority of articles adopt an economic performance focus and

employ perception-based indicators such as cost-savings, among others (Laari, 2016).

2.6.2. BUSINESS PERFORMANCE AND SMES' PARTICIPATION IN THE SUPPLY CHAIN

Hong Jeong (2006) argued that the responsibilities of suppliers, manufacturers, distributors, and consumers are assumed by SMEs actively engaging in the supply chain. Therefore, the involvement of SMEs in the economy is contingent upon a more conducive environment (micro-environment and macro-environment).

A GEM SA study (2019) suggests that governments should prioritize policies that promote the expansion of SMEs. The same GEM assessment suggests SEDA's participation in business development and support services for small and medium-sized businesses. The government is tasked with establishing regulations that foster favourable entrepreneurial framework circumstances, including financial assistance, entrepreneurial programs, entrepreneurship education, infrastructural access, and an entrepreneurial culture (GEM report, 2019). This is accomplished by business development programs including the government, private sector, entrepreneurs, and civil society. Dhanah (2016, p. 4) emphasized that the government must take steps such as "reducing administrative burdens and cutting red tape; improving contract enforcement mechanisms; simplifying tax regimes; strengthening physical and digital infrastructures; and enhancing transparency and effectiveness in public governance, such as through the use of digital tools." The implementation of such policies by the South African government will stimulate entrepreneurship among SME investors, innovators, and economic development. Kanyinjii and Tembo (2019) emphasized that the majority of governments must promote for SME participation in value chains.

Numerous ways for enhancing the performance of small and medium-sized enterprises (SMEs) have been outlined by researchers. Among them are the formulation of objectives and goals, organizational structures and culture, and operational strategies (Omoruyi & Dhurup, 2016). Consequently, SMEs possess

the required flexibility and strategic planning for entrepreneurial plans, providing them a competitive edge. In addition, this strategy enables SMEs to make the most of their limited resources in order to succeed in a tough business climate. Okuma et al. (2020) proposed that South African SMEs must establish SCM strategies that strengthen their operational and long-term capacity.

Okoumba et al. (2020) pointed out that the majority of SMEs in South Africa spend fewer resources in supply chain management-related activities owing to a lack of suitable financial skills, which compromises their company performance. This, in turn, has a detrimental effect on their capacity for innovation and exploitation of entrepreneurial prospects, resulting in diminished SME performance. Less investment in SCM processes entails a decline in SME involvement, resulting in diminished company performance and vice versa. SME managers should participate in SCM operations strategically to enhance company performance and gain a competitive edge (Thakkar et al., 2012; Malakoti-Negad, 2016). SME may achieve greater performance by successfully controlling the elements that affect their involvement in supply chains and by gaining economies of scale via cutting-edge cooperation across all stakeholders (Sabir & Irfan, 2014, p.57). Participation of SMEs in supply chains necessitates fundamental SCM procedures, including coordination, cooperation, integration, and collaboration (Pfanelo, 2017; Mahmud et al., 2021). By engaging in these SCM practices, which are performance enhancers, SMEs will gain a competitive edge and be able to withstand the difficult times of this digital generation. As a strategy, the involvement of small and medium-sized enterprises (SMEs) in the supply chains of the mining sector in Mpumalanga is based on the entrepreneurial skills of the enterprise's management and leadership. SMEs require visionary leadership to prioritize and manage the essential effects of SCM in order to enhance their overall company performance (Mahmud et al., 2021). As a technique to improve performance, Mahama (2006, p.315) recommends collaboration via "information exchange, problem-solving, and openness to adapt to change." On the basis of such collaboration, participation in supply chains by small and medium-sized enterprises would be more strongly correlated with outstanding performance.

SME's with "greater levels of environmental awareness, cross-functional collaboration, and financial, human, and technical slack resources" are substantially readier to engage in SC activities (Lee, 2008, p.195). These small and medium-sized enterprises (SMEs) would need to rely on their primary influencing variables, which include financing, standards and regulation, technology and information technology, human capital (experience and skills), and economies of scale. It is anticipated that SME engagement in supply chains would raise the company's market share, ROI, and overall competitive position (Li et al., 2006). Participation in supply chains by SME owners is an essential entrepreneurial strategy that increases firm performance when they grab entrepreneurial possibilities via proactivity, creativity, measured risk-taking, and aggressiveness (Namagembe et al., 2017; Urban & Venter, 2015).

This research, therefore, proposes the hypothesis that:

Hypothesis 2: Participation in supply chains as a strategy positively influences the business performance of SMEs in the mining industry in Mpumalanga, South Africa.

2.7. CONCEPTUAL FRAMEWORK

Key influencing factors

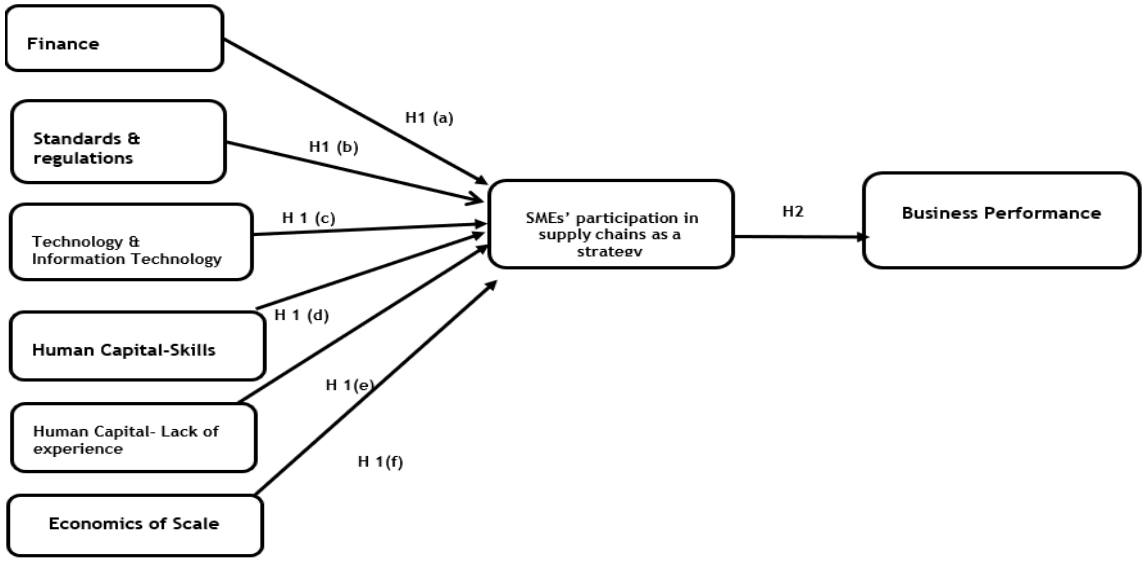


Figure 2.2: Conceptual model
Sources: (Lee, 2008; Dubihlela & Omoruyi, 2014; (Ong, 2017)

The conceptual model adopted for this study consists of eight constructs: six predictors (independent) variables: finance, standards and regulation, technology and information technology, human capital (lack of experience & skills), and economies of scale; SMEs' participation in supply chains in the mining industry as an entrepreneurial strategy (acting as both a dependent and independent variable); and the SME business performance (an outcome, dependent variable). The model proposes that SME participation in the supply chain of the mining industry positively affects their business performance, and that this effect is predicted by key barriers, namely finance, standards and regulation, technology and information technology, human capital (lack of experience and skills), and economies of scale. The six basic obstacles restrict the involvement of the majority of SMEs in mining supply chains.

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The essential pillars of the suggested conceptual framework are the theories of the resource-based view (RBV) (Barney & Clark, 2007) and Ajzen's Theory of Planned Behaviour (TPB) (Venter & Urban, 2015), which were used to support this research.

The conceptual framework presented in Figure 2.2 is consistent with the primary research objective of this study, which is to investigate the impact of critical factors (finance, standards and regulation, technology and information technology, human capital (lack of experience and skills), and economies of scale) that impede SMEs' participation and performance in supply chains the most in the mining industry in Mpumalanga, South Africa.

2.8. CONCLUSION OF LITERATURE REVIEW

In this chapter, an overview of prior investigations conducted by various scholars is presented. Six factors (independent variables), namely financial constraints or finance, standards and regulation, technology and information technology, human capital (lack of experience), human capital (skills), and economies of scale, have been identified as impediments to the participation of the majority of SMEs in the supply chains of the mining industry. In addition, it was stated that the inclusion of SMEs in supply chains as a business strategy had a favourable impact on the commercial performance of mining companies in Mpumalanga, South Africa. There were hypotheses proposed. The study's theoretical and conceptual frameworks were derived from the vast prior research of other scholars, whose contributions are recognized throughout this chapter. In the next chapter, aspects of research methods for data collection and analysis are discussed.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. INTRODUCTION

The research methodology and research design are discussed first in this chapter. Then the target population of SMEs participating in the mining industry sector in Mpumalanga was chosen using the appropriate sampling method. Next, the research instrument, data collection procedure, data analysis, and interpretation are considered in that order. Then finally, ethical considerations were discussed.

3.2. RESEARCH METHODOLOGY

A quantitative approach focused on deductive reasoning based on research questions was ideal for testing relationships between constructs already discussed in chapter 2 (Kotzab, Herbert; Seuring, Stefan; Muller, Martin & Reniner, 2005). The qualitative approach would have been used for in-depth insights and exploratory analysis of the constructs. However, it would limit the generalisation of research findings.

3.3. RESEARCH DESIGN

A cross-sectional method was utilised in this study because it is easier to administer as data is gathered in a single period and there is a limited time for the research of about eight months instead of a longitudinal approach (Sedgwick, 2014; Leedy et al., 2019). Primary data was used as it was more convenient to access than secondary data.

This study was descriptive, explanatory, and non-experimental. The correlational research describes the relationship between identified dependent and independent variables in this study, as shown in figure 2.3 of the conceptual framework (Creswell, 2014). The survey research was based on a closed-ended questionnaire method as it provides more specific information on a large population with easy and low costs (Almeida et al., 2017; Cooper & Schindler, 2014). This focused on understanding the underlying factors influencing the SMEs'

participation in supply chains and their performance in the mining industry in four districts of Mpumalanga. Questionnaires were developed using an online survey called Qualtrics, and SmartPlUS software was used for statistical analysis.

3.3. POPULATION AND SAMPLE

3.3.1 POPULATION

Mpumalanga was chosen based on its greater accessibility to information on SMEs in the mining industry by the researcher than the other eight remaining provinces. The target population included all the SMEs who are participating in the supply chains in the mining industry in Mpumalanga, South Africa, who were the main target population of this research. The target population was the whole group under study (Pfanelo, 2017), which are SMEs in the mining and quarry sector as defined in the National Small Business Act of South Africa of 1996, as amended in 2019 (Government Gazette of the Republic of South Africa, 2019). The study population was only those accessible online on social media like WhatsApp, Facebook and LinkedIn. This poses a risk of bias as the views will be limited to only those accessible online. The SMEs owners or managers were the key targeted group in this study as they have an entrepreneurial responsibility in the participation of SMEs in the supply chains and their performance in the mining industry in Mpumalanga. This targeted population consisted “of a diverse group of entrepreneurs in terms of race, services offered to the mines, number of years in business and management structures" (Musie, 2016, p.30).

3.3.2. SAMPLE AND SAMPLING METHOD

A non-random, non-probability, purposive and snowball sampling method was used in this study amid COVID-19 and POPI constraints (Leedy et al., 2019). The questionnaires were electronically sent to SMEs in mining supply chains in Ehlanzeni, Gert Sibande, and Nkangala. The questionnaires were disseminated on all platforms, online and social media, including snowball. The use of Snowball, for example, resulted in networking among young entrepreneurs from NYDA who

shared link information through their WhatsApp group. Respondents used the link on Qualtrics and remained anonymous. Due to COVID-19 restrictions, social media in the form of WhatsApp groups, Facebook, LinkedIn, and online platforms like Qualtrics were the easiest to use together. This is termed “convenient sampling”. The sample size targeted was 350, but the researcher received only 105 responses before the cut-off date was set. The target was SME owners or owner-manager and/or those in formally registered micro-enterprises, and the selection was guided by historical information from other researchers, as shown in Table 3.1 below:

Table 3.1: A benchmark based on historical information determining sample size

Observations /Participants	**Variable /Predictor**	**Reference**
10-15	1	Field (2009, 2013)
10	1	Nunnally (1978)
5 to 10 Up to 300	1	Kass and Tinsley (1979)
20	1	Hair, Anderson, Tatham, and Black (1995)
300	Absolute	Tabachnick and Fidell (2007)
1000-Excellent 300- Good 200-Fair 100-Poor	Absolute	Comrey and Lee (1992)

Source: Galawe (2017, p. 77)

Table 3.2: Profile of respondents

Description of respondent type.	Number to be sampled.
SME owners or owner-managers in formally registered SMEs	350. However, a low response rate was a challenge. Hence only 105 were sampled, with 61 usable responses and 44 incomplete responses, all from Online, Facebook, WhatsApp, and LinkedIn.

3.4. THE RESEARCH INSTRUMENT

Quantitative data were gathered through the use of a questionnaire with a Likert Scale of 1-7 (Cooper & Schindler, 2014). For most measurement items, a seven-point Likert scale with one (1) strongly disagreeing to seven (7) strongly agreeing is used (Omoruyi & Dhurup, 2016).

An online survey and telephone follow-ups were utilised as they were quicker and more efficient than an offline survey. In addition, a survey gives a high representativeness of the entire population and has a low cost to administer (Almeida et al., 2017).

The questionnaire was divided into five sections: demographic data, business information, SMEs' willingness to participate in supply chain initiatives, factors and subfactors and business performance (financial and market performance). A quantitative approach enabled the use of Qualtrics to construct the questionnaire, which made it easier to collect data. In addition, this data gathering technique is cost-effective and time-saving.

The instrument was adapted from the published work of various researchers, such as Lee (2008), Ong (2017), Kar (2016), Mahmud et al. (2021), Reklitis et al. (2021), Hsu et al. (2011), Li et al. (2006), and has scales to assess the various constructs as shown in Appendix D on page 159.

3.4.1 MEASUREMENT OF SMEs' PARTICIPATION IN SUPPLY CHAINS

There was a measurement scale in the first part of Section C that ascertained the supply chain initiatives for the mining industry, especially the businesses they engage in or intend to engage in. Eight items consisted of mining (extraction of minerals); processing plant (processing raw materials); Inventory (managing inventory levels and quality), rail (moving materials to ports); shipping (shipping material to the final destination); marketing (delivering to the customer); services (consultancy, maintenance & repairs), welding, boiler making, retailing, human resources, purchasing, financial services, skills and technology development, blasting, surveying, and engineering, and others. The measurement scale was

based on the question on the seven-point Likert scale, ranging from 1 = much lower to 7 = much higher, with 4 = about the same.

The SME's willingness to participate in supply chain initiatives or practices adopted in this research was taken from the original work of Lee (2008) and also applied by Kamaruddin et al. (2013). According to Lee (2008, p.193), "four items, including the level of understanding and awareness of GSC initiatives, intention to participate, and expectation of benefits, were employed" and form Section C of the questionnaire. A seven-point Likert scale was used to assess the four items in this study instead of the five-point Likert scale used in Lee (2008) and Kamaruddin et al. (2013) to get high levels of accuracy, ease of use, and stronger correlations (Finstad, 2010). The four items related well to "entrepreneurial orientation or attitudes"(innovativeness; risk-taking propensity; competitive aggressiveness; employee empowerment; and proactiveness)" that entrepreneurs adopt to recognise and exploit entrepreneurial opportunities in the mining supply chains (Namagembe et al., 2016, p.156). The items assessed SMEs' participation in supply chains in the mining industry in Mpumalanga through the use of four questions based on four items of the construct and SMEs' participation in supply chains. The study further showed how the key barriers influence this process where the SMEs' participation in the supply chain is a dependent variable in this scenario. The respondents indicated their preferences for each statement on the seven-point Likert scale, ranging from 1 = strongly disagree to 7 = strongly agree, with 4 = neither agree nor disagree in this second part of Section C.

3.4.2 MEASUREMENT OF KEY FACTORS AND SUB-FACTORS

Section D of the questionnaire consisted of six prime influential factors listed below. This section is related to the most significant factors, influencing SMEs' participation in supply chains in the mining industry in Mpumalanga. These six factors were independent variables. The respondents indicated their preferences for each statement or question on the seven-point Likert scale for all questions in this section.

3.4.2.1 (i) MEASUREMENT OF FINANCE AS A KEY FACTOR

Financial constraints manifest through lack of funds, non-availability of bank loans ((Ong, 2017), demand for collateral security, high investment requirements versus low investment returns, high business costs, low profitability, and bias toward proven financial track record (Mathiyazhagan et al., 2013; Muduli et al., 2013; Kaur, 2016; Sommer, 2017; Kaur et al., 2018; Mahmud et al., 2021). This sub-construct had seven questions and was based on work by several researchers such as (Luthra et al., 2011; Al Zaabi et al., 2013; Mathiyazhagan et al., 2013; Muduli et al., 2013; Kaur, 2016; Sommer, 2017; (Ong, 2017; Kaur et al., 2018; Komlosi, Kelle & Djukec, 2020; Mahmud et al., 2021).

3.4.2.2 (ii) MEASUREMENT OF STANDARDS AND REGULATION AS A KEY FACTOR

Both standards and regulations are external pressures that demand compliance with stringent requirements imposed by statutory bodies and government legislation. There were nine questions or statements on this sub-factor based on the precious work of numerous researchers like (Luthra et al., 2011; Al Zaabi et al., 2013; Mathiyazhagan et al., 2013; Muduli et al., 2013; IFC, 2014; Öztürk & Özçelik, 2014; Kaur, 2016; Sommer, 2017; (Ong, 2017; Kaur et al., 2018; Komlosi et al., 2020; Mahmud et al., 2021). The questions assessed how SMEs face the doughty task of meeting set standards and legal requirements. This metric included regulatory body support and guidance, government support for environmentally friendly policies, stringent standards set by SABS, SABS support, changing regulations and standards due to political climate, access to government subsidies and taxes, technical standards and specifications on quality requirements, and ISO 14000 certification requirements

3.4.2.3 (iii) MEASUREMENT OF TECHNOLOGY AND INFORMATION TECHNOLOGY FACTOR

Technological barriers evolved around restrictions arising from a lack of technological advancement, whilst information technology barriers centred on

information restrictions due to poor IT applications in supply chains (Ong, 2017). The questions involved elements like lack of new technology, information exchange, information management, cooperation with research institutes, fear of new systems, information flow disruption, and difficulty in obtaining information in the supply chain (Luthra et al., 2011; Al Zaabi et al., 2013; Mathiyazhagan et al., 2013; Muduli et al., 2014; IFC, 2014; Kaur, 2016; Sommer, 2017; (Ong, 2017; Kaur et al., 2018; Komlosi et al., 2020; Ozkan-Ozen et al., 2020; Mahmud et al., 2021). .

3.4.2.4 (iv) MEASUREMENT OF HUMAN CAPITAL - LACK OF EXPERIENCE AS A KEY FACTOR

This was a barrier within the organisation, measuring restrictions from its human capital regarding experience based on their knowledge and exposure to work situations in their career path (Fleschhut, 2012; (Ong, 2017). The elements involved lack of leadership experience, an experienced workforce, clarity statements for responsibilities inline functions, and human resource exposure to SCM practices (Levy, 1996, p.13; Luthra et al., 2011; Al Zaabi et al., 2013; Mathiyazhagan et al., 2013; Muduli et al., 2013; IFC, 2014; Öztürk & Özçelik, 2014; Kaur, 2016; Sommer, 2017; (Ong, 2017; Kaur et al., 2018; Komlosi et al., 2020; Ozkan-Ozen et al., 2020; Mahmud et al., 2021).

3.4.2.5 (v) MEASUREMENT OF HUMAN - SKILLS AS A KEY FACTOR

This again emanated from the organisation itself, whereby restrictions on employees' capabilities hindered the progress of the SMEs. The questions involved elements that include lack of technical expertise, training, employee awareness of occupational health hazards, the resistance of employees to adopt new systems, fear of failure in employees, employee motivation, involvement in SCM practices, failure to market the benefits of SCM programmes, communication skills, and entrepreneurial competence (Levy, 1996, p.13; Luthra et al., 2011; Al Zaabi et al., 2013; Mathiyazhagan et al., 2013; Muduli et al., 2013;

IFC, 2014; Öztürk & Özçelik, 2014; Kaur, 2016; Sommer, 2017; (Ong, 2017; Kaur et al., 2018; Komlosi et al., 2020; Ozkan-Ozen et al., 2020; Mahmud et al., 2021).

3.4.2.5 (vi) MEASUREMENT OF ECONOMIES OF SCALE AS A KEY FACTOR

The constructs of the economies of scale were measured using six items adapted from Dubihlela and Omoruyi (2014), Pushpakumari and Watanabe (2009), Forkuoh et al. (2016), and Kazancoglu et al. (2020). The six consisted of poor managerial structure, poor innovation and technological advancement, poor purchasing power, poor efficiency in production, poor synergy, and uncontrolled fixed costs. The respondents indicated their preferences for each statement on the seven-point Likert scale.

3.4.3. MEASUREMENT OF BUSINESS PERFORMANCE

Business performance was measured based on the criteria of the market and financial metrics concurrently (Li et al., 2006). This approach balanced the shortcomings of financial metrics that are too centred on accounting data like return on investments (ROI) and return on assets (ROA), as argued by some researchers such as Tan et al. (2002) with the market metrics. Seven items were used to measure business performance, adapted from Li et al. (2006) and Tan et al. (2002). These were market share, return on investment (ROA), the growth of market share, the growth of sales, growth in return on investment, the profit margin on sales and overall competitive position (Li et al., 2006; Tan et al., 2002; Lee, 2021). The measurement scale was based on the question on the seven-point Likert scale, ranging from 1=much lower to 7= much higher, with 4=about the same.

3.4.4 DEMOGRAPHICS

Section A collected demographic data by asking demographic multiple-choice questions about gender, age, and level of formal education. Business information and exposure were in Section B, with multiple choice questions covering the sector of business, size of business, position of the entrepreneur in business,

business location, length of operation of the business, number of employees in the business, family business background, involvement in small businesses, and status of SMEs' participation in supply chains in the mining industry in Mpumalanga.

3.5. PROCEDURE FOR DATA COLLECTION

Qualtrics, an online survey tool, was used to collect data. The online survey link was emailed to the owners/managers of SMEs linked to the mining supply chains in Mpumalanga, South Africa. The electronic questionnaires were used along with an introductory letter seeking consent and an introduction of the researcher. The respondents were requested to complete and return the questionnaire within 10–12 days. Following the completion of these four days, beginning on the 14th, follow-ups were made via phone or another reminder in the form of an email or WhatsApp call or message, whichever was more convenient and cost-effective. Any appropriate way to communicate through the respondents' most preferred and convenient social media was utilised, like Meta (Facebook), Twitter, Instagram, LinkedIn, etc. The estimated time to complete the Qualtrics questionnaire was 10–15 minutes.

Questionnaires through the online link of Qualtrics were electronically transmitted to SMEs in the mining supply chains in the districts of Ehlanzeni, Gert Sibande, and Nkangala of Mpumalanga province in South Africa and are available online, including social media platforms. The use of WhatsApp groups like mining in Mpumalanga, Facebook entrepreneurial groups in mining and LinkedIn entrepreneurs through social platforms extended the base of respondents significantly. The researcher had shared the link with one young entrepreneur, who also shared it through their WhatsApp group of entrepreneurs mentored by the National Youth Development Agency (NYDA) in Secunda, without giving me access to an invaluable database in terms of POPI of a few young entrepreneurs in the mining industry in Mpumalanga. Other visits to local mines were not fruitful as relevant people to assist were now on their end of year holiday. Personal visits to the surrounding areas of Secunda and Evander entrepreneurs were also helpful

in sharing the electronic questionnaires. The Snowball technique was convenient due to its low-cost benefits (Leedy et al., 2019).

The COVID-19 pandemic and its variants required the use of online platforms to ensure safety and health precautions, thus fulfilling mandatory requirements of social distancing and virtual interactions rather than direct physical contact with people. In addition, this approach ensured anonymity and confidentiality, with all responses channelled to build the Qualtrics database. The research received 105 respondents.

3.6. VALIDITY AND RELIABILITY OF THE RESEARCH

Validity in quantitative research implies “the extent to which a researcher can draw meaningful and valuable inferences from scores on the particular instrument" (Creswell, 2014, p.380). Furthermore, Creswell (2014, p.377) argued that "reliability refers to whether scores to items on an instrument are internally consistent (i.e., are the item responses consistent across constructs), stable over time (test-retest correlations), and whether there is consistency in test administration and scoring." In addition, the researcher should ascertain that the study actually measures correctly and consistently what is intended to be measured (Galawe, 2017). In this research, validity and reliability are enabled by using research instruments successfully applied in previous studies and reputable published literature (see Appendix D).

3.6.1.1 EXTERNAL VALIDITY

"External validity is the extent to which the results of a research study apply to other contexts, especially in real-world situations; the term is more commonly used in quantitative research than in qualitative research" (Leedy et al., 2019, p.415). The sample population of SMEs of 105 participating in supply chains in the mining industry in Mpumalanga used in the study was reasonably representative. Non-random sampling and snowball techniques were applied in this study, using social media platforms like Facebook, LinkedIn, Twitter and WhatsApp groups. The results from this non-random, non-probability, snowball and purposive sample are

valid except that they may not be stretched to the larger population. Equal opportunities were made available for the relevant entrepreneurs to participate in this research voluntarily. The aims of the research were presented to the respondents in the introductory letter to improve the external validity, thus catering to the psychological realism of respondents (Cuncic, 2021).

3.6.1.2 INTERNAL VALIDITY

Schindler (2019, p.237) asserts that "internal validity is the ability of a research instrument to measure what it is purported to measure". The detailed online questionnaires were issued to all participants who are SME entrepreneurs in the supply chains in the mining industry in Mpumalanga. The statements or questions are relevant and logically linked to the study on participation in supply chains and the performance of SMEs in the mining industry in Mpumalanga. Non-random sampling and snowball techniques were used relatively. The research instrument utilised was adapted from instruments used in previous studies by several researchers, such as Lee (2008), Ong (2017), Kar (2016), Mahmud et al. (2021), Reklitis et al. (2021), Hsu et al. (2011), and Li et al. (2006) with impressive Cronbach alpha scores. The constructs used in this research were harnessed to measure the influence (positive or negative) of the independent or dependent variables in the participation of SMEs in the supply chains in the mining industry. The researcher's supervisor carefully examined the research instrument before it was used. All these measures strengthened the internal validity of this study.

3.6.1.2.1 CONVERGENT VALIDITY

The average variance extracted (AVE) was utilised to determine the amount of measurement error variability recorded by a group of objects on a scale. A stringent rate of 0.50 or higher was recommended (Malik et al., 2021, p.107). The SmartPLS was ideal for determining the validity of this study.

3.6.1.2.2 DISCRIMINANT VALIDITY

The Fornell-lacker analysis and cross-loading were applied to test discriminant validity in SmartPLS 3.0 version.

Table 3.3: Summary of three (3) types of validity (Convergent, Discriminant, and Construct validity

Name of Category	Index	Level of acceptance	Comments
Convergent Validity	The average variance extracted (AVE)	AVE>0.50	The validity is achieved when all items in the measurement model are statistically significant.
Construct Validity	Chi-square/Df (Chisq/df)	Chi-square/Df<0.5	This validity is achieved when the fitness indexes achieve the following requirements.
Discriminant Validity	Square Root of AVE and correlation of latent constructs	All the correlations between these constructs should below 0.85	This validity is achieved when the measurement model is free from redundant items.

Source: Mohamad et al. (2013, pp.199-200)

3.6.2 RELIABILITY

Reliability is the measure of consistency derived from the research instrument (Schindler, 2019). Mohutsiwa (2012) asserts that reliability is the extent of being able to repeat the study and obtain similar results. Qualtrics, an online survey, helps to have the data collection done consistently and transparently. The participants have more convenience and flexibility and are not threatened or pressured by the researcher (Bell, 2011). They have their own space, time and schedule forgoing through the research instrument and are well informed about

the process through the introductory letter accompanying the questionnaire. Data errors due to human error in handling the data are reduced through exporting data from Qualtrics to SmartPLS. The research instrument has scales of items based on previous work tested and tried by several researchers, thus enhancing the reliability of the instrument used in this study (Galawe, 2017).

Cronbach's alpha coefficient was determined and utilised in this research to confirm the internal consistency of the research instrument (Ong, 2017). According to Hair, Risher, Sarstedt and Ringle (2019), an acceptable range of a Cronbach's alpha coefficient is between 0,6 and 0,9. Ong (2017), indicates the rule of the thumb for Cronbach alpha analysis as shown in Table 3.4 below:

Table 3.4: Cronbach's Alpha Coefficient (α)

Coefficient alpha (α)	Level of reliability
0,80 to 0,95	Excellent reliability
0,70 to 0,80	Good reliability
0,60 to -+0,70	Fair reliability
Less than 0,60	Poor reliability

Source: Ong (2017, p.41)

Items with low coefficient values, such as less than 0.60, were removed to increase the reliability of the remaining items.

Scale accuracy based on reliability (internal consistency) was tested using Cronbach's alpha coefficient (Mafini & Okoumba, 2016).

There is also composite reliability, which is examined through load factoring in PLS-SEM using SmartPLS software. The recommended limits are 0.60 to 0.70 in exploratory research and must be less than 0.95 (Hair, Hult, Ringle & Sarstedt, 2017; Alvarenga et al., 2022).

3.7. DATA ANALYSIS AND INTERPRETATION

Collected data in Qualtrics was exported to a statistical tool, the Statistical Packages for the Social Science (IBM SPSS version 27). The data were cleaned and error-free prior to analysis. This was done by identifying missing values, incomplete data, logical inconsistencies, and outliers (Galawe, 2017; Ong, 2017). The data was then summarized or condensed in order to identify patterns and generalise findings about the SME population.

The PLS-SEM technique performed confirmatory factor analysis (CFA) and regression simultaneously was selected and applied (Hair, Hult, Ringle & Sarstedt, 2017; Mohamad et al., 2013; Malik et al., 2021). The statistical software used to run the CFA on the dataset was SmartPLS, and it ascertained whether the measurement model had good reliability and validity or not (Malik et al., 2021, p.107). Using CFA through applying SmartPLS was done in two stages. The first stage involved analysing latent dimension constructs to their indicators, while the second stage focused on analysing latent dimension constructs to their construct dimensions (Wimaladevi & Setyawati, 2018).

The use of PLS-SEM fulfilled the primary objective of the study, which was centred on the prediction and explanation of targeted constructs (Ali & Cobanoglu, 2016). The other benefits of using PLS-SEM were smaller sample sizes (Zineb et al., 2017), complex models, and no assumptions about the underlying data (normality assumptions) (Wong, 2013; Ali & Cobanoglu, 2016). According to Ali and Cobanoglu (2016), PLS-SEM supports reflective and formative measurement models and single item constructs. On the other hand, PLS-SEM has weaker theoretical support or integration of multiple theories (Wong, 2013; Ali & Cobanoglu, 2016). The PLS-SEM works with ordinal and binary-scaled questions (Ali & Cobanoglu, 2016). The bootstrapping technique involving 2000 sub-samples was also utilised instead of 5000 sub-samples. The PLS-SEM technique in SmartPLS first examined the measurement model to assess the internal consistency, convergent validity, and discriminant validity of the constructs and sub-constructs of this study.

PSL-SEM has a PLS path model made up of two elements (see figure.3.1), (i) the structural model that shows the relationships or paths between constructs, and (ii) the measurement models that depict the relationships between the constructs and the indicator variables (rectangles) (Ali & Cobanoglu, 2016).

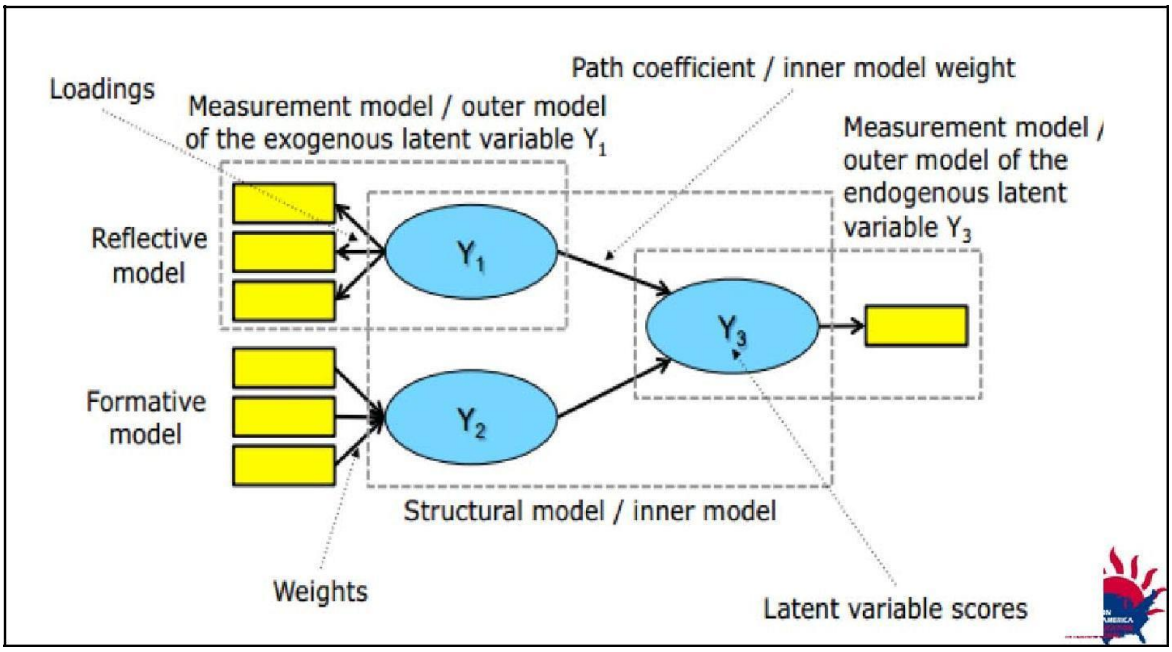


Figure 3.1: PLS path model
Source: Ali and Cobanoglu (2016, p.17)

In the reflective measurement model, indicators must be highly correlated, whilst formal measurement models can have plus (+), minus (-) or zero (0) correlation (Hulland, 1999 as cited by Ali & Cobanoglu, 2016, p.17). In this study, the reflective measurement model was applied. (Sekaran, Uma & Bougie, 2011). SmartPLS displayed the frequency distribution of the nominal variables in the form of pie charts, histograms, bar charts, and others (Sekaran et al., 2011).

3.8. ETHICAL CONSIDERATIONS

The research was anchored on the voluntary participation of participants, and the participants had to show consent (Williams & Babbie, 2021). The purpose of the research, the procedures to be followed, and the probable time set for the respondent to go through the questionnaire were made clear in the introductory letter. The ethics issues are addressed, emphasising the importance of

confidentiality and anonymity (Williams & Babbie, 2021) as well as that it is optional and must be of the appropriate age of 18 years or older. The supervisor and my contact details were included in the form of email addresses and telephone numbers. The researcher assured the participants that the WBS Code of Ethics would comply with this research.

Confidentiality was ensured, and personal information such as the name of a respondent, address, and contact details was not required (Williams & Babbie, 2021). A letter from the university was sent or shown to the respondents to assure them of the research's authenticity, legality, and professionalism. An ethics clearance certificate was sought from the Ethics Committee through the proper channels of the University of Witwatersrand before embarking on the research work of data collection. The responses on Qualtrics are not open to the public and remain anonymous, hence maintaining honesty as a value.

CHAPTER 4: PRESENTATION OF RESULTS

4.1. INTRODUCTION

This chapter presents the results of this study, derived from the statistical analysis of data. Demographic results are presented first, followed by data analysis on validity and reliability, hypotheses results, and a summary of results. A discussion of the profile of SMEs participating in the mining supply chain, the correlation between constructs, model fit and structural equation modelling results is also presented.

4.1.1 DATA SCREENING

A total of 105 responses were recorded. Of these 105 responses, 44 were incomplete, with a lot of missing data. This resulted in a usable rate of 58%, which is higher than the average rate of 20% for supply chain research (Larson & Poist, 2004; Meehan & Muir, 2008). These were eliminated from the sample, and the remaining 61 were analysed for the study. A few cases were missing, and Little's MCAR test (Little, 1988) was conducted, and the results showed a Chi-Square value of 570.281, DF (degree of freedom) = 587, and a p-value of.682. Since the p-value was more significant than 0.05, the missing values were missing at random. Thus, the mean scores were used to replace missing values.

4.2. DEMOGRAPHIC PROFILE OF RESPONDENTS

This section presents an analysis of respondent demographics, focusing on gender, age, level of education, and business characteristics where the frequency of occurrence is depicted graphically.

4.2.1 GENDER

Males dominated as entrepreneurs at 67%, with female entrepreneurs at 29%, non-binary or third gender at 2% and 2% of respondents preferred not to say their gender. Figure 4.1 below depicts the gender distribution of the sample.

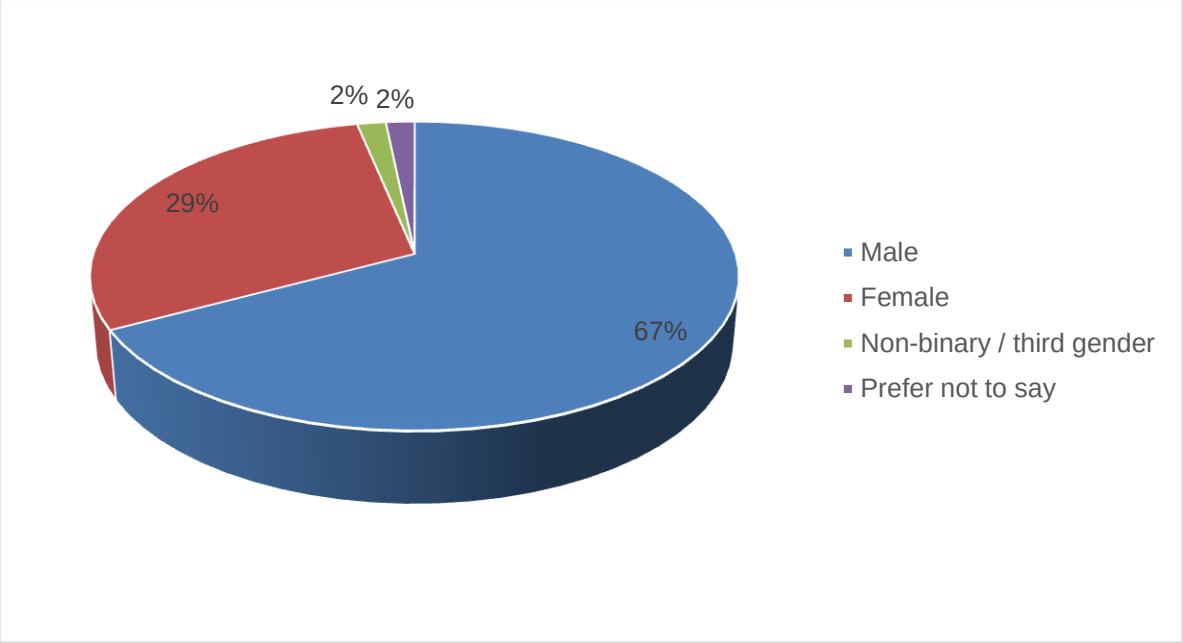


Figure 4.1: Respondent gender

4.2.2 AGE DISTRIBUTION

Figure 4.2 shows the results of the age distribution of the sample. 7% of the respondents are from the ages of 18–24 years old, 18% are aged 25–34 years old, 20% are aged 35–44 years old, 43% are aged 45–54 years old, 11% are aged 55–64, and 2% are from the age range of 65 to 64 years old.

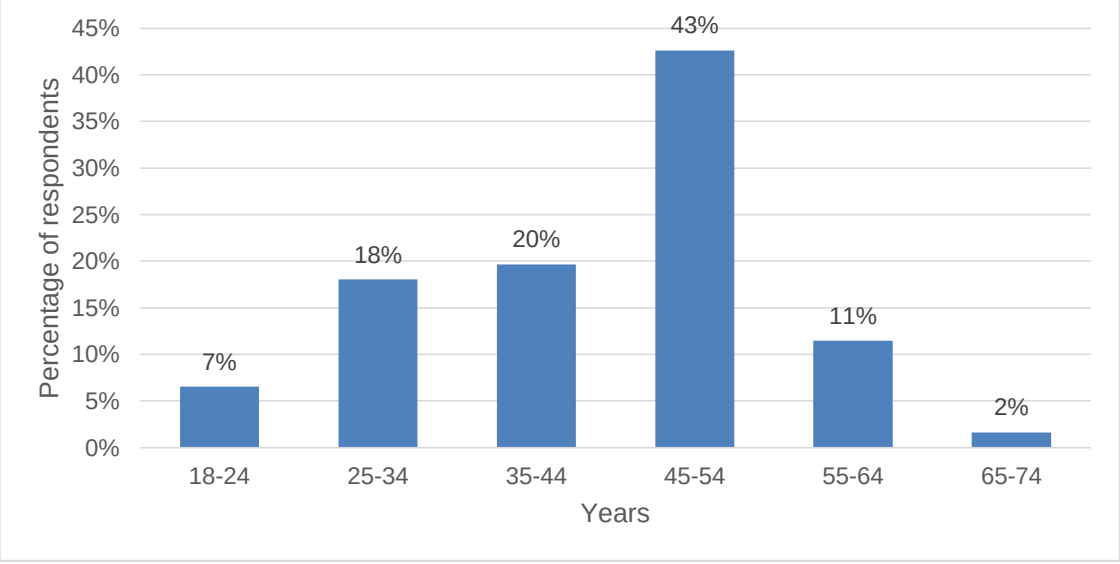


Figure 4.2: Ages of respondents

4.2.3 LEVEL OF EDUCATION

The respondents' highest level of education is portrayed in Figure 4.3 below. 3% of the respondents had no schooling, 3% completed matric or high school, 18% had some college qualification, and 30% held an undergraduate degree. Respondents with a post-graduate qualification were 28%, whilst those with a professional degree were 18%.

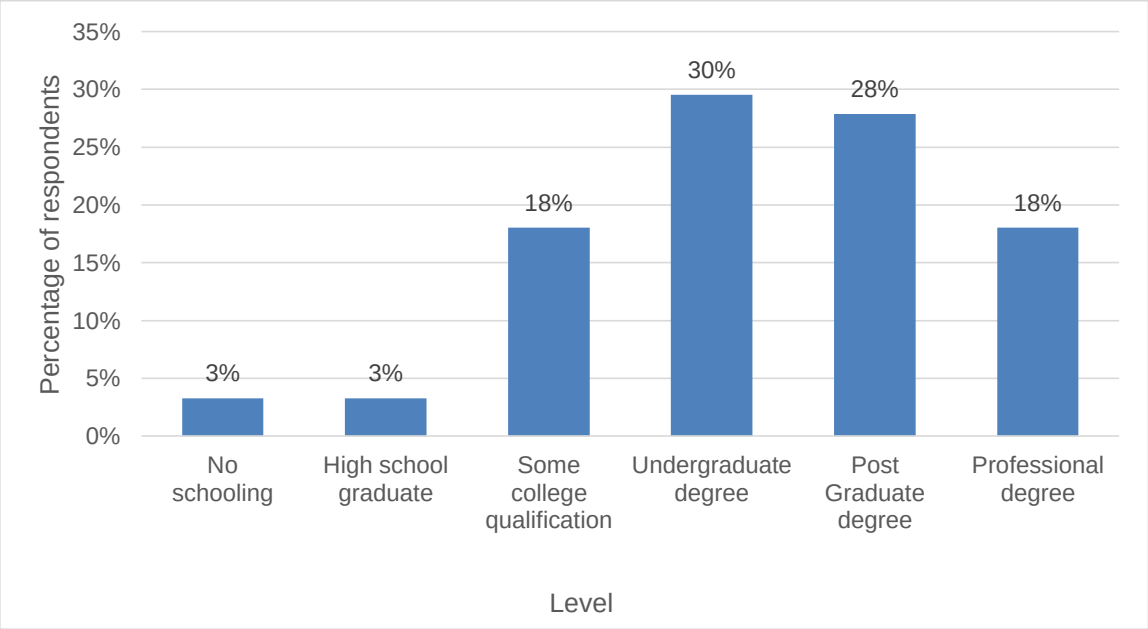


Figure 4.3: Level of education

Table 4.1 profiles the business characteristics of SMEs. The profile analysis of the SMEs, as presented in Table 4.1, reflects that most SMEs are engaged directly or indirectly in mining and quarrying (66% in total). Micro, very small, and small businesses constituted the majority (74% in total) and employed less than 50 employees (89% in total). Concerning the number of years in business, most SMEs had been in operation for less than five years (68% in total). 48% of the respondents are owners, and 20% are managers of SMEs. Most respondents had no parents with previous experience in starting a business (79%). Most respondents (59%) had previously worked in a small business or newly founded firm.

Table 4.1: Business characteristics

Variable	Option	Frequency	Per cent
Sector	Mining and Quarrying	33	54%
	Directly linked to Mining and Quarrying	21	34%
	Indirectly linked to Mining and Quarrying	7	12%
	Outside Mining and Quarrying	0	0%
	Not indicated	0	0%
Size of business	Micro	9	15%
	Very small	17	28%
	Small	19	31%
	Medium	16	26%
Position in the firm	Owner	29	48%
	Manager	12	20%
	Other	20	33%
Business age	less than two years	12	20%
	2-5 years	29	48%
	6-10 years	10	16%
	11-20 years	6	10%
	21-50 years	2	3%
	over 51 years	2	3%
Number of employees in the firm	0-10	36	59%
	11-50	18	30%
	51-250	7	11%
My parents have previously started a	Yes	13	21%
	No	48	79%

business			
Previously worked in a small business or newly founded firm	Yes	36	59%
	No	25	41%

4.3. VALIDITY AND RELIABILITY OF CONSTRUCTS

SmartPLS was employed in data analysis, especially as a procedure for verifying the reliability and validity of the research instruments. In addition, confirmatory factor analysis (CFA) and structural equation modelling (SEM) were employed. Partially, least squares structural modelling (PLS-SEM) was used by applying SmartPLS version 3 software or application.

4.3.1. VALIDITY

This research determines validity by using convergent and discriminant validities (Mafini et al., 2016). This forms part of the measurement model of PLS-SEM (Iqbal et al., 2019).

4.3.2. CONVERGENT VALIDITY

Convergent validity confirms “the degree to which two measures designed to measure the same construct are related”, that is, “if independent measures of the same construct converge, or are highly correlated” (Netemeyer, Bearden & Sharma, 2003, p.13, 77). The factor loading or cross-loading shown in Table 4.4 ascertained the convergent validity of measurement items (Pfanelo, 2017; Mafini et al., 2016).

Table 4.2 shows a very good convergence of the same constructs loaded strongly, with values ranging from 0.574 to 0.918. The recommended convergent validity is 0.50; therefore, the measurement "instruments were acceptable, valid, and converged well on the respective constructs they were supposed to measure" (Mafini et al., 2016).

CR values are above 0.6, the prescribed minimum threshold, and range from 0.784 to 0.935, further confirming convergent validity (Pfanelo, 2017). The average variance extracted (AVE) of 0.5 confirms convergent validity (Ali & Cobanoglu, 2016). The standard and regulation construct could not be validated and, therefore, were removed from the scales.

Therefore, “these results further indicate good convergent validity where items are explaining 50% (more than half) or more of their respective constructs” (Galawe, 2017, p.170; Hair et al., 2011). According to Ali and Cobanoglu (2016), an established rule of thumb is that a latent variable should explain a substantial part of each indicator's variance, usually at least 50%. Secondly, an indicator's outer loading should be above (0.708) since that number squared (0.7082) equals 0.50.

Table 4.2: Loading on common construct

	Business Performance	Economies of Scale	Financial Constraints	Human Capital- Skills	Human Capital- Lack of Experience	SME Participation	Technology & Information Technology
BP 1	0.812						
BP 2	0.893						
BP 3	0.904						
BP 4	0.871						
BP 5	0.901						
BP 6	0.847						
BP 7	0.702						
EoS 1		0.574					
EoS 2		0.690					
EoS 3		0.685					
EoS 4		0.840					
EoS 5		0.794					
EoS 6		0.912					
FC 2			0.724				

FC 5			0.678				
FC 6			0.676				
FC 7			0.679				
HCE 1				0.848			
HCE 2				0.845			
HCE 3				0.878			
HCE 4				0.918			
HCS 1					0.662		
HCS 10					0.800		
HCS 2					0.686		
HCS 3					0.881		
HCS 5					0.902		
HCS 6					0.867		
HCS 7					0.608		
HCS 8					0.591		
HCS 9					0.712		
PSC 1						0.855	

PSC 2						0.933	
PSC 4						0.764	
TIT 1							0.796
TIT 2							0.735
TIT 3							0.763
TIT 4							0.893
TIT 5							0.863
TIT 6							0.816
TIT 7							0.749
TIT 8							0.891

Table 4.3: Construct Reliability and Validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Business Performance (BP)	0.935	0.952	0.948	0.722
Economies of Scale (EoS)	0.901	1.169	0.888	0.574
Financial Constraints (FC)	0.795	0.779	0.784	0.475
Human Capital (Skills) (HCS)	0.927	0.812	0.921	0.568
Human capital (Lack of Experience) (HCE)	0.911	1.190	0.927	0.762
SME Participation (PSC)	0.813	0.856	0.889	0.729
Technology & Information Technology (TIT)	0.935	0.945	0.940	0.665

4.3.3 DISCRIMINANT VALIDITY

Discriminant validity assesses the degree to which two measures designed to measure similar but conceptually different constructs are related. A low to moderate correlation is often considered evidence of discriminant validity (Netemeyer, Bearden & Sharma, 2003). “Discriminant validity requires that a measure not correlate too highly with measures from which it is supposed to differ” (Netemeyer et al., 2003, p.77).

Using the PLS-SEM together with the SmartPLS software, discriminant validity is determined using the Fornell-Larcker criterion, cross-loadings, and the multitrait-multimethod matrix (MTMM matrix) proposed by Campbell and Fiske (1959) and the heterotrait-monotrait ratio of correlations (HTMT Criteria) (Netemeyer et al., 2003). In this study, only the Fornell-Larcker and Cross-loadings were utilised.

Cross-loadings

The factor loadings presented in Table 4.4 below indicate that the items loaded highly on their respective factors and lowly on the other factors, except for a few items that loaded highly on both Human Capital (Skills) and Human Capital (lack of experience). This was expected as these are all human capital items. These were nothing to worry about, as the Fornell-Larcker Criterion scores in Table 4.6 below show good discriminant validity.

As indicated in Table 4.4 below, an indicator's outer loadings on a construct should be higher than its cross-loadings with other constructs (Netemeyer et al., 2003).

Table 4.4: Cross Loadings

	Business Performance	Economies of Scale	Financial Constraints	Human Capital (Skills)	Human capital (Lack of Experience)	SME Participation	Technology & Information Technology
BP1	0.812	-0.049	-0.060	-0.234	-0.383	0.485	-0.307
BP2	0.893	-0.116	0.078	-0.105	-0.192	0.302	-0.161
BP3	0.904	-0.194	0.159	-0.173	-0.314	0.332	-0.262
BP4	0.871	-0.248	0.165	-0.092	-0.171	0.333	-0.160
BP5	0.901	-0.197	0.227	-0.148	-0.284	0.356	-0.284
BP6	0.847	-0.195	0.159	-0.042	-0.143	0.325	-0.148
BP7	0.702	-0.186	0.181	-0.267	-0.235	0.282	-0.229
EoS1	-0.293	0.574	-0.092	0.575	0.527	-0.024	0.505
EoS2	-0.255	0.690	0.116	0.651	0.529	0.071	0.656
EoS3	-0.230	0.685	0.077	0.630	0.526	0.024	0.593
EoS4	-0.191	0.840	0.157	0.508	0.412	0.095	0.500
EoS5	-0.100	0.794	0.055	0.580	0.464	0.019	0.546
EoS6	-0.135	0.912	0.071	0.299	0.360	0.220	0.376
FC2	0.120	0.065	0.724	0.087	0.003	0.152	-0.177
FC5	0.075	0.113	0.678	0.014	-0.023	0.045	-0.004

FC6	0.074	0.115	0.676	0.015	-0.025	0.051	-0.003
FC7	0.072	0.114	0.679	0.015	-0.018	0.047	-0.004
HCE1	-0.273	0.484	-0.233	0.568	0.848	-0.076	0.777
HCE2	-0.256	0.524	0.113	0.646	0.845	-0.050	0.734
HCE3	-0.310	0.447	0.149	0.641	0.878	-0.100	0.625
HCE4	-0.247	0.358	-0.038	0.760	0.918	-0.194	0.730
HCS1	-0.192	0.379	-0.111	0.662	0.685	0.061	0.672
HCS10	-0.282	0.548	0.144	0.800	0.729	-0.012	0.776
HCS2	-0.217	0.351	-0.073	0.686	0.629	-0.112	0.712
HCS3	-0.090	0.267	0.115	0.881	0.676	-0.152	0.643
HCS5	-0.116	0.468	0.112	0.902	0.659	-0.164	0.724
HCS6	-0.234	0.566	0.018	0.867	0.679	-0.109	0.628
HCS7	-0.141	0.546	-0.171	0.608	0.432	0.003	0.476
HCS8	-0.267	0.520	-0.172	0.591	0.600	-0.023	0.639
HCS9	-0.110	0.531	-0.059	0.712	0.535	-0.023	0.593
PSC1	0.411	0.047	0.054	-0.156	-0.191	0.855	-0.146
PSC2	0.365	0.252	0.188	-0.234	-0.121	0.933	-0.151
PSC4	0.291	0.165	0.122	-0.018	-0.059	0.764	-0.098
TIT1	-0.315	0.319	-0.192	0.633	0.680	-0.161	0.796

TIT2	-0.321	0.471	-0.086	0.482	0.660	0.016	0.735
TIT3	-0.214	0.382	-0.274	0.636	0.686	-0.027	0.763
TIT4	-0.148	0.519	-0.039	0.729	0.674	-0.105	0.893
TIT5	-0.167	0.442	-0.034	0.721	0.660	-0.068	0.863
TIT6	-0.203	0.491	-0.183	0.630	0.594	-0.152	0.816
TIT7	-0.243	0.546	-0.005	0.555	0.593	-0.022	0.749
TIT8	-0.248	0.548	-0.024	0.702	0.782	-0.151	0.891

4.3.4. CONFIRMATORY FACTOR ANALYSIS (CFA)

The structural equation modelling was utilised for confirmatory factor analysis (CFA) using the SmartPLS software. The SmartPLS was used to assess the validity and reliability of the model. Figure 4.4 below depicts the measurement model from the output of SmartPLS after applying CFA as the primary in structural modelling (Ahmad & Afthanorhan, 2014). The values are acquired from the outer loading, representing the factor loading for each indicator (Mohamad et al., 2013). Items that had factor loadings of less than 0.6 and were loaded highly on more than one construct were eliminated from the constructs measurement model as they contributed less towards these factors, as shown in Table 4.5 below. The outer loadings of 0.60 or higher were retained in the measurement model. The items were reflective of the latent constructs. The final model with the CFA model is presented in Figure 4.4 below.

Deleted items for particular constructs are as shown in Table 4.5:

Table 4.5: Summary of deleted and retained items of constructs

Construct	**Item (s) deleted**	**Comments**
Standards & regulations (SR)	All 9 items deleted	All 9 items invalidated
Financial Constraints (FC)	3 items-FC 1, FC 3, & FC 4.	3 items invalidated; 4 items validated and retained
Technology & Information Technology (TIT)	None deleted	All 8 items were validated and retained
Human capital-lack of experience (HCE)	None deleted	All 4 items were validated and retained
Human capital-skills (HCS)	2 items-HCS4 & HCS10	2 items invalidated; 8 items validated and retained
Economies of Scale (EoS)	None deleted	All 6 items were validated and retained

SME participation in the supply chains (PSC)	1 item-PSC 3	1 item invalidated; 3 items validated and retained
Business performance (BP)	None deleted	All 7 items were validated and retained
Total items	15 removed or deleted	40 items retained as valid

Fornell-Larcker criterion

According to Ali and Cobanoglu (2016), each construct's square of the AVE should be higher than its highest correlation with any other construct. Table 4.6 below depicts the discriminant validity per Fornell-Larcker criterion and shows that “all the pairs of constructs had an adequate level of discriminant validity” (Mafini, et al., 2016, p.272). However, there are negative correlations between some eight (8) pairs of constructs or factors, namely, Economies of Scale and Business performance, Human capital (skills) and Business performance, Human capital (lack of experience) and Business performance, Human capital (lack of experience) and financial constraints, SME participation in supply chains and Human capital (skills), SME participation in supply chains and Human capital (lack of experience), Technology and Information Technology and Business performance, and Technology and Information Technology and SME participation. This could be attributed to the fact that entrepreneurial attitudes tend to influence decision-making, business opportunity recognition (Urban & Naidoo, 2012; Galawe, 2017), and SME participation in supply chains.

Table 4.6: Discriminant Validity: Fornell-Larcker Criterion

	Business Performance (BP)	Economies of Scale (EoS)	Financial Constraints (FC)	Human Capital (Skills) (HCS)	Human capital (Lack of Experience) (HCE)	SME Participation (PSC)	Technology & Information Technology (TIT)
Business Performance (BP)	0.850						
Economies of Scale (EoS)	-0.191	0.757					
Financial Constraints (FC)	0.139	0.126	0.690				
Human Capital (Skills) (HCS)	-0.183	0.498	0.074	0.754			

Human capital (Lack of Experience) **HCE)**	-0.302	0.475	-0.013	0.770	0.873		
SME Participation **(PSC)**	0.420	0.184	0.144	-0.176	-0.150	0.854	
Technology & Information Technology **(TIT)**	-0.269	0.546	-0.133	0.799	0.805	-0.157	0.815

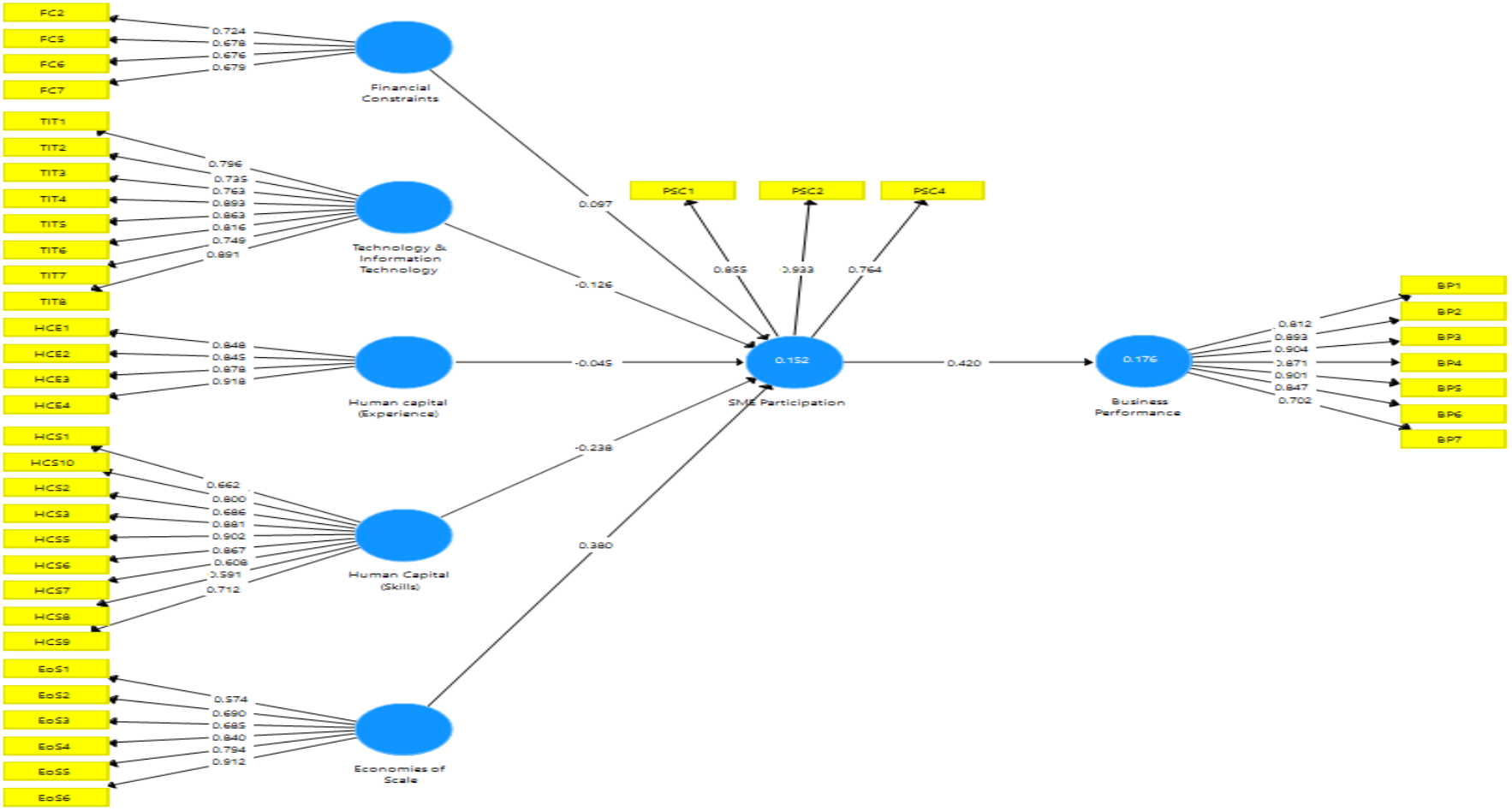


Figure 4.4: CFA model

4.3.5 STRUCTURAL EQUATION MODELLING (SEM)

SmartPLS was developed for partial least square structural equation modelling (PLS-SEM) (Mohamad et al., 2013). The effects of the independent variables on the dependent variables were assessed using the sinner model, as plotted in Figure 4.5 below. The t-values were presented on the causal lines. A t-value greater than 1.96 implies that a relationship is significant at a 5% significance level. The interpretation will also tally with p-values less than 0.05 in Table 4.10.

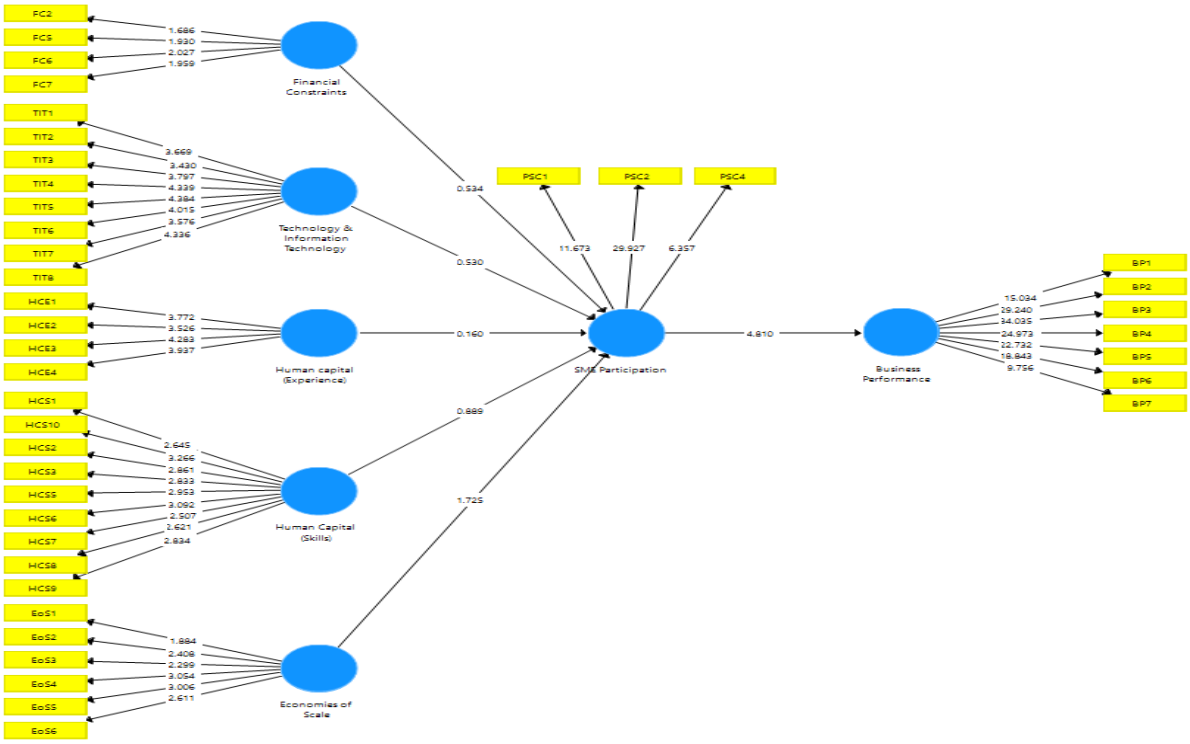


Figure 4.5: SEM Model

4.3.2.1 RELIABILITY

The Cronbach alpha, composite reliability (CR), and average value retrieved were used in this study to estimate the reliability centred on the internal consistency of measuring scales of all constructs (AVE). The results of all three tests or indicators (Cronbach alpha, CR, and AVE) for most (7) constructs, namely, Business performance (BP), economies of scale (EoS), Financial constraints (FC), Human capital skills (HCS), Human capital-lack of experience (HCE), SME Participation in

supply chains (PSC), and Technology and Information Technology (TIT), are shown in Table 4.3 above, with the exception of the standard and regulation construct, which failed the validity test.

4.3.2.1.1. CRONBACH' ALPHA TEST

Table 4.7: Reliability scale based on Cronbach's alpha (α)

Construct	**Number of items**	**Cronbach's Alpha (α)**	**Reliability Level**
Business Performance (BP)	7 (None deleted)	0.935	Excellent
Economies of Scale (EoS)	6 (None deleted)	0.901	Excellent
Financial Constraints (FC)	4 (After 3 items were deleted)	0,795	Acceptable
Human Capital - Skills (HCS)	9 (After 1 item was deleted)	0.927	Excellent
Human Capital-Lack of Experience (HCE)	4 (None deleted)	0.911	Excellent
SME Participation (PSC)	3 (After I Item deleted)	0.813	Good
Technology & Information Technology (TIT)	8 (None deleted)	0.935	Excellent

Adapted from Oladapo (2019)

As demonstrated in Tables 4.3 and 4.7, the Cronbach's alpha values for the seven (7) constructions vary from 0.795 (good reliability level) to 0.935 (great reliability level). Cronbach's alpha should be 0.7 or 0.6. (Ali & Cobanoglu, 2016; Mafi et al., 2016; Pfanelo, 2017). Cronbach's alpha values are clearly higher than those indicated by Nunnally and Bernstein (1994), and the internal consistency of the measurement scales is demonstrated. Cronbach's alpha grows as the number of objects increases.

4.3.2.1.2. COMPOSITE RELIABILITY (CR)

As indicated in Tables 4.3 and 4.8, the composite reliability levels in this study varied from 0.784 (acceptable reliability level) to 0.948 (outstanding reliability level). The acceptable CR ranges from 6.0 to 7.0 for exploratory research and 0.70 to 0.90 for more advanced stages of study (Hair et al., 2011; Ali & Cobanoglu, 2016; Mafini et al., 2016; Pfanelo, 2017). The study's CR verified the internal reliability of scales for the seven Nunnally and Bernstein constructs (1994).

Table 4.8: Composite Reliability Scale

Construct	**Number of items**	**Composite Reliability**	**Reliability Level**
Business Performance (BP)	7 (None deleted)	0.948	Excellent
Economies of Scale (EoS)	6 (None deleted)	0.888	Good
Financial Constraints (FC)	4 (After 3 items were deleted)	0,784	Fair
Human Capital -Skills (HCS)	9 (After 1 item was deleted)	0.921	Very good
Human Capital-Lack of Experience (HCE)	4 (None deleted)	0.927	Very good
SME Participation (PSC)	3 (After 1 Item deleted)	0.889	Good
Technology & Information Technology (TIT)	8 (None deleted)	0.940	Excellent

4.3.2.1.2 AVERAGE VARIANCE EXTRACTED (AVE)

Tables 4.3 and 4.9 show the AVE of the seven constructs that are over the suggested threshold of 0.4 (Mafini et al., 2016), with values ranging from 0.475 (acceptable, reliable level) to 0.762. (excellent, reliable level). As a result, scale

reliability is acceptable for latent constructs (Pfanelo, 2017), but the latter researcher proposed 0.5 as the minimal criteria for AVE.

Table 4.9: Average Variance Extracted (AVE)

Construct	**Number of items**	**Average Variance Extracted (AVE)**	**Reliability Level**
Business Performance (BP)	7 (None deleted)	0.722	Very good
Economies of Scale (EoS)	6 (None deleted)	0.574	Good
Financial Constraints (FC)	4 (After 3 items were deleted)	0,475	Fair
Human Capital - Skills (HCS)	9 (After 1 item was deleted)	0.568	Good
Human Capital-Lack of Experience (HCE)	4 (None deleted)	0.762	Excellent
SME Participation (PSC)	3 (After 1 item deleted)	0.729	Very good
Technology & Information Technology (TIT)	8 (None deleted)	0.665	Excellent

The PLS-SEM uses a nonparametric bootstrap approach to evaluate the significance of coefficients (Ali & Cobanoglu, 2016, p. 22) and is required for any study that uses partial least square structural equation modelling as a help for non-normal data or nonparametric analysis (Ahmad & Afthanorhan, 2014, p.4).

To determine the relevance of route coefficients, the bootstrapping approach was applied. The number of bootstrap sub-samples should be kept to a minimum of 5, which is termed double sampling (Ahmad & Afthanorhan, 2014, p.4). The number

of bootstrap sub-samples utilized was 2 000, which was considered a doubling sample at the standardised test of 1.69 and a significant level of 5%. Zineb et al. (2017) employed 500 subsamples in the bootstrapping technique, whereas our work used 2000. The findings of the route coefficient for the structural model using the SmartPLS 3.0 version after executing the bootstrap procedure are shown in Table 4.10.

Table 4.10: Mean, STDEV, T-Values, P-Values/Path Coefficient

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Economies of Scale -> SME Participation	0.389	0.202	0.226	1.725	**0.085**
Financial Constraints -> SME Participation	0.094	0.131	0.176	0.534	**0.594**
Human Capital (Skills) -> SME Participation	-0.247	-0.096	0.278	0.889	**0.374**
Human capital (Lack of Experience) -> SME Participation	-0.030	-0.112	0.191	0.160	**0.873**
SME Participation -> Business	0.416	0.430	0.086	4.810	**0.000**

Performance					
Technology & Information Technology -> SME Participation	-0.137	-0.069	0.259	0.530	**0.596**

Table 4.10 reveals that all five factors that impacted SME participation in the supply chain had insignificant impacts, with p-values larger than 0.05. The t-test result was less than 1.96. SME engagement in supply chains, on the other hand, has a substantial impact on company performance (hypothesis accepted), with a p-value less than 0.05 and a t-value more than 1.96. This implies that there is a high level of assurance and confidence; that is, it is not happening by coincidence. Because it had previously failed the validation test, the Standards and Regulations element was eliminated.

4.4. RESULTS PERTAINING TO HYPOTHESIS 1

In this study, the presence of influencing variables was determined utilizing research tools. As a result, a positive effect on supply chain involvement indicates that supply chain participation is strong. As a result, the hypothesis is unsupported, and a negative effect suggests reduced supply chain involvement. As a result, the theory is supported.

Results pertaining to Hypothesis 1 (a): Finance influences SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.

Financial limitations (B = 0.094, p-value 0.594) had a positive but negligible influence on SMEs' participation in the mining supply chain in Mpumalanga, according to the findings. Because the coefficient for Financial Constraints (B = 0.094) was larger than zero, the effect was positive. Because the p-value was

more than 0.05, it was not significant. This indicates that when there are financial limits, supply chain involvement is higher. This theory is not supported.

Results pertaining to Hypothesis 1(b): Standards and regulations influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.

This was not tested as no valid construct for Standards and Regulations existed.

Results pertaining to Hypothesis 1 (c): Technology and Information technology influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa

According to the findings, the technological and information technological barrier (B =-0.137, p-value 0.596) had a negative but minor influence on SMEs' involvement in the mining supply chain in Mpumalanga. Because the coefficient for the technical and information technological barrier (B =-0.137) was less than zero, the effect was negative. Because the p-value was more than 0.05, it was not significant. This suggests that if there is a technological and information technological barrier, supply chain involvement is lower. This theory is supported.

Results pertaining to Hypothesis 1(d & e): Human capital (lack of experience and skills) influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.

The findings demonstrated that technological and information technological hurdles (B =-0.137, p-value 0.596) had a negative but minor influence on SMEs' involvement in the mining industry's supply chain in Mpumalanga. Because the coefficient for the technical and information technological barrier (B =-0.137) was less than zero, the effect was negative. Because the p-value was more than 0.05, it was not significant. This suggests that if there is a technological and informational barrier, supply chain involvement is lower. This theory is supported.

Results pertaining to Hypothesis 1(f): Economies of scale influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.

The findings demonstrated that economies of scale (B = 0.389, p-value 0.085) had a favourable but minor influence on SMEs' participation in the mining supply chain in Mpumalanga. Because the coefficient for economies of scale (B = 0.389) was larger than zero, the effect was positive. Because the p-value was more than 0.05, it was not significant. This suggests that when there are economies of scale, supply chain involvement is stronger. This theory is not supported.

4.5. RESULTS PERTAINING TO HYPOTHESIS 2

Results pertaining to Hypothesis 2: Participation in supply chains as a strategy positively influences the business performance of SMEs in the mining industry in Mpumalanga, South Africa.

It is pertinent to mention that supply chain involvement (B = 0.416, p-value 0.000) had a favourable and substantial influence on the performance of SMEs in Mpumalanga. Because the coefficient for SMEs' participation (B = 0.416) was larger than zero, the effect was positive. The p-value was likewise less than 0.05, indicating that it was significant. This suggests that when there is more SME engagement in supply chains, there is more participation in supply chains, and vice versa. This theory is supported.

4.6. SUMMARY OF THE RESULTS

Table 4.11 below presents a summary of the hypotheses testing results.

Table 4.11: Summary of Hypothesis testing results

Hypothesis	**Path *B(Beta)***	***T*-value**	***p*-Value**	**Supported and other comments**
H1 (a): Finance influences SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.	0.094	0.534	0.594	Not supported, positive but insignificant effects as p-value was greater than 0.005. *T*-value is below 1.96 (5% (0.05) significance level)

H1 (b): Standards and Regulations influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.	-	-	-	Invalid, and no test could be done.
H1 (c): Technology & Information technology influence most SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.	-0.137	0.530	0.596	Supported, negative and insignificant effects as p-value is greater 0.05 *T*-value is below 1.96 (5% (0.05) significance level)
H1 (d): Human capital (lack of experience) influences SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.	-0.030	0.160	0.873	Supported, negative and insignificant effects as p-value is greater than 0.05 *T*-value is below 1.96 (5% (0.05) significance level)
H1(e): Human capital (skills) influences SMEs' participation in the supply chain in the mining industry in Mpumalanga, South	-0.247	0.889	0.374	Supported, negative and insignificant effects as p-value is greater than 0.05 *T*-value is below 1.96 (5% (0.05) significance level)

Africa.				
H1 (f): Economies of scale influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.	0.389	1.725	0.085	Not supported, positive but insignificant effects as p-value was greater than 0.005. *T*-value is below 1.96 (5% (0.05) significance level)
H2: Participation in supply chains as a strategy positively influences the business performance of SMEs in the mining industry in Mpumalanga, South Africa.	0.416	4.810	0.000	Supported, positive and significant effects as p-value were less than 0.005. *T*-value is above 1.96 (5% (0.05) significance level)

Two hypotheses relating to the participation of SMEs in supply chains in the mining sector were investigated in this study. Hypothesis 1 (c) Technology and information technology, (d) Human Capital (lack of experience), and (e) Human Capital (skills) were supported, and it was proved that they had a negligible influence on SMEs' involvement in mining sector supply chains. This suggests that they are not statistically significant determinants of SME participation in the mining industry's supply chain (Kanyinji & Tembo, 2019). Financial limitations and economies of scale (f), according to hypothesis 1 (a), were not supported but had a small influence on SMEs' participation in mining supply chains. This would imply that there are many more aspects that the current study did not consider that might have a substantial influence on SMEs' engagement in supply chains in the Mpumalanga mining sector.

Hypothesis 2 was accepted, demonstrating that participation in mining supply chains has a favourable and substantial impact on the business performance of SMEs. This shows that increasing supply chain engagement leads to improved business success. A substantial effect implies that there is at least a 95% certainty level.

CHAPTER 5: DISCUSSION OF RESULTS

5.1. INTRODUCTION

Chapter 5 discusses the demographic results and hypotheses analysis based on findings on each variable and the model as presented in Chapter 4. The sequence of the discussion is as follows: Firstly, the focus is on the demographic profile of respondents from SMEs, and secondly, the chapter examines the results of hypothesis testing. Finally, a summary of key findings concludes the chapter.

5.2. DEMOGRAPHIC PROFILE OF RESPONDENTS

According to demographic data, male entrepreneurs continue to dominate the mining sector, including Mpumalanga, just as they do throughout South Africa (Galawe, 2017). The age group with the highest engagement in mining entrepreneurship is 45-54 years old, accounting for 43%, followed by 35-44 years old, accounting for 20%. Maturity, together with suitable mining experience, is a necessary qualification for entering the mining industry as an entrepreneur (Oladapo, 2019). A substantial proportion of the responders have a post-secondary education. Although this study did not investigate particular entrepreneurial education degrees, it demonstrates a strong emphasis on possessing matric plus a postsecondary education certificate to enter the mining business. The extensive use of social media and referrals through business platforms during data collection may have contributed to accessing well-educated entrepreneurs. According to Ndlovu (2018), as cited in Fatoki and Garwe (2010), Sheer (2010), and Nakhata (2018), there is a new trend among SMEs to improve their academic qualifications in anticipation of improving their human capital, which will also improve their entrepreneurial performance.

The characteristics of entrepreneurs were profiled based on the business sector, size of the business, the entrepreneur's position in the business, business age or experience, number of employees in the firm, parental business, and personal business background connected to SMEs. The majority of SMEs are involved in mining and quarrying, either directly or indirectly. There is a need to boost SMEs'

engagement in mining supply chains, as the Mpumalanga mining economy raised its contribution to GDP to 23.6 percent in 2020, up from 19.5 percent in 2019. (Minerals Council South Africa, 2020).

The majority of the sampled SMEs are little, tiny, and micro firms, with 26% of medium-sized enterprises employing less than 50 people, and the majority have less than five years of company age or experience running SMEs. According to Herrington and Kew (2018), SMEs in South Africa are experiencing poor development and a high failure rate. The data also corroborated this pattern, in which the upward mobility of SMEs to medium and large business sizes remains difficult, even for SMEs in the mining industry. The majority of respondents were business owners, while 20% were managers, with the majority having no prior entrepreneurship experience. However, 59 percent of respondents have previously worked in or created small enterprises.

There is a need to enhance appropriate entrepreneurial education, particularly in secondary and postsecondary education, in order to develop an enabling entrepreneurial environment in South Africa and address these gaps with BRIC countries such as India and Brazil (Bate, 2021). South Africa was rated "57th out of 140 nations in 2018 in terms of start-up skills, networking, technology absorption, human capital, and risk capital pillars" (Bate, 2021, p.120). More SMEs participating in mining supply chains will open the door for more entrepreneurs to positively contribute to the country's economic development, similar to how China leads the Brics in terms of growth and entrepreneurial ecosystem (Klaus, 2018).

5.3. DISCUSSION PERTAINING TO HYPOTHESIS 1

Finance and financial restrictions; standards and regulations; technology and information technology; human capital (lack of experience); human capital (skills); and economies of scale were the six sub-variables of the important variable barrier (independent variable: IV). The dependent variable was SME participation in

mining sector supply chains (DV). These factors and sub-variables were combined to generate hypothesis 1, the results of which are detailed in Section 5.3:

5.3.1. HYPOTHESIS 1(a): Finance influences SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.

Hypothesis 1 (a) is not supported, although financial limitations have a negligible beneficial influence on SMEs' participation in mining supply chains. The findings suggest that financing is not a significant impediment to SMEs' participation in the supply chain. This suggests that it prefers SMEs to participate in the mining supply chain. This finding contradicts the findings of prior investigations by Dubihlela and Omoruyi (2014), Sommer (2017), and Kanyinji and Tembo (2019), among others. Ong (2017) was unable to examine financial restrictions that were dropped off throughout study loading.

It is possible that SME owners or managers may not rely on traditional financial institutions such as banks for financial help because the latter sometimes need collateral, therefore they resort to bootstrapping in the early phases of their enterprises (Gumboh & Gichira, 2015; Harvard Business Review, 2018; Abbasi et al., 2018). Entrepreneurial behaviour might be a motivator and a contributing factor (Namagembe et al., 2016), although this was not explored in this study. It is expected that future studies will look at this topic.

5.3.2. HYPOTHESIS 1(b): Standards and Regulations influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa

This was not tested, as there was no valid construct for Standards and Regulations that existed.

5.3.3. HYPOTHESIS 1(c): Technology and Information Technology Influence SMEs' Participation in the Supply Chain in the mining industry in Mpumalanga, South Africa.

Hypothesis 1 (c) is validated, however technology and information technology have a negligible negative impact on SMEs' participation in the mining sector supply chain. Participation in the supply chain has no substantial association with technology and information technological constraints. This implies that it has a minor impact on SMEs' engagement in mining supply chains. This discovery backs with prior findings from Kanyinji and Tembo's investigation (2019). They identified technology as one of the most significant impediments to access into the mining value chain for Zambian SMEs. Similarly, Ong (2017) identified informational barriers as the most influential factor influencing food and beverage manufacturing SMEs in implementing green supply chain management (GSCM) in Selangor, Malaysia. This researcher went on to demonstrate a strong favourable association between informational barriers and GSCM adoption (Ong, 2017, p.76). In a research, the technological barrier, as well as the link between this barrier and the adoption of GSCM, were hypothesized and rejected (Ong, 2017).

Setyaningsih, Kelle, and Maretan (2020) discovered that several researchers have highlighted a shortage of innovative technology, materials, and procedures in supply chain small enterprises. Several studies, including Govindan et al. (2013), Majumdar and Sinha (2018), Ozkan-Ozen et al., 2020, Parmar and Shah (2016), Al Zaabi et al., (2013), Gupta et al. (2020), Dubihlela and Omoruyi (2014), Gorane & Kant (2014), Quayle (2003), Chand et al. (2018), Jayant and Azhar (2014), Katunzi

The key findings of several of the above-mentioned researchers on technology and information technical hurdles are summarized shortly below:

(i) "Technological challenges are indirectly negatively influencing SMEs' business performance through impeding the implementation of supply chain management" in South Africa (Dubihlela & Omoruyi, 2014, p.1026). This confirms that technological barriers hinder SMEs’ participation in the supply chain.

(ii) Govindan et al. (2014) asserted that hesitation/fear to convert to new systems is a crucial technological barrier affecting SMEs in GSCM in the

manufacturing Indian industry. This implies that owners/managers of SMEs fear embracing new and advanced technologies as part of their decision-making processes. This will, in turn, limit SMEs' participation in the supply chains, especially in the mining industry, where the latest and high technology is often preferred to run businesses more successfully.

(i) The same researchers agree that a lack of innovative technology, materials, and procedures is a major impediment to SMEs' participation in supply chains (Govindan et al., 2014).

(ii) Poor ICT structure and a lack of information technology are two of the five technological barriers to SCM in the manufacturing industry that has a significant influence on the supply chain network in India (Parmar & Shah, 2016).

(iii) A major hurdle in GSCM in SMEs in India's clothing industry was identified as a lack of green materials, techniques, and technology (Majumdar & Sinha, 2018). This hurdle was scored lower than others such as a lack of regulatory backing, large investment, and poor profit. This verifies the findings of this study, which show that this barrier has no effect.

(iv) "Lack of R&D and innovation capabilities," "popularity of traditional technology," and "high initial investment in the latest technology" are among the top five barriers to advancing sustainable supply chain innovation practices faced by Indian manufacturing companies (Gupta et al., 2020, p.1).

(v) According to Ozkan-Ozen et al. (2020), technology and information technological barriers faced by circular supply chains in Industry 3.5 and Industry 4.0 include low demand and acceptance of environmentally superior technologies, a lack of information sharing, coordination, and information sharing products.

According to Ahmed et al. (2020), critical technological impediments to GSCM in the construction sector in industrialized nations include a lack of IT support systems or technology infrastructure, a lack of innovative technology, processes, or materials, and insufficient research and development. Lack of IT deployment for communication and coordination, technological impediments, a lack of focus on establishing theories, and increased research effort in green business practices

were recognized as key elements in GSCM in the Bangladeshi textile sector (Tumpa et al., 2019).

Most studies that were done by the researchers that were discussed in Chapter 2 of this study substantiate the fact that the technology and information technological barriers hinder the participation of SMEs in the supply chains in the mining industry. The finding from this study shows that technology and information technology influence SMEs' participation but not significantly.

5.3.4. HYPOTHESIS 1(d): Human capital (lack of experience) influences SMES' participation in the supply chain in the mining industry in Mpumalanga, South Africa

Hypothesis 1 (d) is validated, and human capital (lack of experience) is a barrier that has a negligible negative impact on SMEs' involvement in the mining sector supply chain. As a result, human capital (lack of experience) as a barrier to supply chain involvement has no meaningful effect. This means that it has an impact on SMEs' participation in mining supply chains, although the impact is minor. However, earlier research has highlighted human capital (lack of experience) as a barrier to SMEs and their supply chains, including Yu et al. (2008), Dashore and Sohani (2013), Fleschhut (2012), Fawcett et al. (2008), Gumboh and Gichira (2015), and Ab Talib et al. (2015).

Athirath et al. (2013) noted that the lack of quality employees in SCM is a crucial barrier affecting SMEs in the Indian auto component manufacturing industry. "Lack of supply chain management knowledge exposure to employees" was identified as a fourth-ranked barrier in Hungary, which formed part of the human capital (experience) of this study (Setyaningsih & Kelle, 2021, p.83). "Lack of good influence," "lack of commitment at the top management level and lack of decision-making at upper levels," "short-term thinking and tactical decision-making" that result in more collaboration to increase SMEs’ participation in the supply chain (Fawcett et al., 2015, p.653).

Leadership deficit, as a barrier, was confirmed and categorised as the most significant barrier under intra-organizational barriers by Mahmud et al. (2021). SME leadership is the driving force of SCM systems, including their participation in the supply chains (Setyaningsih & Kelle, 2021). Terziovski and Hermel (2011) argued that the leader's SCM knowledge will inspire and elevate them to a senior management position.

5.3.5. HYPOTHESIS 1(e): Human capital (skills) influences SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.

Hypothesis 1 (e) is supported, but human capital (skills) has an insignificant negative effect on SMEs' participation in the supply chain in the mining industry. Human capital (skills) as a barrier has a non-significant relationship to participation in the supply chain. This implies that it hinders SMEs' participation in mining supply chains minimally.

Parmar and Shah (2016) noted human capital (skills) as a critical barrier to SCM in the manufacturing industry. Lack of motivation and employee involvement, unwillingness to implement supply chain practice, lack of education and training for employees and suppliers, lack of necessary tools, management skills and knowledge, and lack of awareness were identified as its key constituents. Therefore, the researchers have corroborated that human capital (skills) impedes SMEs' participation in the supply chain in the mining industry.

Lack of technical and technological know-how was identified as a human capital (skills) barrier affecting SMEs implementing circular economy models in Europe (Rizos et al., 2016). This same barrier has hindered SMEs' participation in the supply chains in the mining industry in Mpumalanga, South Africa.

Ozkan-Ozen et al. (2020) outlined a lack of skilled workers, lack of knowledge, lack of awareness, lack of appropriate training and development programs for SC members and HR, the inadequacy of knowledge and awareness of organizational members about circular supply chain management (CSCM) initiatives, and lack of adequate planning and management for (CSCM) concepts as key hindrances in

the CSCM. Hence, "not much involvement in SCM-related programs/meetings" was regarded as a human capital (skill) barrier by Govindan et al. (2014) in GSCM in Indian manufacturing industries. This means that there would be a "lack of participation in conferences/seminars related to green supply chains conducted by governments/organisations which successfully adopted this concept" (Govindan et al., 2014, p.599). In addition, "lack of training courses/consultancy/institutions to train, monitor, and mentor progress specific to each industry" is also a barrier to human capital (skills) (Govindan et al., 2014).

Lack of awareness of the environmental impact on business, including occupational hazards in the supply chains, is a crucial hindrance to SMEs' participation in supply chains and business (Govindan et al., 2014).

The lack of technical expertise and fear of failure in employees as result of inadequate skills results in SMEs suffering monetary losses or product failure (Govindan et al., 2014). This leads to a loss of competitive advantage.

5.3.6. HYPOTHESIS 1(f): Economies of scale influence SMEs' participation in the supply chain in the mining industry in Mpumalanga, South Africa.

Hypothesis 1 (f) is not supported, but financial constraints have an insignificant positive effect on SMEs' participation in the supply chain in the mining industry. Economies of scale as a barrier have no significant relationship to participation in the supply chain. This implies that it greatly favours SMEs' participation in the mining supply chain. Fleschhut (2012, p. 29) cited El-Namaki (1990) and confirmed that "economies of scale do not play a major role" in SMEs' participation in supply chains.

However, Dubihlela and Omoruyi (2014) made a different observation and noted this barrier as having a more substantial negative influence on the SMEs' capacity to implement SCM. Other researchers who asserted that economies of scale were a barrier are Julien (1993), Zehrer (2009), Thakkar et al. (2009), Zehrer (2009), and Abdul-Halim et al. (2012), which is contrary to the main findings of this study.

Sommer (2017, p.31) acknowledged that SMEs in India, faced with limitations in the economies of scale, have resorted to forming industrial clusters to improve their "networking, specialisation and innovation" since the 1990s.

5.4. DISCUSSION PERTAINING TO HYPOTHESIS 2

The independent variable (IV) was SMEs' participation in the supply chains as a strategy, and the business performance (dependent variable: DV) of the SMEs was used to form hypothesis 2, whose findings are discussed below in Section 5.4:

5.4.1. HYPOTHESIS 2: Participation in supply chains as a strategy positively influences the business performance of SMEs in the mining industry in Mpumalanga, South Africa.

Hypothesis 2 is supported and has a significant positive effect on SMEs' participation in the supply chain in the mining industry. As an entrepreneurial strategy, SME participation in the supply chain in the mining industry has a solid and significant relationship to supply chain participation. This means that this variable greatly favours SMEs' business performance in the supply chain in the mining industry in Mpumalanga, South Africa. This observation corroborates findings from researchers such as Wu and Chiu (2018) and Li et al. (2006), who argued that supply chain management initiatives by SMEs enhance business performance (financial and market), including SME participation in mining supply chains. Lee (2008) affirmed that participation in GSC initiatives results in the enhanced business performance of SMEs as suppliers and respective buying firms in which financial and human resources are required in line with the RBV. Therefore, the availability of resources encourages SMEs to participate in supply chains as they envisage all the benefits of their participation in the supply chain, social, environmental, and economic (Lee, 2008). The opposite will confirm that lack of resources impedes SMEs' participation in supply chains and negatively impacts SME business performance. Studies of both Iranian and Malaysian manufacturing companies (SMEs) concluded that they suffer from a lack of

expertise and awareness about SCM, which are significant limitations to implementing SCM (Manzouri et al., 2010, p.456).

Owners' and managers' views of SMEs are vital influential factors in their business performance concerning initiating new strategies to revive their overall business results, such as a deliberate choice to the willingness to participate in the supply chains in the mining industry (Setyaningsih & Kelle, 2021). "Employees' SCM competencies and organisational SCM knowledge" shown in SME participation in supply chains improves business performance in SMEs (Gammelgaard et al., 2018, p.75). Researchers such as Okoumba (2020), Thakkar et al. (2012), and Malakoti-Negad (2016) advocated for the use of SCM practices in SMEs, such as supply chain participation, as an entrepreneurial strategy to improve business performance. Better performance by SMEs is realised if fewer hindrances impede the SMEs' participation in the supply chains in the mining industry (Sabir & Irfan, 2014). Many researchers have presented various strategies to be utilised by SMEs to improve their business performance through their participation in supply chains (Okoumba et al., 2020; Thakkar et al., 2012; Malakoti-Nejad, 2016; Omoruyi & Dhurup, 2016). Good leadership in SMEs that promotes more participation in the supply chains yields high business performance (Mahmud et al., 2021). Higher participation in the supply chains results in better market performance (Li et al., 2006). The findings of this study and this hypothesis are well supported by the literature discussed above.

5.5. CONCLUSION

The outcomes of this study support the majority of the hypotheses tested in the empirical inquiry. Although there are insignificant negative impacts, hypotheses 1(c), (d), and (e) are supported. As indicated by the negligible effects provided and analyzed in the results, technology and information technology, human capital (skills), and human capital (lack of experience) operate as impediments to SMEs' involvement in supply chains. SME's agreed with Hypothesis 2 and found it to have a strong beneficial impact. Participation in the supply chain as a strategy affects corporate success in Mpumalanga, South Africa's mining sector. Despite

minor impacts on certain factors, such as obstacles, the study's main goal was met.

CHAPTER 6: CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

6.1. INTRODUCTION

The chapter gives a summary of the findings and discusses the main conclusions. This study's theoretical and practical contributions are also presented in this chapter, followed by recommendations, limitations of the study, and, finally, suggestions for areas that require further exploration.

6.2. CONCLUSIONS

The main objective of the study was to empirically investigate the influence of critical factors (finance, standards and regulation, technology and Information technology, human capital (lack of experience and skills), and economies of scale that influence SMEs' participation and performance in supply chains the most in the mining industry in Mpumalanga, South Africa.

The results of this research suggest that technology and information technology, human capital (skills) and human capital (lack of experience) barriers influence SMEs' participation in supply chains in the mining industry with insignificant effects due to the low confidence level. This suggests that there may be other factors influencing SMEs' participation in the supply chains in the mining industry beyond what this research is planned for.

Financial constraints and economies of scale were found to be non-barriers, contrary to the previous work of many researchers, as stated in the literature in Chapter 2. This could be attributed to sub-constructs being "poorly conceived and misunderstood by respondents" under the two constructs (Murimbika, 2011, p.119). The standards and regulations barriers are not examined further in this study as intended as they tested invalid during cross- loading. As a business strategy, SMEs' participation in the supply chains in the mining industry positively influences business performance. The standards and regulations barriers are not investigated further in this study because they were found to be invalid during cross-loading. As a business strategy, SMEs' participation in the supply chains in

the mining industry positively influences business performance. There were positive and significant effects on these variables as they were correlated. There were positive and significant effects on these variables as they were correlated.

To some degree, SMEs' participation in the supply chains in the mining industry is low or non-existent due to technology and information technological barriers and human capital (lack of experience and skills), among other factors, which are still to be researched. However, as a strategy, participation in the supply chains in the mining industry positively influences business performance, both in the market and in financial performance. This suggests that where SMEs' participation is high, there is high business performance, and vice versa is also true.

Any factor negatively influencing SME participation in the supply chain lowers their business performance. Technology and information technology, human capital (skill) and human capital (experience) barriers are ranked in this order concerning how they influence SMEs' participation in the supply chains in the mining industry in Mpumalanga but have a weak effect, as reported in this study.

The conceptual framework identified some key barriers affecting the SMEs' participation in supply chains and their performance in the mining industry in Mpumalanga. Therefore, the resource-based view and TPB theory were relevant as theoretical approaches employed in this study to provide the conceptual framework focused on key barriers: SMEs' participation in the supply chains in mining and their business performance, using only marketing and financial metrics.

6.3. IMPLICATIONS AND RECOMMENDATIONS

6.3.1. THEORETICAL IMPLICATIONS

This study added to the body of knowledge in the area of business in SCM or entrepreneurship and the public domain in terms of theoretical and conceptual implications. The study provides a recommended or created conceptual framework that conceptualizes the specific impediments to SMEs' participation in the mining industry's supply chain. Furthermore, it conceptualizes SMEs'

engagement in supply chains as a tactic used by entrepreneurs to favorably affect the commercial performance of their SMEs. In terms of theoretical and conceptual consequences, this study added to the body of knowledge in the field of business in SCM or entrepreneurship and the public sphere. The study provides a recommended or created conceptual framework that conceptualizes the specific impediments to SMEs' participation in the mining sector supply chain. Furthermore, it conceptualizes SMEs' engagement in supply chains as a tactic used by entrepreneurs to favourably affect their SMEs' commercial performance.

6.3.2. PRACTICAL IMPLICATIONS FOR POLICYMAKERS

Policymakers and managers in mining supply chains may utilize the knowledge obtained in this study to build strategies to overcome key hurdles identified in this research and strengthen the status of SMEs in mining supply networks or value chains, in accordance with practical and policy implications.

The government plays a critical role in fostering an enabling business climate by enacting progressive laws and reducing bottlenecks that inhibit SMEs' participation in mining supply chains (Sabir & Irfan, 2014). However, the human capital (lack of experience and skills) barrier persists, as evidenced by large organizations and state entities' insistence on supporting documents for years of experience in a similar business as a track record and proof of peculiar and rare skills that require time and exposure in the mining industry to acquire (Fleschhut, 2012).

Technology and information Some of the limiting obstacles in ICT services in mining supply chains include technological limitations, and there is a larger desire for technology improvement in the mining sector. Aside from a dearth of new technology, SMEs need experienced and highly trained people resources to manage their businesses and, worse, to keep them (Fleschhut, 2012).

6.3.3. PRACTICAL IMPLICATIONS FOR PRACTITIONERS

Managers and owners of SMEs should work hard to reduce the negative effect of the impediments highlighted in this study. As a result, they must encourage more SMEs to engage in mining supply chains by employing successful entrepreneurial methods, such as flexibility and strategic planning, which were already detailed as part of the literature study in Chapter 2. (Mohutsiwa, 2012;Thakkar et al., 2012; Malakoti-Negad, 2016). Furthermore, existing mining industry incubators must refocus their attention on adapting to international trends (Oladapo, 2019) and attracting SMEs that are only partially or not at all participating in supply chains due to the identified barriers in this study and others not yet identified in this research.

Managers or owners must establish strong, long-term connections with the public, including government, consumers, suppliers, and purchasers in their mining supply chains, in order to promote stakeholder engagement. This will result in positive outcomes such as SMEs having access to vital information, technological improvements, and financial resources in the form of loans and funding, which will expedite their participation in mining supply chains (Ong, 2017; Kanyinji & Tembo, 2019). Furthermore, strategic engagement with the government allows SMEs to lobby the government on issues of concern, particularly those that impede SMEs' participation in supply chains and business performance, such as technology and information technology, labour, taxes, regulations, incentives, and funding, to name a few (Ong, 2017; Kanyinji & Tembo, 2019).

6.3.4. PRACTICAL IMPLICATIONS FOR RESEARCHERS

(i) The presence of technological and information technology hurdles impacts SMEs' supply chain involvement. It is both relatively powerful and has a little and inconsequential effect. If the firm lacks technology and information technology, it may be unable to participate in mining supply chains. Because of the small impacts posed by this barrier, the overall impact may be unknown. Decision makers should review the study's findings and decide

how to proceed in light of the severity of this obstacle in comparison to others.

(ii) SME participation in supply chains is influenced by a shortage of human capital (skills). It is mild and has a little and inconsequential impact. The absence of trained human resources may have an impact on SMEs' engagement in mining supply chains. Because of the minor effects, the impact is once again questionable. Decision-makers must pick the best alternatives while taking into account the surrounding options and hazards.

(iii) The effective utilization of human capital (jobs) impacts SMEs' participation in supply chains. However, it has a negligible, modest, and inconsequential effect. Inclusion of SMEs in mining supply chains may be hampered by a lack of experienced staff in current enterprises or the high cost of obtaining highly skilled human resources. Because of its small size, the impact is uncertain. Due to the high level of ambiguity, decision-makers face a difficult problem in prioritizing their alternatives.

(iv) High SME involvement in supply chains as a strategy greatly improves business performance and vice versa.

To get the greatest business results, SME participation in the mining industry's supply chains must be maximized. Participation in mining supply chains must become a fundamental entrepreneurial strategy for the company.

In summary, this study is anticipated to add to the information base that researchers may use and to empower SMEs. If any of these insights are effectively implemented in SMEs, there will be more economic development with the potential to reduce unemployment, poverty and crime (Olawale & Garwe, 2010; Galawe, 2017).

6.3.5. RECOMMENDATIONS

Risk reduction is supported in the face of SMEs' engagement in mining supply chains to guarantee that present and future supply chains achieve long-term and short-term sustainability (Ong, 2017; Galawe, 2017; Oladapo, 2019).

The National Young Development Agency (NYDA) must be well-equipped with resources to decrease hurdles preventing SMEs' participation in mining supply chains, particularly among the youth of Mpumalanga in South Africa, who need to be more connected to mines as entrepreneurs than is currently the case. This applies to the Small Enterprise Growth Agency (SEDA) and other governmental bodies tasked with assisting SMEs with their business development.

SME senior management should consider training or seminars on change management, the benefits of participating in SCM supply chains, stakeholder involvement, risk management in the face of hurdles, and performance management in a SME business environment ((Ong, 2017; Kanjinyi & Tembo, 2019). The seminars or training would raise awareness and knowledge of excellent SCM practices linked to SMEs' supply chain involvement and business success in the mining sector (Ong, 2017). Furthermore, top management may assess key result areas (KRA) to incentivize internal stakeholders to enthusiastically embrace involvement in mining supply chains at greater motivating levels than previously (Ong, 2017; Urban & Venter, 2015).

There should be deliberate policies and regulations in place to protect developing and hesitant young entrepreneurs from recognized impediments, allowing them to play a more important role in the mining sector supply chains.

Policymakers must enact laws and regulations that decrease or eliminate these barriers to SMEs' participation in mining supply chains. Furthermore, current rules and regulations need to be updated to be more relevant in the fourth industrial revolution, which welcomes the destruction of archaic entrepreneurial ecosystems and promotes greater innovation, as Schumpeter predicted (Bate, 2021; Urban & Venter, 2015). The Constitution of South Africa Act-section 9 (equality clause), the

Mineral and Petroleum Resources Development Act (MPRDA) Act-Mining Charter, the Social and Labour Plan (SLP), SMME development and procurement, and the Broad-Based Black Economic Empowerment (BBBEE) Act - Socio-economic Development, Enterprise Development, and Procurement, as well as the relevant tax legislation, are among these (Bag, 2016; Dubey, 2016; Moagi, 2015).

The business needs to invest more in technology and information technology. Funding may be required for this. Furthermore, investment in ICT skills training may be necessary for sophisticated technology purchase and utilization.

To update the capabilities of current human resources or to acquire new personnel with rare talents in the labour market, training and finance may be required.

Entrepreneurs may consider these highlighted constraints, but must combine resource allocation and utilization with excellent entrepreneurial acumen to guarantee that SMEs continue to actively engage in mining supply chains.

To keep the firm functioning well, the entrepreneur must employ a variety of tactics. This may imply controlling a number of critical variables that affect SMEs' participation in supply chains and company performance.

6.4. LIMITATIONS OF THE STUDY

The study has limitations based on the following aspects:

(i) The study was focused on the mining industry in Mpumalanga Province, leaving out eight provinces, which makes it hard to generalise across the whole country of South Africa.

(ii) Only six key barriers were selected, leaving out numerous barriers that may significantly impede SME's participation in the supply chains in the mining industry.

(iii) The Protection of Personal Information Act (POIA) went into effect on July 1, 2021, making it difficult for the general public to access information from the survey. As a result, some organisations like SEDA and some companies,

denied researchers access to their entrepreneurs under their jurisdiction in their database, as mentioned in Chapter 3.

(iv) Time constraints to finish the research project as set by the university limited my time to collect data. Therefore, in this study, only 105 questionnaires were completed by respondents who participated in the survey, leaving only 61 usable.

(v) The sample size was smaller than the set target of 350 before the university revised the usable sample size to a minimum of 40. This is because online or email surveys are relatively cheaper and more difficult to administer than other methods of surveys (Ong, 2017, citing Dillman, 2011).

(vi) Educated entrepreneurs dominate the sample structure due to the effective use of online and social media platforms. There may be a degree of bias, so a generalisation must be cautiously applied (Galawe, 2017).

(vii) The use of a cross-section approach sets limitations for the researcher so that it "does not allow" the manipulation of any of the variables. This creates a problem in establishing the direction of causal influence "(Bell, 2011, p. 54).

(viii) The PLS-SEM approach is limited because no assumptions are made when the bootstrapping technique is used to test the hypotheses (Streukens & Leroi-Werelds, 2016).

(ix) There is a limitation arising from using the same standard or same instrument and respondents for data collection for both independent and dependent variables. Therefore, caution is needed in interpreting the results (Galawe, 2017).

(x) Overreliance on the quantitative method has the significant drawback of a lack of in-depth information from the respondents, which only comes through the use of qualitative analysis (Almeida et al., 2017; Williams & Babbie, 2021).

6.5. SUGGESTIONS FOR FURTHER RESEARCH

The research was unique and complex in studying SMEs' participation in the supply chains in the mining industry in Mpumalanga, South Africa.

Future research may be on the following basis:

(i) To attain holistic findings, researchers may extend their area of investigation to the other eight provinces in South Africa, focusing on the participation of SMEs in supply chains in the mining industry. It may also focus on other industries besides mining and quarrying in South Africa. This would allow more generalizability to the broader population (Ong, 2017).

(ii) In place of a cross-sectional approach, a longitudinal approach can allow more time for data collection to ensure that more respondents are engaged, say 550. A larger sample would be more valuable for quality research work (Galawe, 2017; Bell, 2019).

(iii) Besides using online and email surveys, other survey methods could supplement those used in this study to ensure a higher response rate during data collection (Ong, 2017).

(iv) Selected case studies of selected industries would be used in qualitative research to gain more meaningful insights into the participation of SMEs in the supply chains and their performance in South Africa.

(v) The PLS-SEM and SPSS software would be used with larger sample sizes and compare the outcomes.

(vi) (ix) A comparative study on SMEs' participation in supply chains in the mining industry and their business performance in selected countries of the BRICS, say, South Africa, Brazil, and China or India. This would assist in

comparing and learning about the challenges SMEs face in participating in the supply chains in the mining industries.

(xi) A qualitative or mixed approach could be considered to acquire more in-depth Information from the respondents.

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APPENDICES

APPENDIX A: RESEARCH INSTRUMENT

QUALTRICS QUESTIONNAIRE

Participation in supply chains and performance of SMEs in mining industry in Mpumalanga

Start of Block: INTRODUCTORY LETTER & CONSENT

Dear Entrepreneur

My name is Ronald Chibanda and I am a student in Masters in Management in Entrepreneurship and New Venture Creation at the University of the Witwatersrand, Johannesburg. As part of my studies, I have to undertake a research project, and I am investigating participation in supply chains and performance of SMEs in mining industry in Mpumalanga under the supervision of Dr Jabulile Msimango-Galawe and she is contactable through email on: jabulile.galawe@wits.ac.za. The aim of this research project is to investigate the influence of SMEs' participation in supply chains on SMEs performance in mining industry in Mpumalanga. As part of this project, I would like to invite you to take part in answering a questionnaire which will take 15 to 20 minutes to complete.

There will be no personal costs to you if you participate in this project, You will not receive any direct benefits from participation but there are no disadvantages or penalties if you do not choose to participate or if you withdraw from the study. You may withdraw at any time or not answer any question if you do not want to. The survey will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the information you give me will be held securely and not disclosed to anyone else.

If you have any questions during or afterwards about this research, feel free to contact me on the details listed below. This study will be written up as a research report which will be available online through the university library website. The data collected from this research project will be stored in Qualtrics and will be stored for 5 years. And all access to the system will be controlled through use of passwords. If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrec-medical.researchoffice@wits.ac.za

Yours sincerely,

Ronald Chibanda (Researcher) 1022593@students.wits.ac.za or chibandaronny@gmail.com; 0764265401

Q1.1 CONSENT:

- ○ I consent , begin the study (1)
- ○ I do not consent (2)

Skip To: End of Survey If CONSENT: = I do not consent

End of Block: INTRODUCTORY LETTER & CONSENT

Start of Block: Section A : Demographic Data

Demography Note: Participation in supply chains and performance of SMEs in mining, Mpumalanga, is the focus of this research.

This section will help me understand you as an individual. Please specify your answer by placing a tick (v) on the relevant answers provided.

Q2.1 What is your gender?

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

Q2.2 What is your age?

- 18-24 (1)
- 25-34 (2)
- 35-44 (3)
- 45-54 (4)
- 55-64 (5)
- 65-74 (6)
- 75-84 (7)
- 85 or older (8)

Q2.3 What is your level of education?

- No schooling (1)
- Less than high school (2)
- High school graduate (3)
- Some college qualification (4)
- Undergraduate degree (5)
- Post Graduate degree (6)
- Professional degree (7)

End of Block: Section A : Demographic Data

Start of Block: Section B Business Information

BUSINESS INFORMATION AND EXPOSURE

This section will help me understand you as an individual and business.

Q3.1 What is the sector of your business?

- Mining and Quarrying (1)
- Directly linked to Mining and Quarrying (2)
- Indirectly linked to Mining and Quarrying (3)
- Outside Mining and Quarrying (4)

Q3.2 What is the size of your business?

- Micro (1)
- Very small (2)
- Small (3)
- Medium (4)

Q3.3 Please indicate your position in the firm.

- Owner (1)
- Manager (2)
- Other (3)

Q3.4 In which district in Mpumalanga province is your business located?

- Ehlanzeni (1)
- Gert Sibande (2)
- Nkangala (3)
- Other provinces (4)
- Outside South Africa (5)

Q3.5 How long has your firm been in operation?

- less than 2 years (1)
- 2-5 years (2)
- 6-10 years (3)
- 11-20 years (4)
- 21-50 years (5)
- over 51 years (6)

Q3.6 How many employees are in your firm?

- 0-10 (1)
- 11-50 (2)
- 51-250 (3)

Q3.7 My parents have previously started a business

- Yes (1)
- No (2)

Q3.8 I have previously worked in a small business or newly founded firm before my current business

- Yes (1)
- No (2)

Q 3.9 Is your business is involved in participation in supply chains in the mining industry in Mpumalanga

- Yes (1)
- Partially involved (2)
- No (3)

End of Block: Section B Business Information

Start of Block: Section C SMEs' willingness to participate in supply chain initiatives

Participation by SME MEASUREMENT SCALES DESCRIPTIONS

This section is about supply chain initiatives which are practices that promote a level of understanding, awareness, and intention to participate in supply chain initiatives, as well as, expectation of benefits from participating in supply chains.

Q4.1 1 Which of the following supply chain initiatives for mining industry does your company engage in or intent to engage in?

Supply chain initiatives (SCI)

	Much Lower (1)	Moderately lower (2)	Slightly lower (3)	About the same (4)	Slightly higher (5)	Moderately lower (6)	Much higher (7)
SCI 1: Mining-Extraction of minerals (1)	○	○	○	○	○	○	○
SCI 2: Processing Plant -Processing the raw materials (9)	○	○	○	○	○	○	○
SCI 3: Inventory - Managing inventory levels and quality (10)	○	○	○	○	○	○	○
SCI 4: Rail-Moving materials to the ports (11)	○	○	○	○	○	○	○
SCI 5: Shipping - Shipping material to the final destination (12)	○	○	○	○	○	○	○
SCI 6: Market-Delivering material to the customer (13)	○	○	○	○	○	○	○
SCI 7: Services-Consultancy, Maintenance & Repairs, Welding, Boiler making, Retailing, Human Resource, Purchasing, Financial Services, Skills & technology development, Blasting, Surveying, Engineering, etc, (14)	○	○	○	○	○	○	○
SCI 8: Others. (15)	○	○	○	○	○	○	○

Q4.2 The next set of questions are on 7-point Likert Scale with Strongly Disagree=1 and Strongly Agree=7
Please indicate to what extent you agree or disagree with each statement:
SMEs' participation in supply chains (PSC)

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
PSC 1: I am aware of supply chain initiatives being practiced in my enterprise. (1)	○	○	○	○	○	○	○
PSC2: Our enterprise is willing to participate in the supply chain initiatives as a strategy (2)	○	○	○	○	○	○	○
PSC3: Owner/managers have interest in the supply chain initiatives. (3)	○	○	○	○	○	○	○
PSC4: Our entity expects social, environmental and economic benefits from the supply chain initiatives. (4)	○	○	○	○	○	○	○

End of Block: Section C SMEs' willingness to participate in supply chain initiatives

Start of Block: Section D Factors (barriers or hindrances) and their sub-factors

Barriers This section is about factors (barriers or hindrances) as there are in your firm. Factors (barriers or hindrances) are dimensions that limit most the SMEs’ participation in supply chains and their business performance in the mining industry in Mpumalanga, South Africa.

The next set of questions are on 7-point Likert scale with Strongly Disagree=1 and Strongly Agree=7

Q5.1 With regard to factors (barriers) to SMEs' participation in supply chains in mining industry, please tick the number that accurately reflects your firm's present conditions. Tick the appropriate number.

Please indicate to what extent you agree or disagree with each statement:
Financial Constraints (FC)

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
FC1: We face high financial costs. (1)	○	○	○	○	○	○	○
FC2: We lack funds to expand the business. (2)	○	○	○	○	○	○	○
FC3: We have low-profit. (3)	○	○	○	○	○	○	○
FC4: We have low credit score with key financial institutions and/or suppliers. (4)	○	○	○	○	○	○	○
FC5: Non -availability of bank loans to encourage supply chain management (SCM) practices. (5)	○	○	○	○	○	○	○
FC6: Low investment in new technologies/innovation to encourage SCM practices. (6)	○	○	○	○	○	○	○
FC7: High investments and less return on investments. (7)	○	○	○	○	○	○	○

Q5.2 Please indicate to what extent you agree or disagree with each statement:
Standards & regulations (SR).

Q5.3 Please indicate to what extent you agree or disagree with each statement: Technology & Information technology (TIT)

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
TIT1: Lack of new technology and /or innovation. (1)	○	○	○	○	○	○	○
TIT2: Poor supplier commitment/Unwilling to exchange information. (2)	○	○	○	○	○	○	○
TIT3: Lack of information management about SCM practices. (3)	○	○	○	○	○	○	○
TIT4: Lack of ability to research and develop key technologies. (4)	○	○	○	○	○	○	○
TIT5: Lack of cooperation with research institutes like universities and other research boards. (5)	○	○	○	○	○	○	○
TIT6: Hesitation/fear to convert to new systems. (6)	○	○	○	○	○	○	○
TIT7: Information flow disruption. (7)	○	○	○	○	○	○	○
TIT8: Difficulty in obtaining information on potential SCM practices improvements. (8)	○	○	○	○	○	○	○

Q5.4 Please indicate to what extent you agree or disagree with each statement: Human capital (experience)-(HCE)

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
HCE 1: Leadership experience deficit. (1)	○	○	○	○	○	○	○
HCE2: Lack of experienced workers for SCM practices. (2)	○	○	○	○	○	○	○
HCE3: No clear statement for responsibilities from management due to a vast number of inexperienced managers/supervisors in key positions. (3)	○	○	○	○	○	○	○
HCE4: Lack of human resources with adequate exposure to SCM practices. (4)	○	○	○	○	○	○	○

Q5.5 Please indicate to what extent you agree or disagree with each statement: Human capital (skills)-HCS

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
HCS1: Lack of technical expertise. (1)	○	○	○	○	○	○	○
HCS2: Lack of training courses/consultancy/institutions to train, monitor/mentor progress specific to the mining industry. (2)	○	○	○	○	○	○	○
HCS3: Lack of employee awareness about occupational health hazards in supply chains in mining industry. (3)	○	○	○	○	○	○	○
HCS4: Resistance offered by employees to adoption of modern technology due to poor skills. (4)	○	○	○	○	○	○	○
HCS5: Fear to failure in employees due to inadequate skills. (5)	○	○	○	○	○	○	○
HCS6: Lack of employee motivation due to poor skills. (6)	○	○	○	○	○	○	○
HCS7: Not much involvement in SCM programmes/meetings. (7)	○	○	○	○	○	○	○
HCS8: Failure to market benefits or results of SCM programmes. (8)	○	○	○	○	○	○	○
HCS9: Lack of communication skills in SCM programmes. (9)	○	○	○	○	○	○	○
HCS10: Lack of entrepreneurial competence in management team related to SCM practices. (10)	○	○	○	○	○	○	○

Q5.6 Economics of scale' describes the situation when the cost-per unit of goods sold goes down as your output increases. In other words, it's a way in which a business becomes more profitable as it grows

Q 5.6 Please indicate to what extent you agree or disagree with the each statement below:
Economies of Scale (EoS)

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
EoS 1:Poor managerial structure (1)	○	○	○	○	○	○	○
EoS2: Poor innovation and technological advancement. (2)	○	○	○	○	○	○	○
EoS 3: Poor purchasing policy (3)	○	○	○	○	○	○	○
EoS 4: Poor efficiency in production. (4)	○	○	○	○	○	○	○
EoS 5: Poor synergy (5)	○	○	○	○	○	○	○
Eos 6: uncontrolled fixed costs. (6)	○	○	○	○	○	○	○

End of Block: Section D Factors (barriers or hindrances) and their sub-factors

Start of Block: Section E Business performance (BP)/SMEs ' performance

SMEs' performance -This section is about your business performance namely, both market and financial performance.

The next set of questions are on 7-point Likert scale with Strongly Disagree=1 and Strongly Agree=7. Business Performance (BP): Market and Financial Performance:

6.1 With regard to SCM practice, please tick the number that accurately reflects your firm's present conditions. Tick the appropriate number. Business performance: how well an organization/firm achieves its market-oriented goals as well as its financial goals?

Please tick in circle appropriate number which best indicates your firm's overall performance:
Business Performance (BP)

	Much lower (1)	Moderately lower (2)	Slightly lower (3)	About the same (4)	Slightly higher (5)	Moderately higher (6)	Much higher (7)
BP1: Market share. (1)	○	○	○	○	○	○	○
BP2: Return on investment. (2)	○	○	○	○	○	○	○
BP3: The growth of market share. (3)	○	○	○	○	○	○	○
BP4: The growth of sales. (4)	○	○	○	○	○	○	○
BP5: Growth in return on investment. (5)	○	○	○	○	○	○	○
BP6: Profit margin on sales. (6)	○	○	○	○	○	○	○
BP7: Overall competitive position. (7)	○	○	○	○	○	○	○

End of Block: Section E Business performance (BP)/SMEs ' performance

APPENDIX B: ETHICS CERTIFICATE

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg

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

Ethics Clearance Certificate

Ethics protocol number: WBS/EN1022593/971
This certificate is only valid with a legitimate ethics protocol number and signed by the Researcher (below).

Project title	Participation in supply chains and the performance of SMEs in the mining industry in Mpumalanga, South Africa.
Investigator / Researcher	Mr Ronald Chibanda
Nature of Project	MM (Entrepr & New Venture Creation)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed anonymity and confidentiality.
Issue Date of Certificate	2021-11-29
Expiry date	Date of submission of the project report
Chairperson	Prof Anthony Stacey ☎ +27 11 717 3587 +27 82 880 4531 anthony.stacey@wits.ac.za

Declaration by Researcher

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

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

Signature

29/11/2021
Date:

APPENDIX C: CONSISTENCY MATRIX

Consistency matrix

TITLE: Participation in supply chains and SMEs' performance in mining industry in Mpumalanga.							
Problem: There are key influential barriers that negatively affect SMEs' participation in the supply chain and SMEs' performance in the mining industry in Mpumalanga. Investigating the key underlying hindrances of this phenomena leads to crafting better strategies to increase SME's participation in supply chains and performance.							
Main Objective: to investigate the influence of key factors a**) finance b) standards and regulation c) technology and information technology d) human capital (experience & skills), and e) economies of scale that hinders SMEs' participation and performance in supply chains most in the mining industry in Mpumalanga, South Africa.**							
Sub-Objectives	**Literature Review**	**Research questions**	**Hypotheses**	**Variables (Independent & Dependent)**	**Source of data**	**Type of data**	**Analysis**
To investigate the key factors a) finance b) standards and regulation c) technology and information technology d) human capital (experience & skills), and e) economies of scale that hinders most the SMEs' participation in supply chains in	Muduli et al (2013) IFC (2014) Öztürk & Özçelik (2014) Kaur (2016) Kaur et al (2018) Kanyinji and Tembo (2019) Mahmud et al	To what extent does a) finance b) standards and regulation c) technology and information technology d) human capital (experience & skills), and e) economies SME of scale , hinders most participation in supply	Key factors a) finance b) standards and regulation c) technology and information technology d) human capital (experience & skills), and e) economies of scale hinder most SMEs'	IV1=a) finance b) standards and regulation c) technology and information technology d) human capital (experience & skills), and e) economies of scale**.**	Questionnaire	Ordinal Data (7 Likert Scale)	1. Descriptive 2. Correlation 3. CFA 4.PL-SEM
				DV1=SMEs' participation in supply chain in mining industry.	Q4.2 TO Q5.6		

mining industry.	(2021)	chain the most in mining in Mpumalanga, South Africa?	participation in the supply chains in mining industry.				
To investigate the influence of SMEs' participation in the supply chains as a strategy on business performance in mining industry in Mpumalanga.	Dhanah (2017) IFC (2014) Kanyinji and Tembo (2019) Li et al (2006) Reklitis et al (2021)	To what extent to does SMEs' participation in supply chains as a strategy influence business performance of SMEs in mining industry in Mpumalanga ?	SMEs 'participation in supply chains as a strategy positively influences business performance in mining industry in Mpumalanga. .	**IV2**= SMEs' participation in supply chains as a strategy	Questionnaire	Ordinal Data (7 Likert Scale)	
				DV2=SME business performance of SMEs.	Q4.2; Q6.1		

APPENDIX D: MEASUREMENTS OF SCALES IN RESEARCH INSTRUMENTS

Measurements of scales in research instruments

Instrument	**Scale (s)**	**Scholar (s) who made measurement scales**	**Literature Sources**
Section C: Identification of key SC initiatives participants are actively involved in. (7 Items) Scale on SME's participation in Supply Chains (4 Items)	Use of seven-point Likert scale with 1=Much Lower and 7=Much higher Use of seven-point Likert scale with 1=Strongly disagree and 7=Strongly agree	Gorner et al. (2020, p.3) Reklitis et al. (2021) Hsu et al. (2011) Lee (2008)	Gorner et al. (2020, p.3) ILO (2014); McMahon (2010); Bebbington (2011) Lee (2008); Kamaruddin et al. (2013) UNDIP report (2015) Reklitis et al. (2021) Hsu et al. (2011)

Section D: Key factors and sub-factors (prime barriers or hindrances) (i) Finance (7 Items) (ii) Standards and regulation (9 Items) (iii) Technology and information technology (8 Items) (iv) Human capital-Lack of experience (4 items) (v) Human capital-skills (10 Items) (vi) Economies of scale (6 Items)	Use of seven-point Likert scale with 1=Strongly disagree and 7=Strongly agree	Ong (2017) Kar (2016) Mahmud et al. (2021)	Muduli et al. (2013) IFC (2014) Tarihi and Yay (2014) Kaur (2016) Ong (2017) Sommer (2017) Kaur et al. (2018) Kanyinji and Tembo (2019) Mahmud et al. (2021) Ong (2017)
Section E: Business performance (overall)- (7 Items) Market Performance (i) Market share (ii) The growth of market share	Use of seven-point Likert scale with 1=Much Lower and 7=Much higher	Reklitis et al. (2021) Hsu et al. (2011) Li et al. (2006)	Dhanah (2017) IFC (2014) Kanyinji and Tembo (2019) Li et al. (2006) Reklitis et al. (2021) Hsu et al. (2011). Lee (2021)

(iii) Overall competitive position Financial Performance (i) Return on investment (ii) The growth of sales (iii) Growth in return on investment (iv) Profit margin			Tan et al. (2002)