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An investigation into how small businesses can gain competitive advantage through collaborative supply chain models

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An investigation into how small businesses can gain competitive advantage through collaborative supply chain models

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Abstract

The failure rate of SMMEs in South Africa is alarming and it is impacting the economy negatively (Herrington, Kew, & Mwanga, 2017). SMMEs discontinuance is a multi-faceted problem that requires multiple mitigation strategies, as it stems from multiple social, economic, political, financial, infrastructure and supply chain challenges (Bureau for Economic Research, 2016). The primary reasons for small businesses discontinuance include: (a) lack of access to and efficient use of working capital; (b) access to and efficient use of infrastructure; (c) business profitability; (d) access to and efficient use of finances (Bureau for Economic Research, 2016). This research demonstrates how all four challenges (a, b, c and d above) can be mitigated significantly through the implementation of different collaborative supply chain models. This was done by developing an investigational framework that links supply chain collaboration to the sustainability of SMMEs in the South African context.

The investigative framework was then tested by formulating and quantitatively evaluating 12 hypotheses with the use of a questionnaire. The participants were categorised into three main parts namely, (a) position in company, (b) industry they operate in and (c) the size of their organisation. Once the research results were obtained, they were interpreted and a conclusion made affirming the framework. The research provided clear answers for the central question, as well as the five sub-questions which sought to assess validity of the investigational framework and its possible application in the South African context.

DECLARATION

I declare that this research is my own, unaided work. It is submitted in partial fulfilment of the requirements for the MSc degree. It has not been submitted before for any degree or examination at any other university.



Onalenna Tshabangu

……

(Signature of candidate)

……14…… day of …December 2020……

(day) (month) (year)

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I would like to thank God, my wife, my parents, my supervisor, the panel of experts, everyone who filled in the questionnaire, and everyone who supported me in fulfilling this responsibility.

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List of acronyms

BER – Bureau of Economic Research

SMME – Small, Medium and Micro Enterprises

ROA – Return on Assets

GEM – Global Entrepreneurship Monitor

R&D – Research and Development

SA – South Africa

CFI – Corporate Financial Institute

SCM – Supply Chain Management

HREC – Human Research Ethics Committee

OEM – Original Equipment Manufacturer

DTI – Department of Trade and Industry

StatsSA – Statistics South Africa

LRB – Legendary Retail Brands

VMI – Vendor Manged Inventory

SC – Supply Chain

CNC - Computer Numerical Control

SSC – Shared Service Centres

NWC – Net Working Capital

EFA – Exploratory Factor Analysis

CFA – Confirmatory Factor Analysis

SEM – Structural Equation Model

VIF - Variance Inflation Factor

Chapter 1

1 INTRODUCTION

1.1 Introduction

Supply chain collaboration is increasingly becoming a requirement for business sustainability, as the 21st century supply chains are able to cope with the highly volatile and ever-changing demands of customers, they are therefore very different to the supply chains of the 'more stable' 20th century. Mass customisation and flexibility to meet customer requirements means that businesses in the value chain operate more cooperatively and collaboratively with one another, which is different to the adversarial approach previously used in pre-21st century supply chains (Bowersox, Closs, Cooper, & Bowersox, 2013). This research relates to the SMME sector in South Africa. The estimated failure rate of small businesses in South Africa in the first three years of operation is 80% (Mail & Guardian, 2019). This means that for every five businesses launched, only one will survive the first three years and the rest will fail. The Bureau for Economic Research (BER) (2016) cites several challenges faced by SMMEs in South Africa; these are detailed below.

1. Access to and efficient use of finance and credit

Herrington, Kew and Mwanga (2017) assert that the main reasons for small businesses disconsolation are lack of business profitability, problems with accessing finance, and running out of working capital due to working capital being tied up unnecessarily.

2. Poor infrastructure

Reference is made by BER (2016) to the 2014 GEM report, which suggests that infrastructure is one of the key enablers for SMME development. A further assertion is that the following can be instrumental to supporting new businesses: ease of access to communication infrastructure; utilities and transport; land and space being available at affordable prices (Herrington, Kew, & Kew, 2014).

3. Low levels of research and development

BER refers to research and development (R&D) as the indicator of idea actualisation by the small business. Reference is also made to Maas, De Coning and Smit (1999), who cite the link

between innovative organisations being likely to grow faster than traditional start-ups. Furthermore, Booysens (2011) alludes to the failure by small business to create strong links with larger firms as being a constraint to innovation in small business in South Africa, as it prevents technology diffusion.

4. Onerous labour laws

South African labour laws are a challenge for small businesses, as they do not allow for cyclical downswings in business, which means that businesses are under strong pressure to keep their staff complement even in tough times. Another challenge is that the minimum wage is relatively high, which exacerbates the cyclical downswing challenge (Bureau for Economic Research, 2016).

5. An inadequately educated workforce

The service sector is noted as being at highest risk regarding skills (Bureau for Economic Research, 2016).

6. Inefficient government bureaucracy

It is suggested that the bureaucracy associated with starting and managing a business in South Africa is a major obstacle to entrepreneurship and business activity (Bureau for Economic Research, 2016).

7. High levels of crime

BER (2016) asserts that increased security spending is putting pressure on small businesses, furthermore, the assert that crime is also impacting negatively on investor confidence regarding South Africa.

8. Lack of access to market

Access to market, especially for small businesses in remote locations, limits them from acquiring funding and mentorship assistance (Bureau for Economic Research, 2016).

In this research study, the first two challenges (access to and efficient utilisation of finances; poor infrastructure) were explored to ascertain how SMMEs could gain a competitive advantage through supply chain collaboration. The other six challenges detailed above are not related to supply chain collaboration.

Herrington et al. (2016) show that the industry sector with the largest percentage of early stage entrepreneurship is consumer services. This sector serves consumers directly by providing a range of products and services, and includes retail, motor vehicles, lodging and restaurants, personal services, education and recreational services. The sector with the second largest stake in early stage entrepreneurship is the transformation sector. This sector involves the manufacture of goods and is generally capital intensive and it may also be labour intensive. It includes manufacturing, transportation, construction, communication, utilities and wholesale distribution (Herrington, Kew, & Mwanga, 2017).

The transformation and consumer sectors were the focus of this research study for three reasons:

1. The sectors are synonymous with supply and value chains; therefore an improvement in supply chain costs would reduce the cost of doing business, and therefore improve sustainability.
2. It could be argued that large clusters of business categories (manufacturing, transportation, construction, wholesales, retail, lodging and restaurants) in these sectors use common value chains and stand to gain the most from collaboration.
3. Together, these sectors account for over 82% of early stage businesses in South Africa, therefore improvements made in these sectors can leverage to scale and contribute to the sustainability of these sectors, i.e. over three-quarters of early stage businesses in SA.

Using a collaborative supply chain models would provide businesses with an opportunity to access infrastructure at lower cost. Furthermore, a reduction in supply chain cost may improve the efficiency in the utilisation of available working capital in a business (Bakker, Walker, Schotanus, & Harland, 2008).

This research seeks to investigate how small business can leverage the collaborative supply chain model to make access to infrastructure more affordable, and thereby increase working capital. The aim is to utilise the collaborative supply chain model to contribute towards overcoming the two main reasons for small businesses closing.

It is recognised that technology can be an enabler in collaboration models (e.g. Airbnb, Uber, etc.); therefore, the use of e-commerce as an enabler was also explored (Pomponi, Fratocchi, Tafuri, & Palumbo, 2013).

1.2 Problem Statement and Motivation

1.2.1 High level view of the research motivation

Mentzer *et al*. (2001, p. 4) describe a supply chain 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". Collaboration in supply chains has been defined as occurring when "two or more independent companies work jointly to plan and execute supply chain operations with greater success than when acting in isolation" (Simatupang & Sridharan, 2005). The two definitions form the basis for unpacking the two concepts. The research aims to demonstrate how the two concepts link to the improvement of SMMEs sustainability in South Africa, as demonstrated in Figure 1.1.

1.2.2 Problem statement and motivation

The failure rate of SMMEs in South Africa is alarming and it is impacting the economy negatively. The problem of SMMEs closing down is a multi-faceted one that requires multiple mitigation strategies, as it stems from multiple social, economic, political, financial, infrastructure and supply chain challenges (Bureau for Economic Research, 2016). The primary reasons for small businesses closing are a lack of: (a) access to and efficient use of working capital; (b) access to and efficient use of infrastructure; (c) business profitability; (d) access to and efficient use of finances (Bureau for Economic Research, 2016). All four challenges (a, b, c and d) can be significantly mitigated by using collaborative supply chain models; however, there is insufficient evidence of the adoption of the collaborative supply chain models by small businesses in South Africa. Therefore, the problem statement is: There is insufficient research that explores the adoption and utilisation of collaborative supply chain models to improve business sustainability for South African SMMEs.

To better understand the impact of supply chain collaboration on small businesses, the following were also investigated:

1. An investigational framework required to leverage collaborative supply chains and support the sustainability of SMMEs.
2. The use of a collaborative supply chain model in general as well as by SMMEs.

Having discussed the problem statement and motivation for this research, the investigational framework is discussed next.

1.3 The Proposed Investigational Framework

The proposed benefits of collaboration can be demonstrated using an investigative framework - see Figure 1.1.

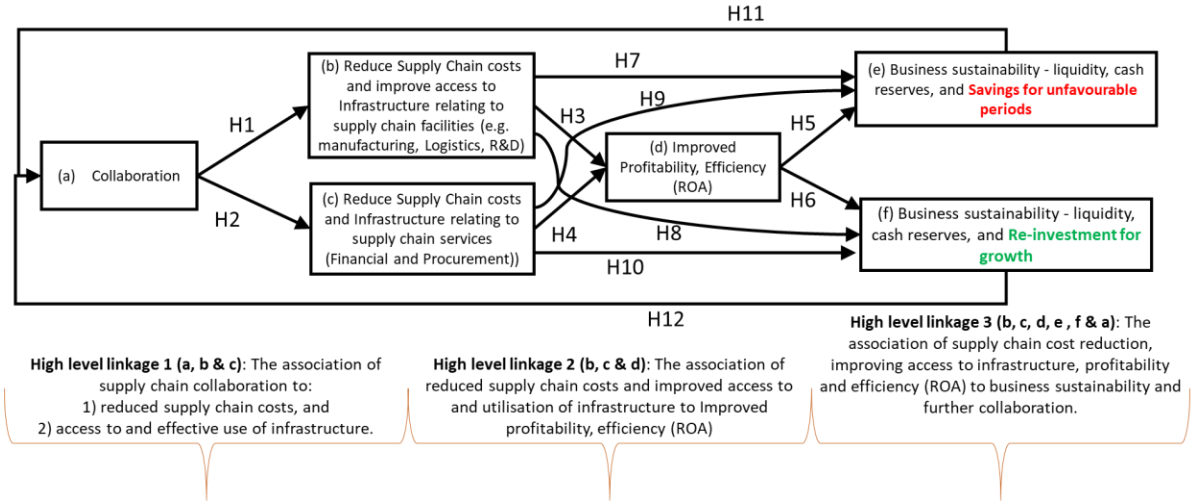

Figure 1.1: The Proposed Investigational Framework

For ease of reading;

Block: "(e) business sustainability - liquidity and the ability to build cash reserves, access free cash flow, and save for unfavourable periods" will be used interchangeably with "(e) business sustainability (saving for unfavourable periods).

Block: "(f) business sustainability - liquidity and the ability to build cash reserves and access free cash flows, and therefore re-invest for business growth" will be used interchangeably with "(f) business sustainability (re-investment for growth)"

The following links can be seen in Figure 1.1:

a) High level linkage 1: The link between (a) supply chain collaboration and (b) a reduction in supply chain costs and improved utilisation of infrastructure in (b) services activities, i.e. financial management activities and procurement activities, and (c) facilities activities, i.e. manufacturing, logistics activities.
b) High level construct 2: The link between (d) and (c) improved supply chain costs and access to and utilisation of infrastructure, and (d) profitability and return on assets (ROA)/(efficiency).
c) High level construct 3: The linking (b), (c) and (d) to (e) business sustainability (saving for unfavourable periods), (f) business sustainability (re-investment for growth) and seeking further opportunities to collaborate.

Figure 1.1 is discussed further in later sections of this report.

Farrell & Wheat (2016, p.2) assert: “For most small business, cash reserves are a critical tool for meeting liquidity needs. Cash reserves provide a readily available means to pay employees and suppliers in normal times and are an important buffer to draw upon during adverse times. This is particularly true for small businesses with limited access to credit and other sources of liquidity. In other words, cash reserves are a key measure of the vitality and security of a small business” (Farrell & Wheat, 2016).

In line with the assertions of Farrell & Wheat (2016) and Liedholm (2002), the investigational framework of this research attributes small business sustainability to the ability to build cash reserves and to grow, which may be achieved through profitability, efficiency and liquidity. The portion of liquidity referred to in this construct is gained through improved efficiency and profitability, which is obtained by reduced supply chain costs and improved access to and efficient use of infrastructure. This is made possible by supply chain collaboration.

Having demonstrated the links in the investigational framework, the hypothesis is discussed next.

1.4 Hypotheses

The proposition of this research is that collaborative supply chains lead to business sustainability (the ability to save for unfavourable periods or re-invest for growth). (See Figure 1.1.) This was done by using the proposed investigational framework to test twelve hypotheses below as extracted from the three high level linkages. The twelve hypotheses are detailed below.

Hypothesis 1 (H1): Null hypothesis: (a) Collaborative supply chains lead to a (b) reduction in supply chain costs and improved access to and use of infrastructure relating to supply chain facilities (e.g. manufacturing, logistics, R&D). Poor access to and utilisation of supply chain infrastructure is one of the key reasons why small businesses cease operating. H1 seeks to demonstrate how collaboration can be utilised to mitigate this particular reason for closing, by enabling small businesses to reduce their supply chain cost and access infrastructure as a critical measure in improving the efficiency of their use of supply chain facilities (e.g. manufacturing, logistics, R&D) and improving business sustainability.

Hypothesis 1 (H1): Alternative hypothesis: (a) Collaborative supply chains do not lead to a (b) reduction in supply chain costs and improved access to infrastructure relating to supply chain facilities (e.g. manufacturing, logistics, R&D).

Hypothesis 2 (H2): Null hypothesis: (a) Collaborative supply chains lead to a (c) reduction in supply chain costs and improved access to and use of infrastructure relating to supply chain services (e.g. procurement and financial management). Lack of access to and inefficient use of finance and credit is one of the key reasons for small businesses closing., H2 seeks to demonstrate how collaboration can be used to mitigate this reason for SMMEs closing, by enabling small businesses to reduce their supply chain cost and access infrastructure relating to supply chain services as a critical measure in improving their efficiency in terms of using services and improving business sustainability.

Hypothesis 2 (H2): Alternative hypothesis: (a) Collaborative supply chains do not lead to a (c) reduction in supply chain costs and improved access to infrastructure relating to supply chain services (e.g. procurement and financial management).

Hypothesis 3 (H3): Null hypothesis: (b) Reduced supply chain costs and improved access to and utilisation of supply chain facilities lead to (d) improved profitability and efficiency (ROA). H3 proposes that reduced supply chain costs and improved access to and use of infrastructure relating to supply chain services improves small business profitability and efficiency (ROA), and is further proposed as a necessary outcome of H1 in terms of small business sustainability.

Hypothesis 3 (H3): Alternative hypothesis: (b) Reduced supply chain costs and improved access to and use of infrastructure relating to supply chain facilities do not lead to (d) improved profitability and efficiency (ROA).

Hypothesis 4 (H4): Null hypothesis: I Reduced supply chain costs and improved access to and use of supply chain services lead to (d) improved profitability and efficiency (ROA). H4 proposes that reduced supply chain costs and improved access to and use of infrastructure relating to supply chain services improves small business profitability and efficiency (ROA), and is further proposed as a necessary outcome of H2 in terms of small business sustainability.

Hypothesis 4 (H4): Alternative hypothesis: (c) Reduced supply chain costs and improved access to and use of infrastructure relating to supply chain services do not lead to (d) improved profitability, efficiency (ROA).

Hypothesis 5 (H5): Null hypothesis: (d) Improved profitability and efficiency gained through a reduction in supply chain costs and more efficient use of infrastructure leads to (e) business sustainability - liquidity and the ability to build cash reserves, access free cash flow, and save

for unfavourable periods. Profitability and efficiency (ROA) lead to liquidity, which enables organisations to build cash reserves and access free cash flows, thereby enabling them to save for unfavourable periods, which is a strong mitigation measure against the business closing down.

Hypothesis 5 (H5): Alternative hypothesis: (d) Improved profitability and efficiency (ROA) do not lead to (e) business sustainability (saving for unfavourable periods).

Hypothesis 6 (H6): Null hypothesis: Improved profitability and efficiency (ROA) gained through a reduction in supply chain costs and more efficient use of infrastructure leads to (f) business sustainability - liquidity and the ability to build cash reserves and access free cash flows, and therefore re-invest for business growth. Profitability and efficiency (ROA) lead to liquidity, which enable organisations to build cash reserves and access free cash flows, thereby enabling them to re-invest for business growth, which is a strong mitigation measure against closure.

Hypothesis 6 (H6): Alternative hypothesis: Improved profitability, efficiency (ROA) do not lead to (f) business sustainability (re-investment for growth).

Hypothesis 7 (H7): Null hypothesis: (b) Reduced supply chain costs and more efficient use of infrastructure in supply chain facilities lead to (e) business sustainability (saving for unfavourable periods).

Hypothesis 7 (H7): Alternative hypothesis: (b) Reduced supply chain costs and more efficient use of infrastructure in supply chain facilities do not lead (e business sustainability (saving for unfavourable periods).

Hypothesis 8 (H8): Null hypothesis: (b) Reduced supply chain costs and more efficient use of infrastructure in supply chain facilities leads to (f) business sustainability (re-investment for growth).

Hypothesis 8 (H8): Alternative hypothesis: (b) Reduced supply chain costs and more efficient use of infrastructure in supply chain facilities do not lead to (f) business sustainability (re-investment for growth).

Hypothesis 9 (H9): Null hypothesis: (b) Reduced supply chain costs and more efficient use of infrastructure in supply chain services lead to (e) business sustainability (saving for unfavourable periods).

Hypothesis 9 (H9): Alternative hypothesis: (b) Reduced supply chain costs and more efficient use of infrastructure in terms of supply chain services do not lead to (e) business sustainability (saving for unfavourable periods).

Hypothesis 10 (H10): Null hypothesis: (b) Reduced supply chain costs and more efficient use of infrastructure in terms of supply chain services leads to (f) business sustainability (re-investment for growth).

Hypothesis 10 (H10): Alternative hypothesis: (b) Reduced supply chain costs and more efficient use of infrastructure in terms of supply chain services do not lead to (f) business sustainability (re-investment for growth).

Hypothesis 11 (H11): Null hypothesis: (e) business sustainability (saving for unfavourable periods) leads to more (a) collaboration in supply chain activities. It could be inferred that if a business can demonstrate that collaboration has improved its sustainability, this will trigger the leadership of the small business to seek more collaboration opportunities.

Hypothesis 11 (H11): Alternative hypothesis: (e) business sustainability (saving for unfavourable periods) does not lead to more (a) collaboration in terms of supply chains.

Hypothesis 12 (H12): Null hypothesis: (f) business sustainability (re-investment for growth) leads to more (a) collaboration in terms of supply chain activities. It could be inferred that if a business can demonstrate that collaboration has improved its sustainability, this would trigger the leadership of the small business to seek more collaboration opportunities.

Hypothesis 12 (H12): Alternative hypothesis: (f) business sustainability (re-investment for growth) does not lead to more (a) collaboration in terms of supply chains. Having discussed the twelve hypotheses, the research questions are discussed next.

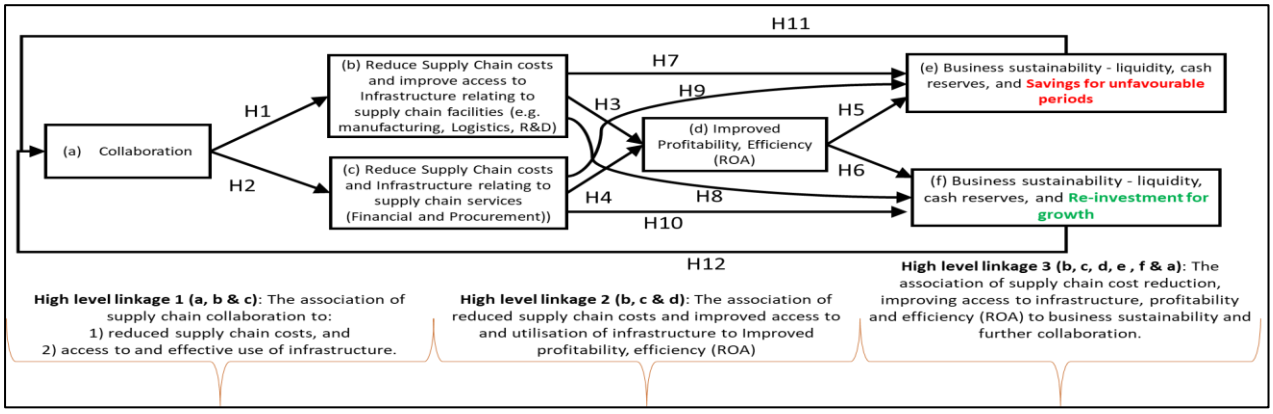

Figure 1.2: The Proposed Investigational Framework

For ease of reading, in the rest of this section the letters a, b, c, d, e, f will be used respectively to denote the relevant blocks in the proposed investigational framework.

1.5 Research Questions

Figure 1.1 demonstrates how the central question and the sub-questions show the link between collaboration and business sustainability.

The central research question: Can an investigative framework be developed that links supply chain collaboration to the business sustainability of SMMEs? (See Figure 1.1.)

The sub-questions of the study were formulated as follows:

1. How can collaborative supply chain models be used to reduce supply chain costs and improve accessibility to and use of infrastructure?
2. What is the link between reduced supply chain costs and improved accessibility to and use of infrastructure, and SMME profitability and efficiency (ROA)?
3. What is the link between profitability and efficiency, and liquidity and access to free cash flows, as well as the inclination to build cash reserves?
4. What is the link between the ability to access free cash flows and build cash reserves, and business sustainability (the ability to save for unfavourable periods or re-invest for business growth)?
5. What is the link between business suitability (the ability to save for unfavourable periods and re-invest for business growth) being improved through a collaborative supply chain and the propensity to seek further collaboration opportunities?

1.6 Research Objectives

The objectives of this research were:

1. To develop an investigational framework that links supply chain collaboration to the sustainability of SMMEs in South Africa. (See Figure 1.)
2. To explore the use of collaborative supply chains models by South African SMMEs.
3. To test the investigative framework using known statistical analysis tools.

1.7 Introductory Literature Review

1.7.1 SMMEs

There are over 2 400 000 small businesses in South Africa and it is estimated that only 20% of small businesses survive the first three years of operation. SMMEs closing down is due to the reasons already discussed in the background section above. In SA, an SMME is defined as a

business with an annual turnover of R150 000 to R50 million. Table 1.1 shows the number of SMMEs by economic sector. Based on this information (regarding business clusters), one of the focus areas of this research is to explore opportunity for collaboration within and across sectors, based on company profiles (BER, 2016).

Table 1.1: SMMEs by economic sectors

SMMEs	Number (2008Q1)	Number (2015Q2)				Turnover* (2015Q1)	GDP (2015Q2)	Turnover* /SMME
	Total	Total	Formal	Informal	Other	R million	R million	R million
Total	**2 182 823**	**2 251 821**	**667 433**	**1 497 860**	**86 528**	**2 908 020**	**815 636**	**1.29**
Agriculture	87 820	56 774	0	0	56 774	na	35 213	na
Mining	2 696	2 199	0	2 199	0	35 256	69 421	16.03
Manufacturing	267 817	201 459	62 657	138 801	0	658 740	111 672	3.27
Electricity, gas & water	4 252	7 456	6 656	801	0	7 488	38 647	1.00
Construction	252 233	299 242	77 098	222 143	0	229 016	38 804	0.77
Trade & Accommodation	974 083	944 467	186 798	757 669	0	1 160 560	129 144	1.23
Transport & Communication	122 370	133 134	56 620	76 514	0	134 152	87 612	1.01
Finance & Bus. Services	236 740	271 712	172 423	99 289	0	571 384	183 430	2.10
Community	227 243	305 624	105 181	200 444	0	111 424	50 982	0.36
Other	7 569	29 754	0	0	29 754	0	70 711	0.00

Source: StatsSA, BER ** annualised*

1.7.2 High level linkage 1: Collaboration linked with a reduction in supply chain costs and access to and efficient use of infrastructure.

1.7.2.1 Supply Chain Collaboration

Mentzer *et al*. (2001, p.4) describes a supply chain 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". Collaboration in terms of supply chains has been defined as occurring when "two or more independent companies work jointly to plan and execute supply chain operations with greater success than when acting in isolation" (Simatupang & Sridharan, 2005). Simatupang and Sridharan (2005) also make reference to Narus and Anderson's (1996) definition of collaborative supply chains as being "cooperation among independent but related firms to share resources and capabilities to meet their customers' most extraordinary needs" (Narus & Anderson, 1996).

Barratt (2004, p.32) assets that a collaborative supply chain can be developed in many ways; the two main types are: "(i) vertical, when collaborating with customers, internally (across functions), service providers and suppliers; (ii) horizontal, between different supply chains when cooperating with competitors and non-competitors". The objective of this study is to utilise the model of horizontal collaboration as an input to developing a workable framework

for small business to improve supply chain deliverables through shared resources - and thereby improve working capital utilisation and profitability, and therefore sustainability. (See Figure 1.1.). The first construct to explore in the investigational framework is the link between collaboration (in terms of supply chain activities) and a reduction in overall supply chain costs, as well as improved access to and more efficient use of infrastructure. One of the collaborative supply chain models found in literature is collaborative procurement, which is introduced at a high level in the next section and further explored in chapter 2.

1.7.2.2 Collaborative Procurement

"Collaborative procurement is horizontal collaboration between two or more organisations during one or more steps of the purchasing process" (Bakker *et al*., 2008). Bakker *et al*. (2008) also reference Jost *et al*. (2005) who asserts that the two main advantages of collaboration are:

- "The first is increased effectiveness through learning from each other and a better use of resources. As purchasing is evolving into a more strategic and demands more strategic skills, collaboration can be a way of accessing these skills or freeing up resources to develop them. The second main advantage is an improved efficiency through reduction of transaction costs and increased economies of scale through bundling purchasing volumes (cf. Leenders and Fearon, 1997; Johnson, 1999)" (Bakker, Walker, Schotanus & Harland, 2008).

  .

Horizontal collaboration may lead to reduced supply chain costs, which would enable SMMEs to access and release much needed working capital that is required for funding expansion. Moreover, in the 21st century, technology is a critical resource that is required to enable collaboration in terms of supply chain activities; therefore, the importance of e-commerce technology is discussed next.

1.7.2.3 E-commerce

Nanehkaran (2013, p.190) defines e-commerce as, "The interaction between communication systems, data management systems and security, which because of them exchange commercial information in relation to the sale products or services, will be available, so the definition, the main components of electronic commerce are: communication systems, data management systems and security". Computers process data with speed, accuracy and security, which means

that electronic transactions used in e-commerce are an enabler of business interactions. However, e-commerce also has various challenges, including inadequate infrastructure, and a shortage of complementary assets, security and skills. This study explored how e-commerce can be used to enable collaboration in terms of supply chain. Having discussed construct 1, the next discussion focusses on construct 2.

1.7.3 High level linkage 2: Reduced supply chain costs and improved access to and efficient use of infrastructure is linked to profitability and return on assets.

1.7.3.1 Return on Assets

Davidson & McDonald (2006) assert that ROA indicates an organisation's ability to generate income and profit from its assets. They further assert that a comparison of two companies in the same industry that have generated the same income would show that the one that has done so with fewer assets has performed better (Davidson & McDonald, 2006), because the income was generated with fewer assets. Davidson & McDonald (2006, p.3-4) indicate two components that make up the operating ROA: (i) "operating margins, which measures the efficiency of an organisation's operations to produce operating profits" and; (ii) "operating assets turnover, which measures management efficiency in utilising operating assests to generate revenue". These assersions indicate that ROA is an approch used to measure the efficiency of an organisation in generating income and profit from its assests.

1.7.3.2 Profitability

Graham *et al*. (2016) state that the examination of profitability reveals the quality of investment and financial decision making in an organisation. It is also used to assess the business' operations performance. This is done by using various ratios; this research will cite one - operating margin. It is described by Graham *et al*. (2016, p.57) as being used to "measure the profitability of the business by deducting from sales income the cost of sales and other operating costs of the business (rent, salaries, etc.), before taking into account the finance costs and taxation charge" The evaluation of this financial ratio is important to this research, as a reduction in supply chain costs will have a positive effect on the ratio. Therefore, it could be proposed that a reduction in supply chain costs will also result in improved profitability. Having discussed construct 2, the next discussion focusses on construct 3.

1.7.4 High level linkage 3: Business sustainability (liquidity, access to cash, saving for unfavourable periods and re-investment for business growth) and further collaboration.

1.7.4.1 Working Capital, Cash Flow and Free Cash Flows

Working capital and cash flow are closely linked with an organisation's liquidity. Corporate Finance Institute (CFI) stated: "Liquidity refers to how quickly an investment can be sold without impacting its price. The more liquid an investment is, the more quickly it can be sold (and vice versa)". It further stated: "In finance and accounting, the concept of a company's liquidity is its ability to meet its financial obligations" (CFI, 2015). Furthermore, Kieso *et al.* (2013, p.234) define free cash flows as, "discretionary cash flow – otherwise cash available for a company to purchase additional investments, retire its debt, purchase treasure stock, or simply add to its liquidity".

This paper seeks to assess the links between (b) reduced supply chain costs and (c) improved utilisation of infrastructure, and (d) improved profitability and ROA. The paper also seeks to assess the links between (b and c) and (e) business sustainability relating to the ability to save for unfavourable periods as well as (f) business sustainability relating to re-investment for growth. The final assessment will be made regarding the link between business sustainability (e and f) and seeking further opportunities for (a) collaboration.

1.8 Research Methods

The research methods used are discussed next and this is sketched out in Figure 1.2.

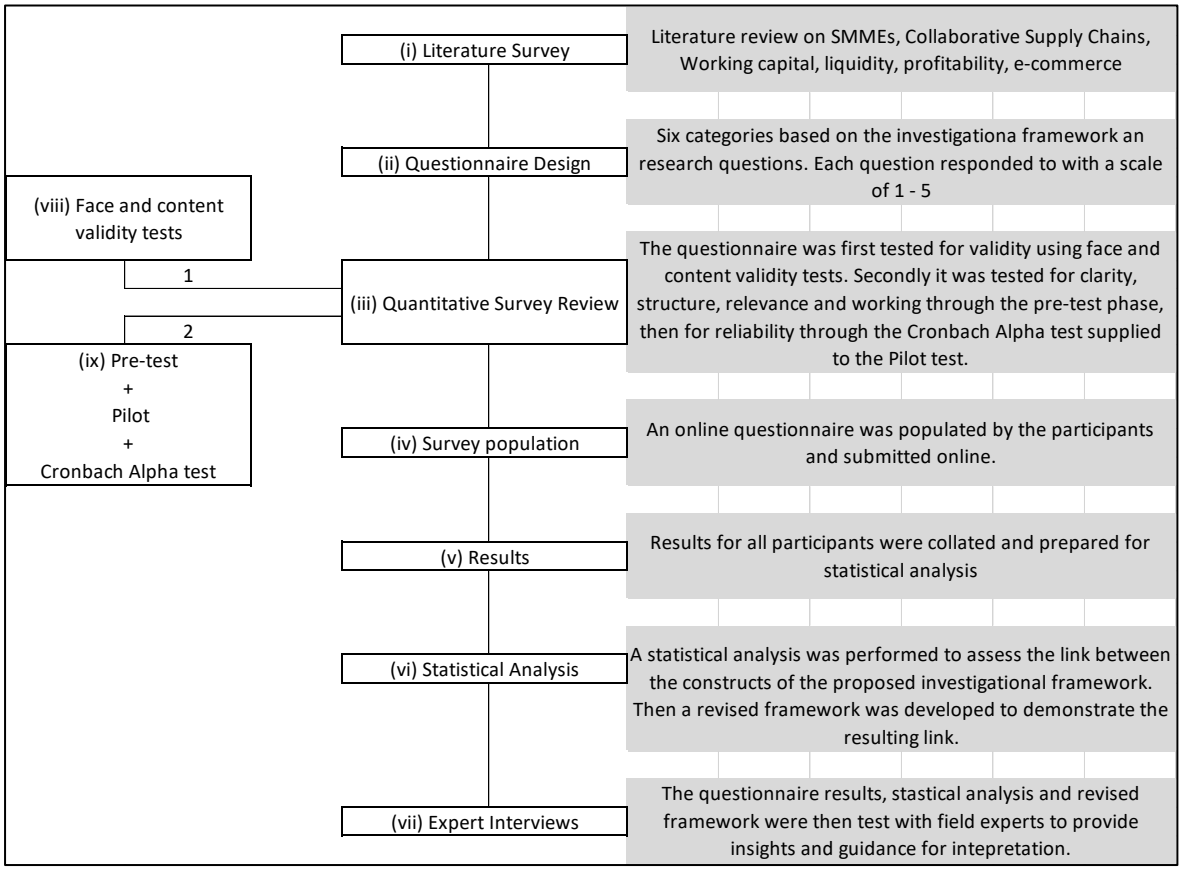

Figure 1.3: Research methods

The research methods used were as follows:

i. A literature review on SMMEs, collaborative supply chains, working capital, liquidity, profitability and e-commerce.
ii. A questionnaire with categories relevant to the investigation framework and research questions. Each question used a response scale of 1 – 5.
iii. The questionnaire was first tested for validity using face and content validity tests. Secondly, it was tested for clarity, structure and relevance by means of a pre-test. It was then tested for reliability using the Cronbach Alpha test supplied to the Pilot test (steps (vii) and (ix)) in figure 1.2, as well as reliability and validity tests for the questionnaire design and data analysis process.
iv. The questionnaire was made available to the participants online, and the completed documents were submitted online.
v. The responses of all participants were collated and prepared for statistical analysis.

vi. A statistical analysis was performed to assess the links in the proposed investigational framework (Figure 1.1). A revised framework was then developed to demonstrate the link.

vii. An expert panel reviewed the results on an individual online interview basis to provide insight and guidance for further interpretation.

The questionnaire contained six categories, with each containing a set of questions that were designed to provide a conclusive view of the category. Once the questionnaire was developed, face and content validity tests were done. This was done by interviewing experts in the fields of small business, supply chain and finance. The interviewees included experts from relevant industries and specialists who are lecturers at Wits University.

The pre-test methodology followed by Siriram (2016) was adopted for this research. The pre-test included 20 participants who tested the questionnaire for clarity, structure, relevance and wording. As per Siriram (2016), the pre-test was followed by a pilot test on a sample of 32 participants. Thereafter, the Cronbach alpha test was performed on the pilot test (Siriram R. , 2016).

Once the results from the questionnaires were obtained, they were analysed, and a collaborative supply chain framework developed and evaluated by means of expert interviews. Interviews were held with specialists in the following fields: small business owner/ industry specialists, supply chain specialists and financial specialist.

The technical results acquired through the questionnaire were fed into a collaborative supply chain framework that was later evaluated by the experts in the interviews. The results of the two phases were used as input to ensure a more reliable view of the link between a collaborative supply chain model and the sustainability of SMMEs.

1.9 Data Collection and Sampling

In preparation for data collection and sampling, a literature review was conducted to obtain a better understanding of the current research in the field. The research included a questionnaire and an expert panel focus group discussion. The questionnaire was distributed to 534 SMMEs in the transformation sector (including manufacturing, transportation, construction, communication, utilities and wholesale distribution) and the consumer services sector

(including retail, motor vehicles, lodging and restaurants, personal services, education and recreational services) (Herrington, Kew, & Mwanga, 2017). The expectation was that a minimum of 55 responses would be received from the 534 participants who received the questionnaire, which translates into a response rate of about 10%. Both sample size and response rate were considered to be adequate based on the research of Swamidass & Kotha, (1998) and Siriram & Snaddon (2005). Thereafter, a test for response bias was conducted to ensure that the responses were not significantly different from the sample (Armstrong & Overton, 1977). A questionnaire was designed, based on the research questions, with a total of 38 questions. Of these, 34 questions had a Likert scale of 1 - 5 for the answer options. The other 4 related to the business profile and the respondent's position in his/her business. The questionnaire was targeted at all levels of staff within an SMME organisations, in order to obtain a balanced view from industry. This was followed by the survey process as follows:

- An email detailing the purpose of the questionnaire was sent out, with a link to the survey attached, and a request to click on the link.
- Clicking on the link allowed the questionnaire to load to Google Forms.
- The participant was then able to complete the survey by: selecting a response on a Likert scale of 1 to 5 for 38 questions; selecting the relevant option for their business profile and their position in the business.
- The participants then clicked the 'submit' key and the form was loaded to the database and was ready for assessment.

1.9.1 Experts Interview

Interviews were conducted with industry experts in different fields to assist with interpreting the research results. The interview discussions were conducted with eight experts from the following fields: SMME business operations, financial management and supply chain management (SCM).

1.9.2 Analysis of Results

SPSS version 26 was used for the statistical analysis. For purposes of data reliability and validity, the Cronbach alpha test will be used. A Cronbach alpha value of 0.5 was used (Hinton, Brownlow, McMurray, & Cozens, 2004). The results were also verified by the expert panel.

The expert panel consisted of experts from registered bodies and specialists who are also lecturers at Wits University.

1.10 Ethical Clearance

Ethics clearance for the following were applied for through the School Ethics Committee and utilised where applicable:

- Ethics Application Form for Human Research Ethics Committee (HREC Non-Medical)
- Request for permission for research among students and staff at Wits, i.e. for permission to interview some of the lecturers at Wits University.
- Participation Information Interview – this will be for the experts outside the university who will be interviewed.
- Letter of Consent for all interviewed participants.
- Participant Questionnaire for the online questionnaire.

The ethical clearance number allocated for the research is: MIAEC 071/19

Chapter 2

2 LITERATURE REVIEW

2.1 Introduction

2.1.1 21st century Supply Chains (the AAA of supply chain)

Handfield and Nichols (1999, p.2) assert: "The supply chain encompasses all activities associated with the flow and transformation of goods from raw materials stage (extraction), through to the end user, as well as the associated information flows; material and information flow both up and down the supply chain". A further assertion is made: "Supply chain management (SCM) is the integration of these activities through improved supply chain relationships, to achieve a sustainable competitive advantage" (Handfiled & Nichols Jr, 1999, p. 2). Porter (1985, p.3) states: "Competitive advantage grows fundamentally out of value a firm is able to create for its buyers that exceeds the firm's cost of creating it. Value is what buyers are willing to pay, and superior value stems from offering lower prices than competitors for equivalent benefits or providing unique benefits that more than offset a higher price". Figure 2.1 gives a visual representation of the supply chain and how value is typically created through the supply chain (Lu, 2011).

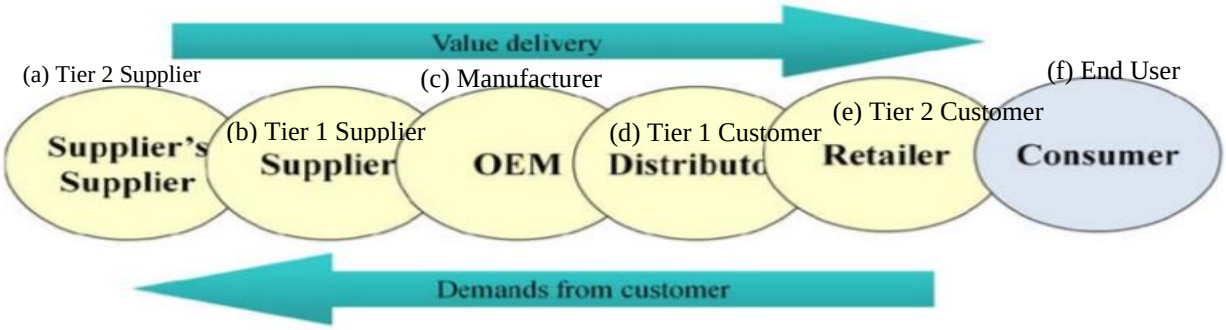

Figure 2.1: Adapted from "The basic supply chain model" by Lu (2011). (For the purpose of this paper, OEM represents manufacturers of any kind.)

The term ‘value’ is used as per the definition of Womack and Jones (1996, p.311), i.e. “capability provided to the customer at the right time at an appropriate price, as defined in each case by the customer”. Figure 2.1 highlights six entities in the supply chain, namely: supplier’s supplier; supplier; OEM (Original Equipment Manufacturers), distributor; retailer; consumer. For the purpose of this paper, OEM represents manufacturers of any kind.

For purposes of this research, the following interpretations are used for the six entities:

1. Supplier’s supplier – (a) tier 2 supplier – organisations that supply raw material to a tier 1 supplier, which then provides semi-finished products to an OEM or manufacturer.
2. Supplier – (b) tier 1 supplier – the organisation that provides semi-finished products and parts to the OEM/ manufacturer.
3. OEM includes (c) manufacturers - organisations that produce finished goods and equipment for the market (Kot, 2013).
4. Distributors – (d) tier 1 customer - organisations that store and distribute products and equipment from manufacturers to other organisations. They typically sell goods in large quantities (Kot, 2013).
5. Retailer – (e) tier 2 customer – organisations that supply directly to the end user (Kot, 2013).
6. Consumer – (f) end user – the individual or organisation that uses the product or equipment (Kot, 2013).

Figure 2.1 shows how material flows through the value chain with value added at every stage, from (a) tier 2 supplier through to the (f) end user. Each organisation performs activities that use the raw material to produce products, and in so doing value is created (McGee & Sammut-Bonnici, 2014).

Traditionally, a supply chain functions as a push system (Ericsson, 2011). With reference to Figure 1.1, each of the organisations utilise a team that facilitates the movement of material and information in their respective supply chain processes (including procurement, storage, manufacturing, and the delivery of raw material and products), as well as teams that facilitate selling products to customers. Historically, there has been misalignment between the objectives of the selling team versus the objectives of the supply chain team. The objective of the selling team is to maximise sales, which does not necessarily lead to efficient manufacturing practices.

The objective of supply chain is to maximise capacity, which is not always in line with rapidly changing customer demands (Lahloua, El Barkany, & El Khalfi, 2018). Madhani (2015) states that this often leads to a mismatch between what the organisation has produced and what customers require. This mismatch is found in demand quantities and other features that the customer perceives as valuable. As a result, traditional supply chains are prone to inefficiencies, such as excessive costs related to over-stocking and markdowns, out of stock situations, redundancies, damages, pilferage, etc.

Previously, participants in the traditional supply chain operated in a stable demand environment, which was more suited to the strategy of obtaining raw material from immediate suppliers, adding value and then pushing the product to customer. This approach is referred to by Ericsson (2011, p.46) as 'supplier driven mass production and mass marketing'.

Supply chain in the 21st century is quite different: it puts much more emphasis on customer insight and catering to customised requirements (Ericsson, 2011). Value creation in the 21st century leans towards demand, which researchers like Jüttner *et al.* (2007, p.377) have endorsed as a model that integrates marketing and supply chain and which they refer to as 'demand chain management'. In the current environment, the value creation process is no longer modelled on the supply-centric (supply capacity) approach, but rather on the demand-centric (customer needs) approach (Ericsson, 2011). The gist of the cited difference is as follows:

- Traditional supply chain – determine the full capacity and create demand according to capacity. New supply chain (demand chain) – determine the full demand and align the supply chain's strategic objectives to satisfy the demand (Jüttner *et al*., 2007*).*

The 21st century supply chain (demand chain) approach is challenging for both SMMEs and large organisations, as it requires more supply chain agility, adaptability and alignment (the Triple-A of supply chain), compared to the old approach. The triple-A of supply chain is a term that was coined by Lee (2004) and includes alignment, adaptability and agility. Lee (2004) regards agility as the ability of a supply chain to respond to sudden and unexpected changes. Furthermore, adaptable organisations are not constrained by supply networks when markets or strategies change; rather, these organizations adapt their supply chains so they can adjust to changing needs. Finally, creating the right alignment means aligning the organisation's strategic objectives to industry objectives and market requirements.

The 21st century supply chain poses a number of challenges, including that large organisations are often bureaucratic and cumbersome. Hamel and Zanini (2018) highlight the severity of bureaucracy in large organisations, which undermines the importance of innovation, instantaneous communication and fast-paced change in gaining competitive advantage. The protracted channels of communication and decision making also hinder adaptability, as decisions need to go through cumbersome bureaucratic structures. Onerous communication and decision-making processes may also result in a slow response to market changes. Finally, when there is a level of autonomy and fast response to changes, it is often to the detriment of organisational alignment. The risk mitigation factors of large organisations are their resources and strong cash reserves, which enable them to withstand the effects of misalignment, slow adaptability and poor agility (Lee 2004).

With SMMEs, bureaucracy and long communication and decision-making channels are not as much of a challenge as in large companies (Hamel & Zanini, 2018). This presents an opportunity for SMMEs to gain a competitive advantage over their larger competitors, by being better positioned to adopt the triple-A of supply chain approach. The adoption of triple-A supply chain approach is particularly suitable for SMMEs, as pivoting is the nature of a growing business. The term pivoting is adopted from Ries (2011) and Black (2013), who indicate that pivoting is when an organisation makes significant changes to its business hypothesis, based on customer feedback, i.e. a change in the organisation's business model as a result of customer feedback.

However, SMMEs are more prone to poor decision making and misjudgement, and unlike larger companies, they do not have the reserves and resources to recover from poor decision making. This is because SMMEs are largely led by entrepreneurs whose decision-making processes are much more innovative, but not as extensive and analytical as that of managers in large organisations. Ashraf *et al.* (2015, p.87) suggest that decisions made by entrepreneurs in SMMEs are "mostly impatient and action oriented". McGrath et al. (1992, p.115) refer to SMMEs as "rugged individuals". It may be deduced that although the entrepreneur's temperament is a factor in poor decision making, the key differences are the lack of time and resources to conduct deep analysis to make comprehensive decisions.

In this paper, the differences between SMMEs and large organisations is as per the classifications provided by the DTI and Stats SA. SMMEs are classified as follows: (a) Very small; (b) Small; and (c) Medium. Details are provided in Table 2.1.

Table 2.1: DTI's turnover lower-boundaries for enterprise size (adjusted by StatsSA).

Industry Turnover	Large > Rm	Medium > Rm	Small > Rm	Very small > Rm
SIC2 Mining and quarrying	370.5	95.0	38.0	2.0
SIC3 Manufacturing	456.3	123.5	47.5	2.0
SIC4 Electricity, gas and water	456.3	123.5	48.5	2.0
SIC5 Construction	247.0	57.0	28.5	2.0
SIC61 Wholesale trade	608.0	304.0	57.0	2.0
SIC62 Retail trade	370.5	180.5	42.5	2.0
SIC63 Motor trade	370.5	180.5	42.5	2.0
SIC64 Accommodation and catering	123.5	57.0	48.5	2.0
SIC7 Transport	247.0	123.5	28.5	2.0
SIC8 Real estate & business services	247.0	123.5	28.5	2.0
SIC9 Community, social and personal	123.5	57.0	8.5	2.0

Having given an overview of supply chain networks in the 21st century, the discussion next focusses on how collaboration can be achieved across the value chain. Based on the overview of a basic supply chain model, as indicated in Figure 2.1, collaboration may be seen as a key component of: (a) responding to growing customer demands by being agile, aligned and adaptable in the way that the supply chain is managed; (b) limiting poor decision making and misjudgement. This is made possible by accessing state-of-the-art assets and resources such as logistics, manufacturing facilities, financial services, procurement services, marketing and R&D at a shared cost, thereby gaining the benefits of accessing good resources and only bearing a portion of the cost associated with those resources.

2.1.2 Collaboration

Barratt (2004) as well as Simatupang and Sridharan (2002) explain that horizontal integration is when organisations form a cooperative association to share resources. Therefore, it could be inferred that collaborating organisations could form associations by making single or multiple linkages with other organisations in the collaborative network in terms of supply chain resources. Pomponi *et al.*, (2013) state that the organisations in the network could also choose to participate in operational, tactical or strategic formats. The three incremental steps are as follows:

1. Operational collaboration includes the sharing of data, information and equipment. The objectives are cost reduction, quicker response, a purchasing and tendering group, joint distribution and flow consolidation, customer service and improved productivity (Pomponi, Fratocchi, Tafuri, & Palumbo, 2013, p. 250).
2. Tactical collaboration includes sharing logistics facilities, warehouses and support processes. The objectives are multimodal collaboration, better resource management and reduced supply risk (Pomponi, Fratocchi, Tafuri, & Palumbo, 2013, p. 250).
3. Strategic collaboration includes sharing joint order fulfilment, market power and expertise. The objectives are innovation, value creation, joint investment, improved market position, social relevance, growth and networking (Pomponi, Fratocchi, Tafuri, & Palumbo, 2013, p. 250).

Simatupang and Sridharan (2002) indicate that there are two common ways in which organisations collaborate or integrate, namely vertically and horizontally. Figure 2.2 (Björnfot & Torjussen, 2012) shows the difference between vertical and horizontal collaboration. This study focussed on horizontal collaboration models that can be used to mitigate three of the challenges facing South African SMMEs, namely: (a) access to and efficient utilisation of finances; (b) poor infrastructure; (c) low levels of R&D. These three challenges were chosen, as they could be mitigated by improvement to the supply chain. Collaboration in terms of organisational assets and activities relating to the following supply chain function areas are discussed: purchasing, logistics, marketing, finance, R&D and production/ core business (the value adding component).

Figure 2.1 (basic supply chain model) depicts the flow of material from the (a) tier 2 supplier (the supplier's supplier) to the (f) end-user (the customer's customer). In an integrated supply chain, as the material flows through the supply chain, there is transparent information flow across the supply chain, indicating the state of each organisation and the status of material in the supply chain.

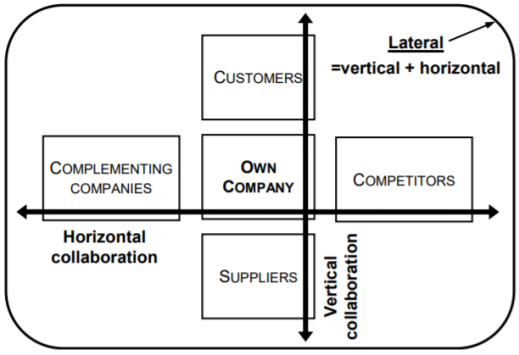

Figure 2.2: Horizontal, vertical and lateral collaboration (Björnfot & Torjussen, 2012)

In integrated supply chains, the supply plans and movement of material in other entities is visible to each organisation (Tier 1 supplier, Tier 2 supplier, Manufacturer, Customer, Consumer), and they are therefore better equipped to apply the triple-A approach. For example, if figure 2.1 represents the value chain of a widget manufacturing company, Tier 1 supplier has visibility of the supply plans and movement of material in the Tier 2 Supplier and Manufacturer's supply chains. In the same vein, the Manufacturer has visibility of the supply plans and material movement at Tier 1 organisations and Customer supply chains, etc.

Such up-to-date knowledge of neighbouring organisations' supply plans provides each organisation with early warning signs and affords them the opportunity to respond to market changes in appropriate time. In fully integrated supply chains, the supply plans of each organisation are known throughout the supply chain. This is crucial, as the supply plans of every organisation impact on the business of every other organisation in the supply chain. Full supply chain integration is particularly possible for supply chain entities that belong to a parent company that owns the supply network, e.g., Distell owns elements (product lines) of the supply chain from the farm to the truck that delivers the goods to the customer (i.e. farm, winery, bottlers, DCs, and the transportation required to move products from one organisation to another). Full integration equips Distell with a competitive advantage in terms of responding to changes in the market that other players in the market may not have.

Although the Distell case study shows vertical collaboration, horizontal collaboration can similarly be used by SMMEs, as in the case of Legendary Retail Brands (LRB). This company is both shareholder and administrator of the voluntary buying group that consists of Mica, DIY Depot and House of Paint and Décor. The LRB business was set up as an administration company that managed the buying and distribution of the products of the entities within its

network. LRB manages trading for its entities with its customers, as well as with each other (Beswick, 2016). This provides them with the leverage to respond to market changes collectively with agility and to use their collective power to influence outcomes.

Having discussed the high-level view of supply chain integration, the next section unpacks other models of collaboration and delves into how these models can be used to reduce supply chain costs and improve SMMEs accessing and better utilising supply chain infrastructure.

In terms of this paper, collaboration and integration are used interchangeably. Most of the current literature focusses on horizontal collaboration in terms of logistics and procurement. This paper aims to extend the models that are used to achieve logistics and procurement collaboration to other organisational functions, such as production, planning, marketing, finance, and research and development (R&D). Cassivi *et al.* (2008) emphasise the importance of technology, particularly e-collaboration in terms of supply chain collaboration. It is in this regard that technology, and particularly e-commerce (as an aid for business transactions), is discussed next.

2.1.3 E-commerce

Pomponi *et al.,* (2013) suggest that trust between cooperating organisations is a critical factor for collaboration. Naesens *et al.* (2009) propose that before starting a collaborative relationship, cooperating organisations must verify that they are strategically aligned. Wilhelm (2011) suggests that trust is even more relevant in the case of coopetition (collaboration between business competitors). Finally, Schulz & Blecken (2010) state that even in post-disaster relief situations, mistrust and lack of transparency are the main impediments to successful collaboration. Therefore, it could be concluded that trust and transparency are the key success factors in collaborative endeavours. Van Sabben & Van Wijk (2018) indicate that technology can be used to build trust in the supply chain by providing a single source of information for all entities involved. Therefore, both trust and transparency challenges could be addressed by using technology to make transactions and key interactions more visible to all entities involved. This is demonstrated by the relationship that developed between Procter and Gamble (P&G) and Walmart, which used technology as a strong enabler to make their relationship possible, transactions fluid, and to minimise the negative impact of poor SCM, e.g. the bullwhip effect.

This was due to their Vendor Managed Inventory (VMI) approach, which was made possible by e-commerce (Ha Nguyen, 2017).

Bowersox *et al.* (2013) state that there are four critical flows that are essential for supply chain intergration, namely:
(a) Product/ service value flow – the flow of material through the supply chain as value is added to the material at every stage,
(b) Market accommodation flow – the process of acquiring information from the market.
(c) Information flow – the flow of information across the supply chain, which informs every other flow in the supply chain as it initiates them.
(d) Cash flow – the flow of cash from customer to supplier in exchange for products and services at every stage of the supply chain. (See the stages of the supply chain in Figure 2.1.)

A case may be made that information flow is the most critical flow, as it initiates, controls and records the other flows. Bowersox *et al.* (2013) also indicate that the paper-based information flow used in past years has been replaced by e-commerce systems such as EDI and other web-based connectivity systems. The literature review to this point suggests that a conclusion could be made that the complexities associated with collaboration in a 21st century supply chain requires capable e-commerce infrastructure. Nanehkaran (2013) indicated that communication systems, data management systems and security are the main components of e-commerce. It follows, therefore, that the drive to adopt e-commerce could be linked to the ability of its main components to manage information flow in a transparent, speedy, accurate and secure manner. Computers process data at speed with a high level of accuracy and security, which positions electronic transactions in e-commerce as an enabler of business interactions. Based on the above, the conclusion could be drawn that e-commerce provides a suitable platform on which collaboration in supply chain can operate with transparency and therefore trust.

The introduction focused on an overview of 21st century supply chains, collaboration and e-commerce. The next section focusses on the investigational framework that links supply chain collaboration to business suitability through three high level constructs (Figure 2.3):

a) High level linkage 1 (collaboration, supply chain costs and access to infrastructure): The link between (a) supply chain collaboration and (b) a reduction in supply chain costs and improved utilisation of infrastructure in facilities (i.e. manufacturing, logistics activities),

as well as (c) a reduction in supply chain costs and improved utilisation of infrastructure services (i.e. financial management activities and procurement activities).

b) High level linkage 2 (supply chain costs, infrastructure, profitability and ROA): The link between (b) and (c) improved supply chain costs and access to and utilisation of infrastructure, and (d) profitability and ROA/(efficiency).

c) High level linkage 3 (supply chain costs, infrastructure, profitability, ROA and business sustainability) links the following constructs:

- (b) Reduce supply chain costs and improve access to infrastructure relating to supply chain facilities (e.g. manufacturing, logistics, R&D), (e) business sustainability - savings for unfavourable periods, as well as (f) business sustainability - re-investment for growth.
- (c) Reduce supply chain costs and infrastructure relating to supply chain services (financial and procurement) to (e) business sustainability - savings for unfavourable periods, as well as to (f) business sustainability - re-investment for growth.
- (d) improved profitability, efficiency (ROA) to (e) business sustainability - savings for unfavourable periods, as well as to (f) business sustainability – re-investment for growth.

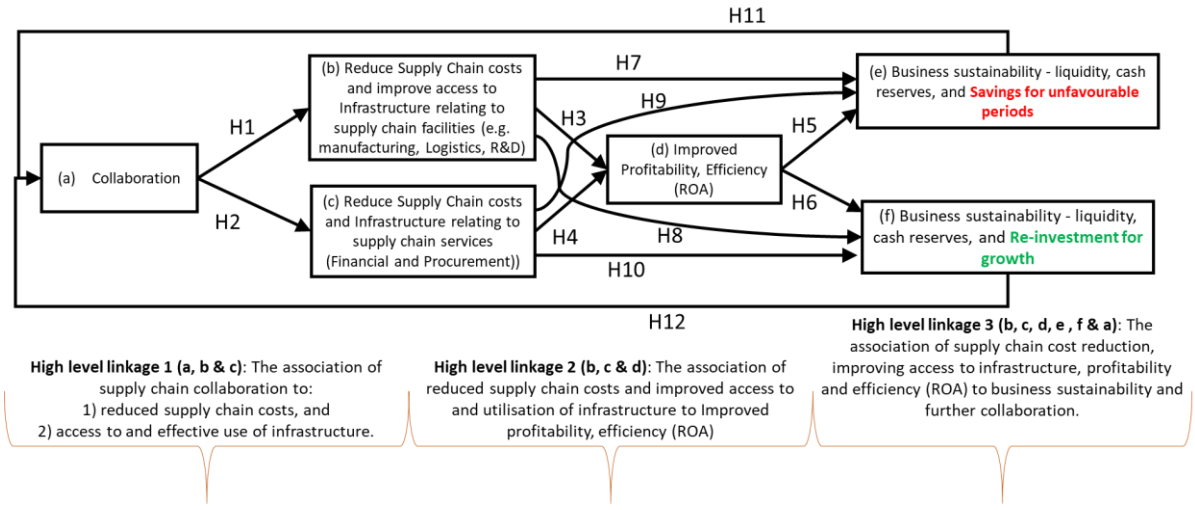

Figure 2.3: Investigational framework

2.2 High level linkage 1

Figure 2.4 illustrates how collaboration leads to reduced supply chain (SC) costs and improved access to and use of infrastructure. Hypothesis 1 states: “Collaborative supply chains lead to a reduction in supply chain costs and access to and efficient utilisation of supply chain facilities”.

Hypothesis 2 states: “Collaborative supply chains lead to a reduction in supply chain costs and access to and efficient use of supply chain services. The link is made for each of the areas of collaboration: firstly, supply chain facilities such as manufacturing, logistics, marketing and R&D; and secondly, supply chain services such as procurement and financial services.

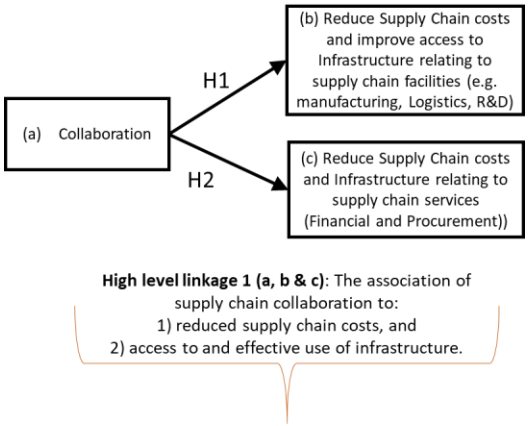

Figure 2.4: High level linkage 1 – the link between collaboration and reduced supply chain costs, as well as improved use of infrastructure.

2.1.1 H1: (a) collaboration leads to (b) reduced supply chain costs and improved access to and efficient infrastructure utilisation of supply chain facilities (e.g. manufacturing, logistics, R&D …).

From a manufacturing perspective, Oeser (2010) asserts that, in situations where demand is stochastic, capacity pooling offers an opportunity to achieve high service levels with low investment in capacity. This is a great development, as manufacturers are able to connect in a way that benefits all entities in the connected network and allows organisations to share the costs of manufacturing/ production. This means that it allows organisations an opportunity to access and utilise resources that they would otherwise not have access to. One of the practices in capacity pooling is contract manufacturing. Pandya and Shah (2013) define contract manufacturing as a form of outsourcing whereby one company manufactures on behalf of other companies, this service often also extends to logistics where the contract manufacturer handles material ordering, movement, storage and shipment of finished goods. In the packaging plant, for example, a few skin care companies can use the same production facilities as their complementary providers for formulation and packaging.

This approach is also applicable to the manufacturing environment, where collaboration between primary, secondary and tertiary or finishing manufacturers takes place. For instance, a steel product supplier (in the collaborative network) that cannot afford to buy a CNC machine or does not have enough business to justify buying a CNC machine, outsources all its steel cutting work to a cutting business in the network and there is discounted cutting or discounted steel prices for all business in the network.

"Logistics involves the management of order processing, inventory, transport, and the combination of warehousing, material handling, and packaging, all integrated throughout a network of facilities" (Bowersox *et al*., 2013, p.29). Bowersox *et al*. (2013, p.29) state: "Logistics is the leadership responsibility to design and administer systems to control movement and geographical positioning of raw material, work-in-process, and finished inventories at the lowest total cost". Bowersox *et al*. (2013, p.35) further assert: "Transportation requirements may be satisfied in three basic ways, private fleet, contract with a dedicated transportation specialist, and engagement with a wide variety of carriers that provide different transportation services as needed on a per shipment basis". It may be deduced that requirements for other aspects of logistics such as warehousing, material handling, order processing and inventory management may be satisfied in a similar manner. This paper highlights at least two ways in which collaboration may reduce supply chain costs:

a) Reduced costs:
    a. This could be achieved by sharing the cost of utilising the service among the entities in the network.
    b. Applying group discounts associated with a large network or key accounts.
b) Reduced risk:
    a. Financing - This is achieved by avoiding financing associated with buying or building large facilities or equipment.
    b. Flexibility:
        - The flexibility to opt in and out of the commitment as per business requirements (increasing the stake in peak times, and reducing the stake in slow times).
        - The ability to move the business from one location to another if the need arises (business requirements change or there is an accident or disaster of any sort).

In the case of transportation, full load shipments and backhauls have reduced costs significantly(Joshy & Regikumar, 2014). Both these aspects of operations are known to be a challenge for large organisations, which have significantly more products and units to move, store and handle. Joshy and Regikumar (2014) estimate that a 25% saving in logisitcs expenditure may be attained through backhauling: "In backhauling the trucks after delivering goods, returning to original destination in empty condition are being hired by another company and they are loading the vehicle with their product and shipped to the destination which will be near or on the way to the starting point of vehicle. This will save one fourth of expenditure in logistics" (Joshy & Regikumar, 2014, p. 660).

In terms of R&D and marketing, Global Entrepreneurship Monitor (GEM) indicates that low sales due to market presence and access to market are among the top three reasons why businesses close (Herrington, Kew, & Mwanga, 2017).

Marketing is normally considered part of services, but in this paper it is considered a facility, as it is proposed that it is closely related to R&D in ensuring business sustainability, particularly with regard to growth. Businesses often consider marketing and R&D as a 'nice to have' and therefore given the least amount of attention. However, Simester *et al.* (2006) showed that current advertising has a positive impact on both short-term and long-term sales, as the positive impact has a long-lasting impact, in terms of increasing market share. Simester *et al*. (2006) also found that advertising attracted new customers who continue to buy even after the advertising/ promotion period had lapsed.

Vanderpal (2015) showed a strong positive correlation between R&D expenditure and company financial performance (revenues, net income, equity and ROE). It is well documented that sound marketing and R&D strategies and activities can improve revenue, yet these core business drivers are usually given the least amount of attention and are poorly resourced (Vanderpal, 2015). The challenge (with regard to marketing and R&D) with small business, as with any acquisition of state-of-the-art capability or resources is the cost associated with such specialised resources in comparison to perceived return on investment (ROI) (Simester *et al*., 2006; Vanderpal, 2015). Marketing and R&D are closely related to demand, which means these functions are critical for the success of any supply chain strategy, as demand dictates how a supply chain should operate in the 21st century (Jüttner al., 200&. Therefore, marketing, R&D and demand planning should be strategically resourced. Based on collaboration models

executed in supply chain areas such as logistics and manufacturing, it could be deduced that collaborating could also reduce costs related to marketing and R&D.

2.1.2 H2: (a) collaboration leads to (c) a reduction in supply chain costs and improved utilisation of infrastructure services (i.e. financial management activities and procurement activities).

Bakker *et al*. (2008, p.298) define collaborative procurement as, "the horizontal collaboration between two or more organisations during one or more steps of the purchasing process". Bakker *et al*. (2008) further cites two main advantages that can be gained from horizontal collaboration in procurement, as indicated by Jost, Dawson & Shaw (2005), namely: improved efficiency through a reduction of transaction costs and increased economy of scale by bundling purchasing volumes; increased effectiveness as a result of learning from each other and better use of resources.

In terms of improved supply chain costs, benefits could be gained by bundling purchases in the network. Bakker *et al.* (2008) cite three factors that affect transaction cost, i.e. uncertainty, asset specificity and frequency of transactions. Bakker *et al*. (2008, p.306) further referenced Beeverland (2001), who stated: "In the context of collaborative procurement, potential benefits are related to reducing the uncertainty experienced by each individual organization … volumes may be bundled leading to a reduction of resource-use per volume and lower purchase prices". In cases where the specificity is very high, transactional costs could be reduced by types of collaboration such as lead-buying and piggy banking. Lead-buying refers to consortium-based purchasing that services members in a network in response to their purchasing requirements (Bakker, *et al*., 2008). Bakker *et al*. (2008) also indicate that members of the consortium could agree on the extent of formalisation of the buying process and the extent to which they have dedicated staff to service the consortium. This allows for customisation of the process to suit the consortium's needs.

In terms of improved infrastructure, benefits could be obtained by accessing state-of-the-art resources through collaboration. Bakker *et al*. (2008) indicate that, in addition to accessing these resources, collaboration could be used to free up internal resources to develop the skills required to meet the evolving demands made on the purchasing function. It may be deduced

from Jost *et al*. (2005) and Bakker *et al*. (2008) that there is an opportunity to access strategic skills without bearing the full cost associated with accessing these skills. This could be achieved through collaboration, with a cluster of organisations sharing strategic resources and therefore the cost of utilising resources is reduced. A model that exemplifies this approach is the outsourcing of specialised work to third party providers of the work (Bowersox *et al*., 2013). Furthermore, it may be deduced that a cluster of organisations could form their own pool of specialised functions that service the network under pre-determined terms and conditions. One of the benefits that may be gained from this approach is better utilisation of resources, so that the resources in the organisation can focus on their core competencies, differentiating factors and unique value propositions.

From a financial perspective, Ross, Westerfield and Jordan (2008) explain that the goal of financial management is to maximise the current value per share of the existing stock. They further indicate that this is done by performing three primary functions (Ross *et al*., 2008):

1. Capital budgeting – management and planning of the organisation's long-term capital.
2. Deciding on the capital structure – the way in which the "organisation obtains and manages the long-term financing it needs to support its long-term investments".
3. Working capital management – managing the organisation's short-term assets (such as inventory) and its short-term liabilities (such as money owed to suppliers). It involves ensuring daily that the organisation is sufficiently resourced to operate without interruption.

Collaboration in terms of financial management could improve the organisation's financial decision making in the following ways, based on the model of Shared Service Centres (SSC) cited by Constantin (2018):

a) Standardised processes that lower the potential for error. She also notes: "With standard processes, it is easier to design and update the control environment, and it is also easier to build consistent input and output reports. The outcome is that the entire review work is stream-lined, and iterations are reduced."
b) "Cost savings: automation and process improvement can reduce costs substantially."
c) Up to date data collection, analysis and reporting.

The model used by Legendary Retail Brands (LRB), suggests that similar benefits could be gained from financial collaboration.

The literature review presented demonstrates that high level linkage 1 collaboration reduces supply chain costs and enables businesses to improve access to and utilisation of infrastructure. Therefore, H1 and H2 are formulated from a South African SMME perspective. High level linkage 1 demonstrates how collaboration models could be implemented to obtain a competitive advantage.

Having reviewed the literature related to construct 1, the literature relating to construct 2 is reviewed next.

2.3 High level linkage 2

Figure 2.5 illustrates that reduced supply chain costs and improved access to infrastructure lead to improved profitability and efficiency (ROA). High level linkage 2 consists of hypothesis 3 (H3) and hypothesis 4 (H4), which are detailed below:

(i) H3: (b) Reduced supply chain costs and improved access to infrastructure relating to supply chain facilities (e.g. manufacturing, logistics, R&D) leads to (d) improved profitability and ROA.

(ii) H4: (c) Reduced supply chain costs and infrastructure relating to supply chain services (financial and procurement) leads to (d) improved profitability and ROA.

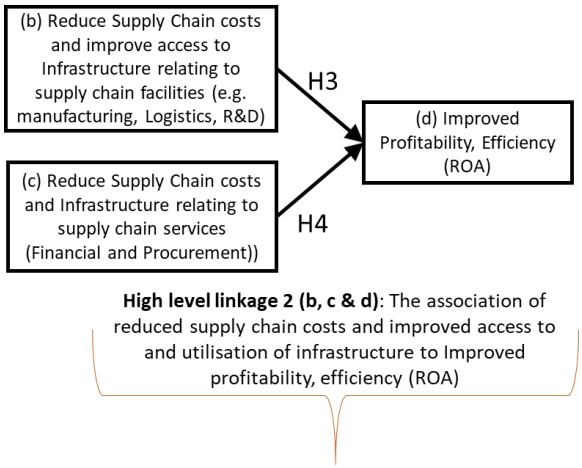

Figure 2.5: High level linkage 2 - the linking reduced supply chain costs and improved utilisation of infrastructure to improved profitability and ROA

High level linkage 1 focuses on the link between collaboration and reduced supply chain costs and access to infrastructure. High level linkage 2 focuses on: how reduced supply chain costs, infrastructure and access to infrastructure lead to profitability and ROA. Therefore profitability and ROA and how supply costs and access to infrastructure relate to them are discussed next.

Pomponi *et al.*, (2013) indicate that the number one aim of horizontal collaboration (particularly in logistics) is cost reduction. (See Figure 2.6 below).

Authors\Aims	1	2	3	4	5	6	7	8	9	10	11	12	Total
Bititci *et al.* 2004	X				X								2
Cruijssen 2006	X		X	X			X	X					5
Mason *et al.* 2007	X									X			2
Cruijssen *et al.* 2007	X	X				X			X				4
Lehoux *et al.* 2009	X	X	X										3
Bahinipati *et al.* 2009	X										X	X	3
Leitner *et al.* 2011	X	X	X	X									4
Total	7	3	3	2	1	1	1	1	1	1	1	1	

Legend: 1= Cost Reduction; 2 = Customer Service; 3 = Increased responsiveness; 4 = Social relevance (especially environmental issues); 5 = Value Creation; 6 = Improved productivity; 7 = Growth; 8 = Innovation; 9 = Improved Market Position; 10 = Better resource management; 11 = Reduced Supply Risk; 12 = Networking

Figure 2.6: Literature analysis done by Pomponi et al., (2013) on the aims of logistics horizontal collaboration.

Müller & Meyer (2019) showed that access to cash can be improved through cost savings gained through horizontal collaboration. They show that the benefits of collaboration between P&G and Tupperware in Belgium and Greece were as follows:

1. 17% reduction in logistics costs and a reduction of over 200 tons of CO2 emissions (cost reduction).
2. Elimination of Tupperware truck to Greece (shared infrastructure).
3. 54% improvement in the load factor of trucks (improved utilisation of infrastructure).

Tulsian (2014, p.19) defines profitability as "the ability for a given investment to earn a return from its use". Tulsian (2014) also believes that profit has no relevance as a measure to compare the efficiency of a business organisations. Furthermore, profitability is described as a relative concept, as opposed to profit, which has an absolute connotation. The following example can be used: If an organisation (ceteris paribus) made a loss of R10m in 2017, and a loss of R6m in 2018, the company may have reported that it utilised its resources more efficiently in 2018 than in 2017, and therefore improved its ability to generate a return from the use of its assets.

Asset turnover ratio is described by CFI (2015) as a measure of the "efficiency with which a company uses its assets to produce sales". In reference to previous sections in the literature review, two examples can be used to illustrate asset use efficiency, i.e.: maintaining the same sales with reduced asset utilisation (Joshy & Regikumar, 2014) and more sales with the same or less assets (Pilat & Schreyer, 2001; Phusavat, 2013); more frequent collection of cash from debtors by improving the cash cycle (Nour, Musa, & Zorqan, 2012). Firstly, in the example of

P&G and Tupperware, Tupperware was able to service Greece without using any of its delivery component, which is a form of maintaining sales while reducing asset utilisation. If this is done sustainably, Tupperware may decide to sell some of its fleet and reallocate the cash to more profitable avenues. Secondly, in reference to collaborative procurement, a cluster of the network may negotiate a 'pay as you use' arrangement of the asset allocation, so that organisations in the network do not bear the full cost that comes with single user ownership (D'Amours & Rönnqvist, 2010). The cluster could also agree on more mutually beneficial payment and collection terms with the suppliers they purchase from and the customers they service (Bowersox *et al*., 2013). Finally, in reference to collaboration in financial management, a more rigorous collection method may be enforced at a network level.

If an organisation could achieve similar savings to that demonstrated by P&G and Tupperware in other departments beyond logistics, it would be well on its way to making a sustainable profit (depending on how far it is from reaching break-even point). An overall deduction could be made that a consistent increase in profitability (increasing the profit to revenue ratio) and improvement in asset use efficiency (increasing the revenue to assets ratio / ROA) work towards sustained profitability. This will, in turn, provide free cash flow (cash that the organisation is free to distribute to creditors and shareholders) (Ross *et al*., 2008)to the organisation. Therefore, it could be concluded that reduced supply chain costs (improved profitability) and improved utilisation of infrastructure through collaboration leads to an increase in net working capital (particularly cash and cash equivalent reserves, which can be used in emergency cases and during market or economic downturn periods) and free cash flow (the cash that the organisation is free to distribute to creditors and shareholders).

High level linkage 2 indicates how reduced supply chain costs and improved access to and efficient utilisation of infrastructure lead to profitability and ROA. Therefore, H3 and H4 were formulated to demonstrate how these objectives can be achieved. Improved profitability and ROA achieved by reducing supply chain cost and improving access to and efficient utilisation of infrastructure may take many forms. An example is a cluster of organisations collaborating to share the use of a warehouse to reduce the cost burden and optimise space utilisation. This would impact on both the profitability and ROA of each organisation, as each organisation would pay less than it would if each organisation utilised the space alone, as the organisations would use only the space that they require (not more), which would improve their ROA.

In the P&G and Tupperware case study, the savings were made on fleet load collaboration alone; therefore, it could be deduced that additional savings may be realised by collaborating in terms of other supply chain activities, such as procurement, warehousing and manufacturing. Depending on the financial status of the SMMEs, savings such as the ones made by the P&G and Tupperware integration may be the difference between profit and loss. This is a move in the right direction with regard to profitability.

ROA is based on an optimal balance between revenue and assets (Ross *et al*., 2008), i.e. maximising the revenue to assets ratio. This would indicate that assets are being used efficiently. The use of shared infrastructure alleviates the pressure of purchasing resources that the business does not require on a permanent basis, which allows the business to share the cost of use with other organisations - thereby improving efficiency.

2.4 High level linkage 3

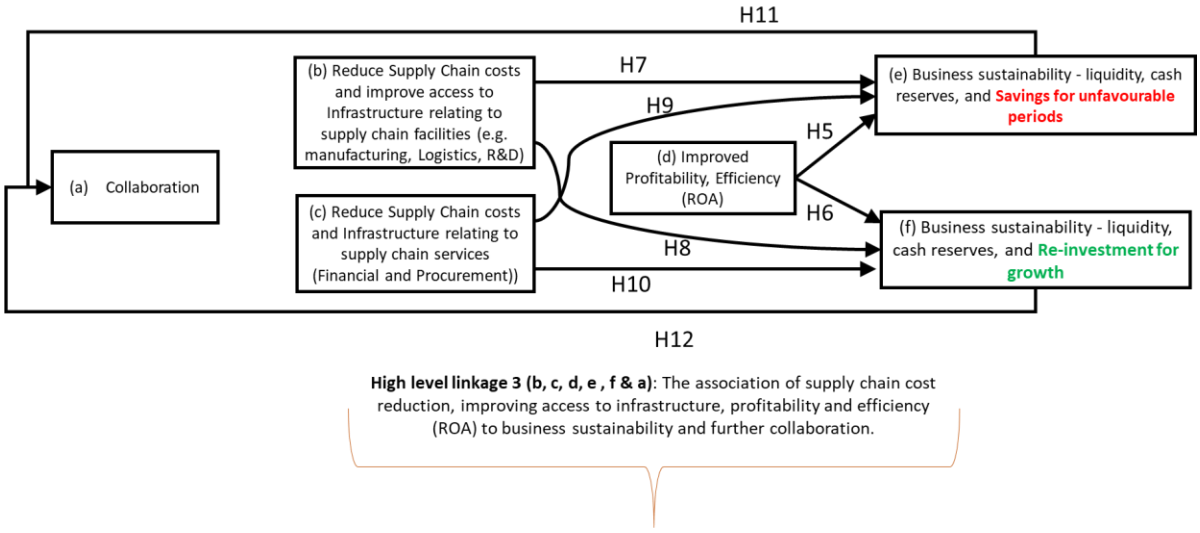

Figure 2.7: High level linkage 3: linking reduced supply chain costs, access to infrastructure, improved profitability and ROA to business sustainability, and therefore to further collaboration.

Figure 2.7 illustrates High level linkage 3, which follows on from high level linkage 2 and consists of H5, H6, H7, H8, H9, H10, H11 and H12. Each of the hypotheses are first presented below and causal explanations are then provided with supporting literature references:

(i) H5: (d) Improved profitability and efficiency (ROA) lead to (e) business sustainability (saving for unfavourable periods). Profitability and efficiency (ROA) lead to liquidity, which enables organisations to build cash reserves and access free cash flows, thereby enabling them to save for unfavourable periods, which is a strong mitigation against discontinuation of a business (Nour, Musa & Zorqan, 2012; Summer, 2018).

(ii) H6: (d) Improved profitability and efficiency (ROA) (f) business sustainability (re-investment for growth). Profitability and efficiency (ROA) lead to liquidity, which enable organisations to build cash reserves and access free cash flows, thereby enabling them to re-invest for business growth, which is a strong mitigation measure against closure (Ross *et al*., 2008; Kieso, Weygandt & Warfield, 2013).

(iii) H7: (b) Reduced supply chain costs and improved access to infrastructure in terms of supply chain facilities (e.g. manufacturing, logistics, R&D) lead to (e) business sustainability (saving for unfavourable periods) (Nour *et al*., 2012; D'Amours & Rönnqvist, 2010; Ross *et al*., 2008).

(iv) H8: (b) Reduced supply chain costs and improved access to infrastructure in terms of supply chain facilities (e.g. manufacturing, logistics, R&D) lead to (f) business sustainability (re-investment for growth) (D'Amours & Rönnqvist, 2010; Ross *et al*., 2008; Brigham & Houston, 2016; Liedholm, 2002).

(v) H9: (c) Reduced supply chain costs and infrastructure in terms of supply chain services (financial and procurement) lead to (e) business sustainability (saving for unfavourable periods) (Nour et al., 2012; D'Amours & Rönnqvist, 2010; Ross *et al*., 2008; Constantin, 2018).

(vi) H10: (c) Reduced supply chain costs and infrastructure relating to supply chain services (financial and procurement) lead to (e) business sustainability (saving for unfavourable periods) (D'Amours & Rönnqvist, 2010; Ross *et al*. 2008; Constantin, 2018; Brigham & Houston, 2016; Liedholm, 2002)).

(vii) H11: (e) business sustainability (saving for unfavourable periods) leads to more (a) collaboration in supply chain activities. It could be inferred that if a business can demonstrate that collaboration has improved its sustainability, it would trigger the leadership of the small business to seek more collaboration opportunities (Bowersox, 2013).

(viii) H12: (f) business sustainability (re-investment for growth) leads to more (a) collaboration in supply chain activities. This infers that if a business could demonstrate that collaboration has improved its sustainability, this would trigger the leadership of the small business to seek more collaboration opportunities (Bowersox *et al*., 2013).

In terms of profitability, ROA, liquidity and business sustainability, Ross *et al*. (2008, p.22) assert: "Liquidity is measured by the speed and ease at which an organisation can convert an asset into cash without a significant loss in its value". Ross *et al*. (2008) also state that liquidity

comes with a trade-off between foregoing potential profit (as the most liquid assets, such as cash, often have the least potential to earn a profit) and being less likely to experience financial distress (difficulty in paying debts and buying needed assets). In the context of collaboration and literature reviewed in previous sections, liquidity should be increased where necessary in to reduce supply chain costs (thereby improving profitability) and sharing infrastructure (thereby improving efficiency – ROA).

Ross *et al.* (2012, p.479) also state: "The use of debt to finance the organisation carries the possibility of financial distress", which occurs when the organisation fails to meet its full financial obligations. This can be defined in several ways, including: an organisation that is "terminated with loss to its creditors"; an organisation whose "liabilities are equal to or greater than its assets and an organisation that is unable to meet its financial obligations" (Ross *et al*., 2012). The above does not imply that using debt to finance an organisation - especially a small business - equates to setting up for business failure. However, in a small business, where maintaining business activities in instances where suppliers demand quick payment, it takes longer to collect from customers and to recover from a market or economic downturn, it is a benefit to have cash reserves to utilise amid these challenges. To avoid financial distress, an organisation must determine its optimal short-term and long-term financing policies and capital structure.

The two main types of short-term financing policies are: flexible short-term financing policies; restrictive short-term financing policies (Ross *et al*, 2008). Flexible short-term financing involves: keeping a large cash balance and a large stock of marketable securities (non-inventory assets that can be converted to cash speedily and easily when needed); making a large investment in inventory; granting liberal credit terms, in order to attract sales, which results in high levels of accounts receivables (Ross *et al*., 2008). Restrictive short-term financing policies involve: keeping a small cash balance and few marketable securities (non-inventory assets that can be converted to cash speedily and easily when needed); little investment in inventory; few or no credit sales, thereby minimising accounts receivables (Ross *et al*., 2008). The short-term financing policy is an input to the optimal management of net working capital and cash flow.

CFI (2015) defines net working capital (NWC) as "the difference between a company's current assets and current liabilities on its balance sheet. It is a measure of a company's liquidity and its ability to meet short-term obligations, as well as fund operations of the business. The ideal

position is to have more current assets than current liabilities, and thus have a positive net working capital balance". This is a challenge for small businesses, as: (a) due to their size, they are not able to spend enough to qualify for large business discounts; (b) their customers often do not pay them in the agreed time, which places pressure on their cash flow and working capital. It is important to view the company's liquidity in terms of working capital and cash flow. This is because the company may indicate a high working capital, however this might indicate that the business has high inventory. Using both lenses is well aligned with the approach of also using working capital cycles as an indicator. Working capital cycle is described by CFI (2015) as "the length of time it takes to convert net working capital (current assets less current liabilities) into cash. Businesses typically try to manage this cycle by selling inventory quickly, collecting revenue from customers quickly, and paying bills slowly, to optimize cash flow".

CFI (2015) describes cash flow as "the increase or decrease in the amount of money a business, institution, or individual has. In finance, the term is used to describe the amount of cash (currency) that is generated or consumed in a given time period" (CFI, 2015).

Based on the importance of liquidity, it could be concluded that the following aspects of a business must be optimised (and particularly in a small business) :

a. Cash flow
b. Working capital
c. Paying bills slowly
d. Collection of revenue from customers.

It could further be deduced that if a business is unable to manage the above, it may face the following challenges:

a. Running out of cash and not being able to pay suppliers, staff and other debtors (financial obligations).
b. Inability to save for economic downturns and to invest in growth activities.
c. If the inability to manage liquidity occurs for a protracted period, the closure of the business becomes a real possibility.

It could further be deduced that access to cash would alleviate the pressure of being unable to meet financial obligations, as it would provide a buffer for times when managing the working capital cycle is not possible (e.g. if customers take longer than normal to make payments, or if

there is a downturn in sales), which will provide an opportunity to invest in innovation and growth opportunities. Therefore, improvement in liquidity could be realised through supply chain collaboration.

Brigham and Houston (2016) define free cash flows (CFC) as "the amount of cash that could be withdrawn without harming a firm's ability to operate and to produce future cash flows" (Brigham & Houston, 2016). Kieso *et al.* (2013) define it as "discretionary cash flow - otherwise cash available for a company to purchase additional investments, retire its debt, purchase treasure stock, or simply add to its liquidity" (Kieso *et al.*, 2013). A combination of the above definitions is used in this paper to indicate the cash that a business has available to save for unfavourable periods, re-invest for growth, pay creditors or distribute to investors/ shareholders.

Liedholm (2002) demonstrates the proportion of growth to business sustainability in terms of employee number growth. Liedholm (2002) also indicates that an organisation that has grown its number of employees by 1% during the observed year is 5% more likely to survive the year. They further suggest that organisations that experience growth are more likely to survive than those that do not. Based on these assertions, it is important to consider re-investment of free cash flows as an important option for business sustainability. Growth is one of the indicators of an organisation's sustainability and another is saving for unfavourable periods.

Summer (2018) asks the following questions to illustrate the importance of having cash saved for unforeseeable business challenges: "What if it's month-end and you're still waiting for that large corporate or government entity to pay for services you delivered three months ago? How will you pay your staff and suppliers when you're having cash flow problems?" Summers (2018) further suggests: "Every small business and every small business owner should be looking to save, especially given an uncertain global economic outlook and the challenges of accessing financing".

Sage (2017) and Bailey (2018, p.22) cite the following regarding delayed payments for SMMEs:

a) "52% of South African Small & Medium Businesses experience direct negative impacts from late payments (Pateman, Cahoon, & Chen, 2016).

b) 28% say they struggle to pay bonuses around the festive period.
c) 34% say they pay suppliers late.
d) 28% say they delay investments into their businesses."

This research seeks to explore the impact of saving on small businesses and the impact of savings on an SMME's sustainability.

Ross *et al*. (2008) further assert that the optimal policy is flexible short-term financing, which implies building cash reserves and having little short-term borrowing.

The goal of finaacial management in an organisation has already been explained as "to maximise the current value per share of the existing stock", which may also be a definition of maximising shareholder value or return on invested capital. It may be deduced that building cash reserves and ensuring free cash flow are key elements of achieving this objecitve. Cash reserves and free cash flows can be used in the following ways: cash reserves can be used to finance the short-term activities of the organisation, thereby minimising the need for borrowings. Free cash flows can be reinvested into the business (thereby growing the business), used to service creditors (thereby improving the organisation's credit rating and making it attractive to creditors) or distributed to shareholders (thereby improving market perceptions and attracting investors) (Brigham & Houston, 2016; Kieso *et al*., 2013).

Herrington *et al.* (2016) indicate that lack of profitability and access to finance are the biggest threats to SMME sustainability, and account for 67% of small businesses closing. Herrington *et al.* (2016) attributes lack of profitabilitiy to a lack of business skills, lack of marketable ideas (innovation), lack of access to markets, lack of support strucutures and infrastructure, and operating in over-traded sectors that have a low profit margin.

High level linkage 3 draws the link between reduced, supply chain costs, access to infrastructure, profitability, ROA, building cash reserves and increasing free cash flow to improve business sustainability. High level linkage 3 also demonstrates a link between improved business sustainability gained through collaboration and further collaboration.

It is on this basis that H5, H6, H7, H8, H9, H10, H11, H12 were formulated.

High level linkages 1 to 3 are aimed at utilising collaborative models to contribute to addressing cited reasons for business discontuation, namely, access to finance, profitability, access to infrastructure, low levels of R&D (Herrington *et al*., 2016). This research proposes that collaboration allows SMMEs to obtain group supply chain cost savings that they would not be

able to obtain as individuals. Furthermore, it is proposed that collaboration also anables SMMEs to access support services (finance and procurement) and infrastrucutre (logistics, warehousing, R&D, information systems, manufacturing facilities, etc.) at a shared cost. Reduced supply chain costs and improved access to and use of infrastructure improves profitability and ROA; in turn, this improves the ability of a business to build cash reserves (which ensures short-term sustainability) and increases free cash flows (which ensures long term sustainability). Short-term sustainability is gained through cash reserves, because when a business has cash reserves, it can utilise the reserves to overcome unexpected challenges, whether it be late customer payments, long supplier terms or market and economic downturns. Long term sustainability is gained through free cash flows, in that when a business has free cash flows, it is able to: meet its long-term obligations; if necessary, reduce its debt; re-invest in the business for growth; or pay its shareholders a dividend, thereby making it an attractive business to borrowers and investors. The final hypotheses (H11 and H12) indicate that demostrating sustainability through collaboration would stimulate further collaboration between the business and other businesses in the SMME sector in South Africa.

2.5 Literature review key findings

The 21st century supply chain demands are very diffferent fro the traditional supply chain needs. In the 21st century supply chain high levels of agility, adaptability and alignment are required for success (Lee, 2004). This has both positive and negative implications for SMMEs. The positive implication in SMMEs stems from their ability to more easily pivot than their larger counterparts (Ries, 2011), meaning that they (SMMEs) are well positioned to take advantage of the demands of the 21st century supply chain. However, due to the lower levels of reserves and resources (as cmpared to large organisations), SMMEs are far less likely to recover from poor decision making. These (poor decisions in SMMEs) may result from the need to make rapid decisions required to respond to the ever changing needs of the customer without the capability needed to conduct detailed research in short spaces of time (Ashraf *et al*., 2015).

Deploying innovative appoaches is critical in responding to the 21st century supply chain demands as in the cases of LRB and Procter and Gamble innovative solutions to complex problems. One of these innovative apporaches is supply chain collaboration, which is one of the key topics explored in this research. The literature review revealed that horizontal supply

chain collaboration models/approaches (as oposed to vertical collaboration) enabled by technology, may be used to mitigate the challenges facing South African SMMEs. Technology (particularly e-commerce) has been identified as a key component in collaboration as it fosters and facilitates the neccesary business to business relational features required for a successful collaboration (van Sabben & van Wijk, 2018) and (Nanehkaran, 2013). These features include trust (Wilhelm, 2011), trnsparency (Schulz & Blecken, 2010), the successful functioning of the four critical supply chain flows (product/service, market accomodation, information and cash) (Bowersox et al., 2013), and data management and security (Nanehkaran, 2013).

The literature review asserts the proposed invetigation frame built on three high level constructs, namely;

a) High level linkage 1 which proposes that supply chain collaboration leads to cost reduction and improved access to and utilisation of infrastrucutre. This is predicted on the assertions of Oeser (2010) and Joshy & Regikumar (2014) who are proponents of capacity pooling and, full load shipments and backhauling respectively as collaborative means of reducing costs, accessing infrusatrucutre and improviing service levels. This linkage is also based on the assertions of Herrington, Kew, & Mwanga (2017), Simester *et al.* (2006) and Vanderpal (2015) who show that marketing, access to market and R&D have a positive impact on an organisation's financial performance and sustainability. However, as indicated by Simester *et al*., (2006) and Vanderpal (2015), marketing and R&D activities are perceived to have a low ROI. This linkage proposes that collaboration may lead to an improved ROI. The proposal is made that this may be achieved by collectively (by participants in the collaborative relationship) accessing state-of-the-art resources at a lower cost, whilst gaining the same or more return on the investment. This proposal is also supported by the assertions of Bakker *et al.* (2008) and Jost *et al.* (2005), and Constantin (2018) who make a similar case for collaboration in procurement activities and financial management activities, respectively.

b) High level linkage 2 which proposes that reducing supply chain costs while improving access to and utiliation of infrastrucutre leads to better profitability and effeciency (ROA). This linkage is predicated on the assertions of Tulsian (2014), CFI (2015), Joshy & Regikumar (2014), Pilat & Schreyer (2001), Phusavat (2013) and Nour, Musa, & Zorqan (2012); who indicates that essence of profitability and asset use efficiency is to move in the

direction in which the ratio between return and investment is increasing. (i.e. ratio return:investment is increasing over a specified period, whereby 'return' is increasing at a higher rate than 'investment' or decreasing a slower rate than investment). The linkage is also rooted in the statement of Ross *et al*., (2008) who indicates that ROA is based on an optimal balance between revenue and assets which would indicate that assets are being used efficiently whereby the revenue to assets ratio is maximised. The linkage proposes that both profitability and ROA may be increased by collaboration which allows organisations to access necessary infrastructure and sharing the cost of doing so.

c) High level linkage 3 which proposes that reducing supply chain costs while improving access to and utiliation of infrastrucutre as well as improved profitability and effeciency lead to business sustanability. This linkage is based on the assertions of Nour, Musa & Zorqan, (2012), Summer, (2018), Ross *et al.,* (2008) and Kieso, Weygandt & Warfield, (2013) who show that a profitable and efficient organisation is able to improve it's liquidity. Liquidity is important for SMMEs as it allows them (SMMEs) to build cash reserves and access free cash flows. These in tern enable an organisation to save for unfavouable times and/or re-invest in the business for growth, both of which are strong mitigation measures against business discontinuation (Nour, Musa & Zorqan, 2012), (Summer, 2018), (Ross *et al.*, 2008) and (Kieso, Weygandt & Warfield, 2013). Futhermore, based on the assertions of Nour *et al.,* (2012); D'Amours & Rönnqvist (2010); Ross *et al.,* (2008); Constantin (2018), Brigham & Houston (2016) and Liedholm (2002), the linkage proposes that reduced supply chain costs and improved access to and utilisation of infrastrucutre are essential for business sustainability.

Finaly, the investigational framework proposes that if an organisation was ably to use collablration as a innovative tool to improve its sutainability, it's leadership would seek more opportunity to collaborate (Bowersox *et al.,* 2013). In conclusion, the investigational framework therefore (supported by the literature review) propose that collaboration may lead to business sustainability and that this would lead to more collaboration.

Chapter 3

3 RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

To determine the appropriate design and methodology for this research, a literature review was conducted on research design and methodology. The research that was considered relevent and the conclusions drawn are detailed at the end of each section in this chapter.

Kothari (2012) describes research methodology as the methodological technique through which the research problem is solved. Ellis and Levy (2008) assert that the research methodology details the steps neccessary for the study to be conducted. Ellis and Levy (2008) also provide the three types of research methodology, i.e.: quantitative, qualitative and mixed methods. Leedy and Ormrod (2015) indicate that a mixed method is one that enables the researcher to utilise both quantitative and qualitative methods.

3.2 Research Methods (qualitative and quantitative)

Quantitative research methodology: Harwell (2011) explains that the aim of quantitative research is to maximise objectivity, replicability and generisability of outcomes. Leedy and Ormord (2015, p.23) assert that “quantitative research involves looking at amounts, or quantities, of one or more variables of interest”. Furhtermore, Leedy ad Ormord (2015, p.23) indicate that qunatitavive research “typically tries to measure variables in some numerical way” this may be done by using tools such as “tests, questionnaire and rating scales” (Leedy & Ormrod, 2015, p. 24). Newman and Benz (1998) note that the quantitative research approach is used when testing for confirmation or disconfirmation of a hypothesis.

Qualitative research methodology: Harwell (2011) explains that qualitative research relates to understanding the opinions and experiences of individuals regarding a phenomenon. Leedy ad Ormord (2015, p.24) state that “qualitative research involves looking at charecteristics, or qualities that cannot be entirely reduced to numerical values”. Newman and Benz (1998) note that most qualitative research approaches relate to the individual phenomonological perspective. Newman and Benz (1998) also state that qualitative research relates to formulating

a theoretical point of view based on investingating and understanding the experiences of people using observation.

Based on the literature review on the two research methodologies (qualitative and quantitative), the apparopriate methodology determined for this research is the quantitative mehodology, based on the following reasons provided in the literature:

- In line with Harwell (2011), the aim of this research is to maximise the objectivity, replicability and generability of the outcome. This is more aligned with the quantitative method, rather than with understanding the opinions and experience of individuals, which is aligned to qualitative research. The rationale is that the research question, sub-questions, hypotheses and investigation framework require objectivity, replicability and generability of outcome from the reseach in a way that correlates (in the general sense) collaborative supply chain techniques that have historically demonstrated success to business sustainability for SMMEs. The intention is to utilise research results from an appropriate sample of South African SMMEs as a representation of the broader population.
- The research also seeks to: (a) explore a common reality that people can agree on, rather than indicate an individual perspective; (b) test for confirmation of the hypothesis, rather than formulating a theoretical point of view based on observations made by the researcher.
- Quantitaive methodology is more suitable methodology for this research as it seeks to obtain an objective view. This stems from using the results from a questionnaire and expert interviews to statistically and numerically test the correlation and cause and effect relationships between supply chain collaboration and business sustainability (Leedy & Ormrod, 2015). In order for a reliable conclusion to be made without bias, the research is to be done through the use of data collection and quantitative analysis, with the researcher being detached from the study and not immersed in it.

The research review led to the conclusion that the quantitative research methodology is more appropriate for this research than the the qualitative methodology.

Having discussed the research methodology utilised for this research, the research design is discussed next.

3.3 Research Design

Kothari (2004) explains that the research design involves detailing the methodological procedure used to conduct the research. Leedy and Ormord (2015) puts emphasis on the following research designs; descriptive, experimental, quasi-experimental, ex post facto and factorial research designs. These were the quantitaive research design explored to direct the research.

3.3.1. Descriptive research design

Leady & Ormord (2015, p.154) assert that descriptive reearch design "involves either identifying the characteristics of an observed phenomenon or exploring possible associations among two or more phenomena". Under this category, Leedy and Ormord (2015) highlights research designs such as 'observation studies' which involves observing certain behaviours of people, animlas, plants or nonliving objects. The authors also cite correlation research design and developmental research designs which relate to the extent of assiciation between two or more variables (correlation research) , and the study of how people, animals, plants, objects or phenomina devolp over time (developmental research). Finally Leedy and Ormord (2015, p.159) cite 'survey research' which "involves acquiring information about one or more groups of people—perhaps about their characteristics, opinions, attitudes, or previous experiences—by asking them questions and tabulating their answers". This typically involves questionnaires and interview (Leedy & Ormrod, 2015).

3.3.2. Experimental research design

This involves the consideration of many factors that may influence a phenominon, then controlling all variables that are not the focus of the study, this is to ascertain the impact of the indepented variable on the controlled phenomenon (Leedy & Ormrod, 2015).

3.3.3. Quasi-experimantal research design

Quasi-experimantal design is applicable when the resulting behaviour of a phenominon may be attributed to a variable either than the focus independent variable. In this research design it is critical to take all all variable not controlled for into consideration (unlike in experimental where all variables excepts the focus variable are controlled for) (Leedy & Ormrod, 2015).

3.3.4. Ex post facto research design or causal comparative design (Kabir, 2016)

This research design explores the cause and effect relationship between a variable that has already occurred on subsequent variables (Leedy & Ormrod, 2015). Kabir (2016, p.130) asserts that causal comparative research design is aimed at measuring the "impact that a specific change will have on norms and assumptions". Kabir (2016, p.130) also indicates that "causal effect (nomothetic perspective) occurs when variation in one phenomenon, an independent variable, leads to or results, on average, in variation in another phenomenon, the dependent variable".

3.3.5. Factorial design

Factorial design is appropriate when atudying the effect of two or more independent variables on a dependent variable as well as their (the independent variable) interaction as with each other as they influence the dependent variable (Leedy & Ormrod, 2015).

Although the all the above have a ceratin level of relevance to this reseach, it was conculded that the survey research, which was noted under decriptive research designs, is the most appropriate. Furthermore, although the research seeks to investigate the impact of supply chain collaboration on business sustainability, causal comparative design is not the most appropriate as it requires for more control than is possible for this research.

In order to assess the links between supply chain collaboration and business sustainability, reach a conclusive answer to the central question and sub-questions, and test the hypotheses relating to this research, the research design considered appropriate for this reseach is survey research which one of the categories of descriptive researh design (Leedy & Ormrod, 2015). A questionnaire was used as the primary data collection tool, and a focus group and statistical analysis tools were used as the intepretive tools.

Having discussed the research design approach, the research design process and tools are discussed next. The research design process and associated tools will be discussed in two main parts: data collection tool selection and tool design; sampling and data collection.

3.4 Data collection tool selection and design

An in-depth and broad review of the literature demonstrates that there is very little evidence of research being conducted on supply chain collaboration between SMMEs, particularly in South

Africa. To this end, the collection of primary data is best suited to this research. Watkins (2012) defines primary data as "data that is collected for the first time for use in the research", while secondary data refers to "data that has already been collected and can be used for the proposed research". Due to the limited time available and the size of the population, a questionnaire was utilised as the tool for collecting the data. Collis and Hussey (2009) describe a questionnaire as a tool used to collect primary data, with a sample of respondents being asked a list of questions relevant to the research at hand. They further note that the questions must be designed carefully and tested for reliability (Collis & Hussey, 2009). Collis and Hussey (2009) recommend that when designing the questionnaire, consideration should be given to three elements, namely:

- Developing question content.
- Designing the question sequence and overall questionnaire layout.
- Selecting the type of question to be used in each instance.

The three elements of questionnaire design are discussed next.

3.3.1 Developing questionnaire content

Watkins (2012) notes that the questions must have a clear link to the research objective, problem, central question, sub-questions and hypotheses. Furthermore, he indicates that the most important aspect of using a questionnaire is that the respondent understands the questions, in order to avoid assumptions and incorrect or unreliable data (Watkins, 2012). In addition, the literature review and the investigational framework were also used as input for the question content, to further ensure alignment between the questionnaire and the research objectives. To ensure that respondents understood the questions, the questionnaire was tested for validity and reliability. The validity and reliability test is discussed in the next section.

3.3.2 Designing the question sequence and overall questionnaire layout, selecting the type of question in each instance and crafting the wording.

Collis and Hussey recommend the following steps when designing a questionnaire:

1. Design the questions and instructions (Watkins, 2012).

For this research, a Likert scale was used with some questions for ease of data analysis and interpretation. The questionnaire includes a clear introduction and each section includes clear instructions on how to proceed through the questionnaire.

2. Determine the order of presentation (Watkins, 2012).

The investigation framework was used to determine the questionnaire layout and sequence, as the investigation framework guides the flow of hypotheses from collaborative supply chain through to business sustainability. (See Figure 1.1.)

3. Write the accompanying letter (Watkins, 2012).

The research was done online, therefore, a brief message containing an introduction and a request for response was sent. It included the link to the questionnaire. The email and the questionnaire indicated that the participants would remain anonymous, so as to ensure honest and transparent responses, and to adhere to the research code of ethics.

4. Pre-test the questionnaire with a small sample (Watkins, 2012).

- Face and content validity tests were done with a small sample and the feedback was used to refine the questionnaire. The face and content validity test were done with individuals from relevant fields, including SMME founders and owners, a financial expert, a business administration expert, a supply chain expert, an e-commerce expert and a business services expert.
- For details on the pilot test, please refer to point 7 below.

5. Choose a method for distribution and return (Watkins, 2012).

The method chosen was 'Google Forms', which allows for ease of distribution and collates all the responses in real time in one location.

6. Plan a strategy for non-responses (Watkins, 2012).

With non-responses, a follow up email was sent to verify that the correct email was used in the first place, and to remind the individual to respond. Furthermore, a non-response bias test was conducted to compare early respondents with late respondents, in accordance with (Armstrong & Overton, 1977). This was based on the rationale that late respondents align more to non-respondents than do early respondents (Siriram R. , 2016).

7. Conduct tests for validity and reliability (Watkins, 2012).

In addition to the tests conducted with a small sample, as indicated in 4.1 above, the refined questionnaire was sent to a broader group of people (the pre-test group) in the same fields as indicated in item 4.1. This was done to test for clarity, structure, relevance and wording. Further refinement was done to the questionnaire to incorporate the feedback. Finally, the refined questionnaire was sent to a pilot group of SMMEs and their responses were tested for reliability using the Cronbach Alpha test. The pre-test methodology followed by Siriram (2016) was adopted for this research, with 20 participants who tested the questionnaire for clarity, structure, relevance and wording. In the same sequence as suggested by Siriram (2016), the pre-test was followed by a pilot test on a sample of 20 participants. Thereafter, the Cronbach

alpha test was performed on the pilot test to test for reliability and Cronbach Alpha values below 0.5 were removed from the analysis (Hinton, Brownlow, McMurray, & Cozens, 2004).

3.5 Data collection and sample

After validity and reliability tests were conducted, and modifications were made to the questionnaire, the questionnaire was then sent to the main group via email. The emails were obtained from several small business directory databases. Google Forms was used as the medium of data collection, as it allows for ease of distribution and the data is automatically saved in one location. In order to maximise SMME reach, questionnaires were distributed to 534 SMMEs in the transformation sector (which includes manufacturing, transportation, construction, communication, utilities and wholesale distribution) and consumer service sector (which includes retail, motor vehicles, lodging and restaurants, personal services, education and recreational services) (Herrington *et al*., 2016/2017). Of the 534 questionnaires distributed, 117 were not delivered, resulting in a reach of 417 SMMEs. This was considered a sufficient sample size, on the basis of previous research evidence noted by Siriram and Snaddon (2005) and Swamidass & Kotha (1998). Of the 417 SMMEs reached, 59 SMMEs responded. This provided a 15% response rate, which was considered sufficient based on the approach cited by Siriram and Snaddon (2005) and Swamidass & Kotha (1998). Of the 59 responses received: 3 were unusable; 56 were usable and used for analysis. The data collection was done in accordance with the process followed by Siriram (2019) and Radics *et al.* (2017).

To test the degree to which the sample respondents represent the population, Siriram (2019) and Radics et al. (2017) recommend three methods, i.e.: a) non-response bias analysis using the t-test on several constructs, including demographics and industry type; b) a comparison between population demographics and sample respondents; and (c) chi-square distribution analysis. For this research, (a) and (c) were used.

Chapter 4

4 RESEARCH RESULTS

4.1 Analysis of results

The t-test done to assess the significance of difference between early respondents (those who responded without a follow up email) and late respondents (those who responded after a follow up prompt) (Armstrong & Overton, 1977) revealed no significant difference between the two groups on 29 of the 38 questions. Therefore, the 9 questions that revealed significant difference were removed from the results and the test was run for a second time. The second run revealed no significant difference on all 29 questions, affirming that non-response bias was not a major factor. To assess for outliers in the data, a chi-square analysis was conducted on the Mahalanobis distance, and all p-values were greater than 0.01. This indicates that the data had no outliers (McCune & Grace, 2002). Furthermore, a chi-square test was conducted to evaluate the degree to which the sample represents the population. This was done on three independent variables, i.e. industry, position in the organisation, and SMME size Siriram (2019). Table 4.1 shows the profile of the research sample in terms of these three dimensions.

Table 4.1: Profile of research sample

Position in company		
Executive	25	42,37%
Foreman/ Supervisor	4	6,78%
Manager	20	33,90%
Operator	2	3,39%
Sales	4	6,78%
Technician	4	6,78%
Industry		
Business/ Management Services	7	11,86%
Construction	4	6,78%
General Distribution	4	6,78%
Lodging, Catering and Restaurants	2	3,39%
Manufacturing	15	25,42%
Retail and Supplies	9	15,25%
Transportation and Logistics	8	13,56%
Travel and Tourism	1	1,69%
Utilities	5	8,47%
Wholesale Distribution	4	6,78%
Revenue of company		
< R1 million	13	22,03%
R1 million - R5 million	34	57,63%
R30 million - R70 million	3	5,08%
R5 million - R15 million	5	8,47%
R70 million +	4	6,78%

In terms of industry as an independent variable, 27 of the 29 dependent variables revealed no significant difference between the sample size and the population from which it was drawn. In terms of positions 28 of the 29 dependent variables revealed no significant difference between the sample and population from which it was drawn. In terms of organisation size, 23 of the 29 dependent variables revealed no significant difference between the sample and population from which it was drawn. The initial interpretation and motivation to retain the items that revealed significant differences are provided in Table 4.2 (a, b and c) below.

Table 4.2 shows the details for questions 16 and 30, which revealed a significant difference in the p-values. This was revealed when industry was used as the independent variable. The expert panel we consulted in interpreting the results and motivate to keep or remove the question suggested keeping these questions. The interpretation and motivation to retain the question are detailed in Table 4.2(a) Chi-square tests on industry as the independent variable.

Table 4.2(a): Chi-squares on industry as an independent variable

Independent Variable: Industry		
Question number	Question detail	P-value
16	16. To what degree would you be willing to collaborate in accessing manufacturing/ operating (machinery, equipment and infrastructure) facilities and sharing the cost of utilising the service and facilities?	0,034
Interpretation	Manufacturing, and transport and logistics indicated a high likelihood in willingness to collaborate in accessing manufacturing/ operations activities. All the other industries indicted low likelihood to this question.	
Expert panel input and motivation to retain question	The expert panel indicated the following regarding the results for this question: 1. The utilisation of "pool" infrastructure is well established in transport and logistics and more established than the rest in manufacturing which provides reference for respondents in these sectors and therefore increases the willingness due to familiarity.	

	2. Cost structures in these industries (manufacturing and logistics have higher fixed costs) may have made them more likely to collaborate to reduce the fixed costs than other industries in the SMME space. 3. Maturity of the industry – Manufacturing has moved into more recent ways of manufacturing (lean, agile, automation) – leading to the thinking, 'In order for me to be successful I don't have to hide what I'm doing'; therefore, the industry is more willing to collaborate. 4. Core of the business – relating to differentiator in a more commodity/ same product market, the value proposition/ unique value proposition has little to do with the supply chain but rather customer services … the core of these business is not necessarily ownership of infrastructure, but rather plugging into a network that enables them to reach their customers, and then focusing on other differentiating factors, i.e. bulk buyer supplying into a network that allows the customer to access the product. 5. Respondents who are not in the manufacturing environment may have struggled to interpret the question as the question may seem to lean towards a manufacturing environment.

Question number	Question detail	P-value
30	30. To what relative extent would the following be improved by better access to infrastructure (1 - 5 as indicated below) [ROA]?	0,017
Interpretation	All industries except for construction, utilities, lodging, catering and restaurants indicted a strong likelihood of better access to infrastructure improving their ROA.	

Expert panel input and motivation to retain question	The expert panel indicated the following regarding the results for this question: 1. It may be that businesses that have indicated a strong likelihood at this question are more engaged in their supply chain, and that their supply chain activities are a large part of their costs, they may also be more flexible in moving their business, whereas businesses like construction and lodging business are more location-based businesses and the largest part of their costs are at the location; material price plays a big part, but once material is delivered the location, internal process becomes far more important and often the supplier/ distributor supplies the transportation. 2. Depending on how their costs impact on their operation – sharing of infrastructure may not be a viable lever as their operating environment has strong element of unpredictability, which would lead to more costs being incurred, as they are more prone to and sensitive to variability than other industries. Therefore, collaborating may impact badly on their efficiencies or asset utilisation.

Table 4.2(b) shows the detail for question 33, which reveals a significant p-value. This was revealed when position was used as the independent variable. The expert panel suggested keeping this question. The interpretation and motivation to retain the question are detailed in

Table 4.2(b): Chi-square on position as an independent variable.

Independent Variable: Position		
Question Number	Dependent variables	P-value
33	33. To what degree would you build cash reserves to survive in unfavourable conditions if you had access to unencumbered cash?	0,08
Interpretation	Executives, Managers, Technicians and Sales personnel indicated a high likelihood to building cash for unfavourable conditions; although	

	2 (3,6%) managers indicated a least likelihood for this category Foreman indicated a moderate to more likely indication of building cash for unfavourable conditions. Operators accounting for 3,6% of respondents indicated a moderate/ neutral likelihood to building cash for unfavourable conditions.
Expert panel input and motivation to retain question	The expert panel indicated the following regarding the results for this question: 1. The results are reflective of executives, managers and sales having a strategic view of the organisations and more visibility of the market which makes them more prone to take a long term outlook on market conditions and therefore indicate the propensity to saving for the future more than other positions. 2. Different levels look at situations from different lenses (external, internal): external – longer view; internal see productivity. In many instances, the gap is not well bridged.

Table 4.2(c) below shows the detail for questions 2, 4, 12, 16, 19 and 27, which reveals a significant p-value. This was revealed when revenue was used as the independent variable. The expert panel suggested keeping these questions. The interpretation and motivation to retain the question are detailed in Table 4.2 (c).

Table 4.2(c): Chi-square on revenue as an independent variable.

Independent Variable: Revenue		
Question number	Question detail	P-value
2	1. Collaborating with other companies would improve my access to manufacturing/operational resources and infrastructure (e.g. machinery, equipment and infrastructure).	0,007
Interpretation	<R1 million band indicated a 55% band indicated a strong likelihood of collaboration improving access to manufacturing/ operating resources and infrastructure and 45% very poor likelihood. R1 million – R5 million and R5 million – R15 million bands indicated	

	a strong likelihood of collaboration improving access to manufacturing/operating resources and infrastructure. R30 million – R70 million and R70 million+ bands indicated a poor likelihood of collaboration improving access to manufacturing/ operating resources and infrastructure.
Expert panel input and motivation to retain question	The expert panel indicated the following regarding the results for this question: 1. The R30 million – R70 million and R70 million+ organisations probably have a strong asset registry and therefore collaboration will impact very low on their accessibility to manufacturing infrastructure. Marginal utility has been reached and their collaboration in manufacturing/ operations facilities would not derive much more utility. 2. Survivalist (-R30 mil) vs well established (R30 mil+) – collaborating in manufacturing/ operations activities may be seen as a survivalist strategy and R30 mil+ organisations have different problems to smaller organisations as they have moved beyond the survivalist stage of their business cycle.

Question number	Question detail	P-value
4	4. Collaborating with other companies would improve my access to logistics resources and infrastructure (e.g. collaborating to access and shared transportation, storage facilities, handling equipment …)	0,01
Interpretation	<R1 million band indicated a 72% band indicated a strong likelihood of collaboration improving access to logistics resources and infrastructure and 28% very poor likelihood. R1 million – R5 million and R5 million – R15 million bands indicated a strong likelihood of collaboration improving access to logistics resources and infrastructure. R30 million – R70 million and R70 million+ bands indicated a poor likelihood of collaboration improving access to manufacturing/ operating resources and infrastructure.	

Expert panel input and motivation to retain question	The expert panel indicated the following regarding the results for this question: 1. The R30 million – R70 million and R70 million+ organisations probably have a strong asset registry and therefore collaboration will impact very low on their accessibility to manufacturing infrastructure. Marginal utility has been reached and their collaboration in manufacturing/ operations facilities would not derive much more utility. 2. Survivalist (-R30 mil) vs well established (R30 mil+) – collaborating in logistics activities may be seen as a survivalist strategy and R30 mil+ organisations have different problems to smaller organisations as they have moved beyond the survivalist stage of their business cycle. 3. Although point number 2 above may not be necessarily true as collaboration has been demonstrated to be an effective strategy to accessing infrastructure by large organisation like P&G and Walmart. However, overall, the results are based on the interpretation of the respondent, who's experience may not be aligned to the results derived from logistics collaboration experienced by larger organisations.

Question number	Question detail	P-value
12	To what degree would collaborating in order fulfilment activities, improve your access to market (e.g. working with another company to tender for a large contract, working with another SA/ international company to address a market ...)?	0
Interpretation	0 – R70 million bands indicated a more likely to most likely to improve their access to market my collaborating R70 million+ band indicated less to least likely to improve their access to market by collaborating.	

Expert panel input and motivation to retain question	The expert panel indicated the following regarding the results for this question: 1. R70 million + business have a much stronger presence in the market and may not view collaboration as a strong leverage for accessing the market as they have a bigger market share. 2. The perception above may shift if the opportunity arises for a large SMMEs to collaborate in market share with a large business (that is not an SMME), as this may yield better market access return for them.

Question number	Question detail	P-value
16	Willing to collaborate on manufacturing/operating machinery, equipment and infrastructure.	0,08
Interpretation	<R1 million, R30 million – R70 million and R70 million+ bands indicated a low willingness to collaborate in accessing manufacturing/ operating equipment. R1 million – R5 million and 5 million – R15 million bands indicated a high willingness to collaborate in accessing manufacturing/ operating equipment.	
Expert panel input and motivation to retain question	The expert panel indicated the following regarding the results for this question: 1. Low willingness in <R1 million business may be associated with the threat to their market share if they share manufacturing/ operating infrastructure. 2. The R1 million -R5 million and R5 million – R15 million bands may be more willing to collaborate in manufacturing/ operation facilities as they have a more established market share and relationships with their clients and see collaboration as a strong leverage for scaling without investing high capital 3. R30 million -R70 million and R70 million+ organisations (as in the previous assumptions) may have a strong asset registry and may not require to collaborate in this regard.	

	4. <R1 mil – survivalist - may have not been very long in the industry; and their level of maturity has not enabled them to explore collaboration as their mentality may be around "beating the other guy", they may view horizontal organisations as competition and are therefore more inclined to keep them at arm's length. They may also not be willing to collaborate with others as there is a much higher risk to be overtaken.

Question number	Question detail	P-value
19	Willing to collaborate in R&D - testing facilities, laboratories and other research facilities; innovative idea generation think tanks	0,025
Interpretation	R30 million – R70 million and R70 million+ bands indicated a low willingness to collaborate in accessing R&D facilities. <R1 million, R1 million – R5 million and R5 million – R15 million bands indicated a high willingness to collaborate in accessing R&D facilities.	
Expert panel input and motivation to retain question	The expert panel indicated the following regarding the results for this question: 1. R70 million+ businesses may have an established infrastructure or relationships to provide this service and may not require to collaborate to access these facilities. 2. <R1 million, R1 million – R5 million and R5 million – R15 million may not have established R&D facilities and therefore perceive this as an opportunity to access state of the art R&D and testing facilities as a necessary for their development and growth. Also, they may need to be less reluctant as they do not have the capability inhouse. 3. Business phases - <R1 million organisations may be more receptive to R&D collaboration as they are still in the early development phase; whereas R70 million + organisations are further along in their development journey.	

Question number	Question detail	P-value
27	To what relative extent would the following be improved by reduced supply chain costs - [ROA]?	0,006
Interpretation	The adjusted residual analysis revealed 2.3 and -2.8 for the <R1 million and R1 million - R5 million bands for the response 'least likely' respectively, the figures were higher than a z-score of 1.96 which means that they deviated significantly from expected counts. An adjusted residual score of 4.1 was revealed on the R30 million -R70 million band which also indicates a significant deviation from the expected score.	
Expert panel input and motivation to retain question	The expert panel indicated the following regarding the results for this question: 4. The assumption may be made that <R1 million and R1 million - R5 million have low/ unstable efficiencies due to low volumes output, therefore they may still be growing towards their efficiency peak, and therefore reduced supply chain costs may not necessary improve their ROA. 5. The R30 million – R70 million business may possibly be assumed to record low impact on ROA/ efficiency as their business is probably in the process of scaling and their challenge is stabilising their efficiency rather than reducing supply chain cost.	

An Exploratory Factor Analysis (EFA) was then done to assess the statistical loading between the variables/questions. CFA (Confirmatory Factor Analysis) was not chosen, because it is not known how the different constructs affect each other; in other words, there is no path model. CFA is normally used for structural equation modelling, but the sample size in this research is too small to conduct structural equation modelling, this does not meet the minimum requirement for a CFA that follows the Structural Equation Model (SEM) (Hair, Black, Babin, & Anderson, 2014). The results from the EFA test were then assessed against the investigative model (Hair, Black, Babin, & Anderson, 2014).

The (EFA) was done by conducting a principal component analysis with a Varimax rotation (Table 4.4). To determine the number of variables to retain, Eigen values were evaluated. To

avoid over-estimation of the factors, the Eigenvalue >1.5 and loading cut-off score of 0,4 were used - see Table 4.5 (Henson & Roberts, 2006). Furthermore, reliability tests were conducted to assess the internal reliability of the factors, and any variable that dropped the Cronbach alpha value below 0.5 was deleted. In other words, all variables that increased the factor reliability to more than 0.5 if deleted, were deleted (Hinton, Brownlow, McMurray, & Cozens, 2004). Some scholars criticise the lower Cronbach alpha of 0.5; however, Hinton *et al.* (2004) showed that 0.5 is a moderate level of reliability. Thereofore, 0.5 was used as a cut off.

Once the factors were established, labels were assigned to them, based on the common themes of the variable, with emphasis on the variable with the greatest contribution to the factors. For ease of information display, the variables were assigned codes (Hair *et al*., 2014). The resulting factors and related variables are shown in Table 4.3. The indicators were used in place of the variables.

Table 4.3: Factor groupings, variables, and variable codes

Number	Factor Groupings	Variables	Variable code
	Supply chain cost and infrastructure (facilities)		
1	Reduce Supply Chain costs and improve access to Infrastructure relating to supply chain facilities (e.g. manufacturing, Logistics, R&D)	Access to manufacturing facilities	RAF1
2		Access to logistics facilities	RAF2
3		Reduced manufacturing facilitates costs	RAF3
4		Reduced R&D costs	RAF4
	Supply chain cost and infrastructure (Services)		
5	Reduced costs and access to supply chain services	Reduced procurement services costs	RAS1
6		Reduced financial services cost	RAS2
7		Access to financial services	RAS3
	Collaboration		
8	Supply chain Collaboration	Collaboration in Manufacturing facilities	SCC1
9		Collaboration in Financial services	SCC2
10		Collaboration in Logistics facilitates	SCC3
	Profitability and ROA		
11	Profitability and ROA	Reduced supply chain costs and Profitability	PR1
12		Reduced Supply chain costs and ROA	PR2
13		Access to infrastructure and ROA	PR3
	Business Sustainability - Growth		
14	Liquidity, free cash flows and growth	Access to Market	LCG1
15		Reduced Supply chain costs and Liquidity	LCG2
16		Access to infrastructure and Liquidity	LCG3
17		Free cash flows and Growth	LCG4
	Business Sustainability - Saving		
18	Liquidity, free cash flows and saving	Liquidity and free cash	LCS1
19		Free cash flows and Saving	LCS2

Table 4.4 shows that the Cronbach Alpha values for ‘supply chain cost and infrastructure (facilities)’, ‘supply chain cost and infrastructure (services)’ and ‘collaboration’ are 0.857, 0.825 and 0.764, respectively, showing high reliability and ‘profitability and ROA’. ‘Business Sustainability – Growth’ and ‘Business Sustainability – Saving’ are 0.636, 0.627 and 0.625, respectively, revealing a moderate level of reliability (Hinton, Brownlow, McMurray, & Cozens, 2004). All item-total correlations were greater than 0.3, which is the desirable score (Nunnally & Bernstein, 1994). Moreover, more than 50% of the item-total correlation scores ranged between 0.3 and 0.7, indicating high internal consistency (Carmines & Zeller, 1974). This is demonstrated in Table 4.4.

The factors’ Eigen values were greater than 1.5; an explained cumulative variable % was greater than the acceptable 60% score; and all factor loadings were above the acceptance level of 0.5. This indicates the uni-dimensionality of the 6 constructs (Hair *et al.*, 2014). The normality test was also conducted and revealed skewness and kurtosis of between +1.96 and -1.96, indicating normality (George & Mallery, 2010). (See Table 4.5.)

Table 4.4: EFA results

Number	Factor Groupings	Indicator / Variable	Variable Loading on factor	Cronbach's Alpha	Mean	Std. Deviation	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
	Supply chain cost and infrastructure (facilities)										
1	Reduce Supply Chain costs and improve access to Infrastructure relating to supply chain facilities (e.g. manufacturing, Logistics, R&D)	RAF1	0,698	0,857	3,714	1,187	10,554	10,070	0,709	0,558	0,815
2		RAF2	0,871		3,554	1,320	10,714	9,008	0,766	0,598	0,790
3		RAF3	0,750		3,339	1,180	10,929	10,140	0,703	0,526	0,817
4		RAF4	0,783		3,661	1,210	10,607	10,425	0,631	0,449	0,846
	Supply chain cost and infrastructure (Services)										
5	Reduced costs and access to supply chain services	RAS1	0,635	0,825	3,9464	0,98016	7,6964	3,961	0,551	0,313	0,878
6		RAS2	0,903		3,8929	0,96632	7,7500	3,355	0,786	0,661	0,659
7		RAS3	0,884		3,8036	1,13490	7,8393	2,937	0,731	0,634	0,710
	Collaboration										
8	Supply chain Collaboration	SCC1	0,714	0,764	3,143	1,212	6,232	5,672	0,555	0,315	0,729
9		SCC2	0,847		2,946	1,407	6,429	4,722	0,596	0,367	0,689
10		SCC3	0,752		3,286	1,275	6,089	5,028	0,646	0,418	0,628
	Profitability and ROA										
11	Profitability and ROA	PR1	0,519	0,636	3,518	1,144	6,786	4,753	0,410	0,175	0,587
12		PR2	0,698		3,375	1,273	6,929	3,958	0,499	0,249	0,461
13		PR3	0,774		3,411	1,318	6,893	4,061	0,434	0,196	0,557
	Business Sustainability - Growth										
14	Liquidity, free cash flows and growth	LCG1	0,544	0,627	3,821	1,130	10,911	6,592	0,370	0,146	0,582
15		LCG2	0,697		3,643	1,182	11,089	6,228	0,405	0,194	0,558
16		LCG3	0,758		3,268	1,198	11,464	5,853	0,471	0,236	0,507
17		LCG4	0,642		4,000	1,095	10,732	6,672	0,379	0,150	0,576
	Business Sustainability - Saving										
18	Liquidity, free cash flows and saving	LCS1	0,845	0,625	3,946	0,980	4,125	0,911	0,454	0,206	
19		LCS2	0,691		4,125	0,955	3,946	0,961	0,454	0,206	

Table 4.5: Normality test results

Number	Factor Groupings	Variable code	Eigenvalues	% of Variance	Cumulative %	Skewness		Kurtosis	
						Statistic	Std. Error	Statistic	Std. Error
	Supply chain cost and infrastructure (facilities)								
1	Reduce Supply Chain costs and improve access to Infrastructure relating to supply chain facilities (e.g. manufacturing, Logistics, R&D)	RAF1	3,166	16,661	16,661	-0,939	0,319	0,300	0,628
2		RAF2							
3		RAF3							
4		RAF4							
	Supply chain cost and infrastructure (Services)								
5	Reduced costs and access to supply chain services	RAS1	2,496	13,139	29,800	-0,875	0,319	1,182	0,628
6		RAS2							
7		RAS3							
	Collaboration								
8	Supply chain Collaboration	SCC1	2,243	11,805	41,605	-0,648	0,319	-0,403	0,628
9		SCC2							
10		SCC3							
	Profitability and ROA								
11	Profitability and ROA	PR1	1,992	10,484	52,088	-0,648	0,319	-0,126	0,628
12		PR2							
13		PR3							
	Business Sustainability - Growth								
14	Liquidity, free cash flows and growth	LCG1	1,928	10,146	62,234	-0,707	0,319	0,589	0,628
15		LCG2							
16		LCG3							
17		LCG4							
	Business Sustainability - Saving								
18	Liquidity, free cash flows and saving	LCS1	1,746	9,189	71,423	-0,798	0,319	0,561	0,628
19		LCS2							

4.2 Multiple regression analysis

The multiple regression analysis results are shown in Table 4.6. The model shows an R-squared value of 0.957 and an adjusted R-square value of 0.951. The ANOVA sum of squares is 15.149. The analysis also revealed an F change value of 88.589 and a significant p-value, which indicates that the constructs are statistically significant (Hair *et al*., 2014).

The model was also tested for collinearity, assessing both tolerance and variance of inflation (VIF), which scored low. All VIF values were under 10, indicating a lack of collinearity (Siriram, 2018).

Table 4.6: Multiple regression analysis

Dependent	Independent	VIF	Dependent	Independent	VIF
Profitability and ROA	Supply chain costs and access (services)	1,401	Supply chain costs and access (facilities)	Collaboration	1,160
	Collaboration	1,240		Profitability and ROA	1,514
	Supply chain costs and access (facilities)	1,411		Supply chain costs and access (services)	1,276
	Business Sustainability - Growth	1,169		Business Sustainability - Growth	1,498
	Business Sustainability - Saving	1,214		Business Sustainability - Saving	1,282
Supply chain costs and access (services)	Profitability and ROA	1,661	Business Sustainability - Growth	Supply chain costs and access (facilities)	1,568
	Collaboration	1,231		Collaboration	1,213
	Supply chain costs and access (facilities)	1,410		Profitability and ROA	1,311
	Business Sustainability - Growth	1,494		Supply chain costs and access (services)	1,414
	Business Sustainability - Saving	1,134		Business Sustainability - Saving	1,285
Collaboration	Profitability and ROA	1,673	Business Sustainability - Saving	Business Sustainability - Growth	1,499
	Supply chain costs and access (services)	1,401		Supply chain costs and access (facilities)	1,566
	Supply chain costs and access (facilities)	1,460		Supply chain costs and access (services)	1,242
	Business Sustainability - Growth	1,459		Profitability and ROA	1,590
	Business Sustainability - Saving	1,279		Supply chain costs and access (services)	1,253

Table 4.7: Hypotheses tests results and panel discussion.

	Research Results			Expert Panel		
Hypotheses	**Fail to reject**	**Reject**	**Significance P-value**	**Accept**	**Reject**	**Panel Discussion**
H1	√		0,386 p<0,01	√		The research results and expert panel showed no discrepancy regarding the link between collaboration and supply chain costs and access to infrastructure in supply chain facilities. The expert panel felt that H1 is a stronger link than H2 because H1 is more capital intense and asset based that H2 which may have introduced a small bias towards the facilities construct
H2	√		0,299 p<0,05	√		The research results and expert panel showed no discrepancy regarding the link between collaboration and supply chain costs and access to infrastructure in supply chain facilities. The expert panel felt that H2 is a weaker link than H1 because H2 is more relationship based which may make the services construct less relatable to supply chain costs and infrastructure, (which may be seen as more transactional) but more to service delivery which may be seen as more relational. The panel made a recommendation for further studies to include 'improved service deliver' as an out come of collaboration. Example of improved service delivery may include being prioritised by customers and suppliers when certain decisions are made, i.e. who to prioritise in payments, who to prioritise in material supply.
H3	√		0,430 p<0,01	√		The research results and expert panel showed no discrepancy regarding the link between collaboration and supply chain costs and access to infrastructure in supply chain facilities. The expert panel felt that similarly to the observation made on H1 and H2, H3 indicates a strong link between supply chain costs and access to infrastructure, and profitability and ROA. This is because a direct and simple parallel can be made between a reduction in costs and profitability, as well as between access to and improved utilisation or infrastructure and ROA.
H4		√	0,173 p<0,05	√		The expert panel felt that (as opposed to the research results) a link could be made in support of H4 as the maturity of the financial resource is a strong input to profitability, and if procurement is responsible for managing the collaborative infrastructure relationship, a direct link may be made between procurement and ROA.
H5	√		0,305 p<0,05	√		The research results and expert panel showed no discrepancy regarding the link between profitability and ROA and, business sustainability - saving for unfavourable times . A distinction was made between H5 and H6 in that profitability and ROA may produce less of a willingness to support growth than saving for unfavourable time. The panel indicated that this may be due to improved profitability and ROA being outcomes of cost management, pricing, efficiency as well as an increase in sales which necessitates re-investment for growth.
H6	√		0,545 p<0,01	√		The research results and expert panel showed no discrepancy regarding the link between profitability and ROA and, business sustainability - reinvestment for growth. A distinction was made between H5 and H6 in that profitability and ROA may produce more of an willingness to support growth than saving for unfavourable time.
H7		√	0,231 p<0,05		√	The research results and expert panel showed no discrepancy regarding the link between collaboration and supply chain costs and access to infrastructure in supply chain facilities. The expert panel felt that a link could be made for supply chain costs and infrastructure (facilities) and liquidity but that could not be directly and simply made for saving for unfavourable times.
H8	√		0,333 p<0,05	√		The research results and expert panel showed no discrepancy regarding the link between supply chain costs and access to infrastructure in supply chain facilities and, business sustainability - reinvestment for growth. The expert panel felt that similarly to profitability and ROA, a direct and simple parallel can be made between a reduction in costs and access to and improved utilisation of infrastructure and business sustainability - re-investment for growth.
H9	√		0,400 p<0,01	√		The research results and expert panel showed no discrepancy regarding the link between supply chain costs and access to infrastructure in supply chain services. The expert panel felt that a direct link may be made between supply chain costs and access to infrastructure (services) and liquidity and saving for unfavourable times. This may be due to financial and procurement functions being more related to financial security and being able to pay suppliers in a sustainable manner than the facilities functions which are more related to ROA (efficiency).
H10		√	0,201 p<0,05		√	The research results and expert panel showed no discrepancy regarding the link between collaboration and supply chain costs and access to infrastructure in supply chain services. The expert panel felt that a direct and simple link could not necessarily be made between supply chain costs and access to infrastructure (services) and business sustainability - re-investment for growth. On the other hand, the panel felt that if 'reinvestment' for growth was interpreted (by the respondents) as reinvestment into further collaboration then the link could possibly be made as the respondents (depending on their maturity and age) may have felt that it would be better to continue with the collaboration rather than to invest in their own infrastructure.
H11		√		√		The expert panel felt that (as opposed to the research results) a link could be directly and simply made between business sustainability - saving for unfavourable periods, and seeking further collaboration opportunities. They further recommended that for further research, other constructs should be explored to establish the linage.
H12	√		0,269 p<0,05	√		The research results and expert panel showed no discrepancy regarding the link between business sustainability - re-investment for growth and seeking further collaboration opportunities. The expert panel felt that H12 is a direct and simple link to make.

4.3 Discussion of results

A new framework was derived from the data analysis, indicating a new link that was revealed by the research results. The additional linkage is between 'supply chain costs and infrastructure (facilities)' and 'supply chain costs and infrastructure (service)', as demonstrated in Figure 4.1.

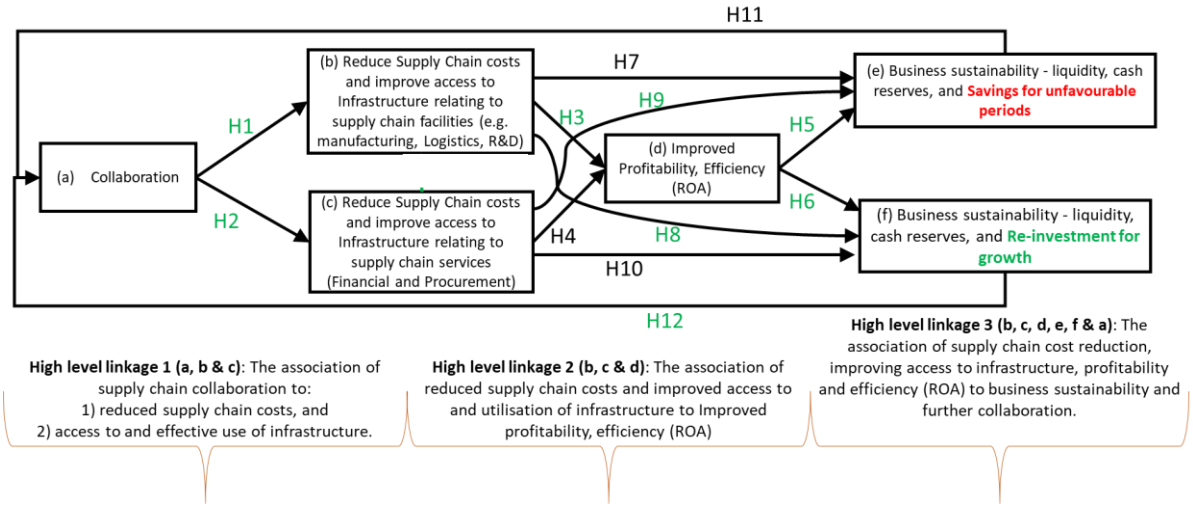

Figure 4.1: Revised investigative framework

For ease of reading, in the rest of this section the letters a, b, c, d, e, f will be used respectively to denote the relevant blocks in the proposed investigational framework.

4.4 Summary of hypothesis and Pearson's correlation analysis

Of the 12 hypotheses proposed, 8 were supported by the research results, and 10 were supported by the expert panel (Table 4.7).

Table 4.8: Pearson correlation results.

Correlations							
		Collaboration	Supply chain cost and infrastructure (Services)	Supply chain cost and infrastructure (facilities)	Profitability and ROA	Business Sustainability - Saving	Business Sustainability - Growth
Collaboration	Pearson Correlation	1	.299*	.386**	0,176	0,197	.269*
	Sig. (2-tailed)		0,025	0,003	0,195	0,146	0,045
Supply chain cost and infrastructure (Services)	Pearson Correlation	.299*	1	.421**	0,173	.400**	0,201
	Sig. (2-tailed)	0,025		0,001	0,202	0,002	0,137
Supply chain cost and infrastructure (facilities)	Pearson Correlation	.386**	.421**	1	.430**	0,231	.333*
	Sig. (2-tailed)	0,003	0,001		0,001	0,087	0,012
Profitability and ROA	Pearson Correlation	0,176	0,173	.430**	1	.305*	.545**
	Sig. (2-tailed)	0,195	0,202	0,001		0,022	0,000
Business Sustainability - Saving	Pearson Correlation	0,197	.400**	0,231	.305*	1	0,191
	Sig. (2-tailed)	0,146	0,002	0,087	0,022		0,160
Business Sustainability - Growth	Pearson Correlation	.269*	0,201	.333*	.545**	0,191	1
	Sig. (2-tailed)	0,045	0,137	0,012	0,000	0,160	
*. Correlation is significant at the 0.05 level (2-tailed).							
**. Correlation is significant at the 0.01 level (2-tailed).							

4.4.1. H1 and H2: (a) Collaboration leads to (b & c) reduced supply chain costs and improved access to and utilisation of infrastructure (facilities) and (services)

At a construct level: Pearson's correlation revealed a significant positive correlation between collaboration and supply chain cost and infrastructure (facilities), as well as between collaboration and supply chain cost and infrastructure (services). The findings are in line with the assertion of Pomponi *et al.*, (2013), who stated that operational collaboration includes sharing data, information and equipment; their objectives are cost reduction, quicker response, a purchasing and tendering group, joint distribution and flow consolidation, customer service and improved productivity (productive utilisation of infrastructure).

4.4.2 H3 and H4: (b) and (c) lead to (d)

At a construct level: Pearson's correlation revealed: a significant correlation between supply chain cost and infrastructure (facilities) and profitability and ROA; but not between supply chain cost and infrastructure (services) and profitability and ROA.

The significant correlation finding is supported by the literature-based deduction made in Chapter 2, in line with the assertions of Ross *et al*. (2008), Tulsian (2014), Pomponi *et al.* (2013), and a P&G and Walmart case study, which indicated the importance of reducing costs and improving asset utilisation to a business' profitability and ROA. Ross *et al*. (2008), Tulsian (2014), Pomponi *et al.*, (2013), and a P&G and Walmart case study furthermore demonstrate that a consistent increase in profitability (increasing the profit to revenue ratio) and improvement in asset use efficiency (increasing the revenue to assets ratio, also known as ROA) work towards sustained profitability, which provides free cash flow (cash that the organisation is free to distribute to creditors and shareholders).

Both the literature and expert panel indicated a narrative contrary to the research results. The expert panel indicated that this may be due to profitability and ROA being perceived as more transactional concepts compared to services, which are more relational. To this end, the expert panel recommended that the concept of service delivery be considered for further studies as well.

4.4.3 H5, H7, H9: (b), (c) and (d) lead to (e);

At a factor level: Pearson's correlation revealed a significant correlation between (d) profitability and ROA and (e) business sustainability - liquidity, cash reserves and saving (H5), as well as between (c) supply chain cost and infrastructure (services) and (e) business sustainability – liquidity, cash reserves and saving for unfavourable periods (H9).

This illustrates that reduced supply chain costs, improved profitability, improved access to and utilisation of infrastructure and improved efficiency/ ROA through collaboration leads to an increase in liquidity, access cash and cash equivalent reserves (to be used in emergency cases and during market or economic downturn periods) and free cash flow (the cash that the organisation is free to distribute to re-investments or shareholders or used to settle debt) (Ross *et al*., 2008). It also supports Summer (2018), who stresses the importance of saving for unforeseeable business challenges.

However, Pearson's correlation did reveal a significant correlation between (b) supply chain cost and infrastructure (facilities) and (e) business sustainability – liquidity, cash reserves and

saving for unfavourable periods (H7). This means that the research results indicate a rejection of H7, which suggests that (b) a reduction in supply chain costs and improvement in access to infrastructure relating to supply chain facilities (e.g. manufacturing, logistics, R&D) leads to (e) business sustainability - liquidity, cash reserves, and Savings for unfavourable periods. This is in line with the assertion of Summers (2018), i.e.: "Every small business and every small business owner should be looking to save, especially given an uncertain global economic outlook and the challenges of accessing financing". This suggests that the smaller the business, the more relevant savings are.

4.4.4 H6, H8, H10: (b), (c) and (d) lead to (f);

At a factor level: Pearson's correlation revealed a significant correlation between (d) profitability and ROA and (f) business sustainability - liquidity, cash reserves, and re-investment for growth (H6), as well as between (c) supply chain cost and infrastructure (facilities) and (f) business sustainability - liquidity, cash reserves, and re-investment for growth (H8).

The findings are in line with Summer (2018), who illustrates the importance of saving cash for unforeseeable business challenges, in order to ensure business sustainability. The findings are also in line with Liedholm *et al.* (2002), who demonstrated the importance of growth for the survival of a business.

However, Pearson's correlation did reveal a significant correlation between (c) supply chain cost and infrastructure (services) and (f) business sustainability - liquidity, cash reserves, and re-investment for growth (H10). This means that the research results indicated a rejection of H7, which suggests that (b) a reduction in supply chain costs and improvement in access to Infrastructure relating to supply chain facilities (e.g. manufacturing, logistics, R&D) leads to (e) business sustainability - liquidity, cash reserves, and savings for unfavourable periods.

The expert panel indicated that a reduction in supply chain costs and improved access to and utilisation of services infrastructure leading to re-investment for growth may be more relevant to a business with revenue above R30 million, but in general, a strong link is not directly and simply inferred.

4.4.5 H11 and H12: (e) and (f) lead to (a)

At a factor level: Pearson's correlation revealed a significant correlation between (f) business sustainability - liquidity, cash reserves, and re-investment for growth (H8) and (a) collaboration (H12). This is in line with the inference made in the literature review that if the organisation gains business sustainability through liquidity, accessing cash and re-investing for growth through collaboration, it would be inclined to seek further collaborative opportunities.

However, Pearson's correlation did not reveal a significant correlation between (e) business sustainability - liquidity, cash reserves, and savings for unfavourable periods leads to collaboration. (H11). This is contrary to the inference made in the literature review that if the organisation gains business sustainability through liquidity, accessing cash and re-investing for growth through collaboration, it would be inclined to seek further collaborative opportunities. The expert panel recommended that further research should be done on other constructs to establish the linkage. Having discussed the results and summary of hypotheses, conclusions, limitations and further research avenues are discussed next.

Chapter 5

5 CONCLUSIONS

5.1 Conclusions

This study looked at the utilisation of collaborative supply chains models to improve business sustainability. The study revealed 8 out of 12 linkages to be statistically significant, as well an additional linkage, linking (c) Reduce supply chain costs and improve access to Infrastructure relating to supply chain services (Financial and Procurement) to (b) reduce supply chain costs and improve access to Infrastructure relating to supply chain facilities (e.g. manufacturing, logistics, R&D, namely:

1. H1: collaboration and supply chain cost and infrastructure (facilities). This linkage is statistically significant, which indicates that collaboration in supply chain activities has a positive impact on the reduction of supply chain collaboration and improvement of access to and utilisation of infrastructure relating to supply chain facilities. This confirms the assertion of Pomponi *et al.,* (2013), who state that: operational collaboration includes sharing data, information and equipment; and their objectives are cost reduction, quicker response, purchasing and tendering group, joint distribution and flow consolidation, customer service and improved productivity (productive utilisation of infrastructure).
2. H2: collaboration and supply chain cost and infrastructure (services), this linkage is statistically significant, which indicates that collaboration in supply chain activities has a positive impact on the reduction of supply chain collaboration and improvement of access to and utilisation of infrastructure relating to supply chain services. This also confirms the assertion of Pomponi *et al.,* (2013).
3. H3: Supply chain cost and infrastructure (facilities) and profitability and ROA. This linkage is statistically significant, indicating that the reduction of supply chain collaboration and improving access to and use of infrastructure relating to supply chain facilities, has a positive effect on profitability and ROA. This linkage supports the assertions of Ross *et al*. (2008), Tulsian (2014), Pomponi *et al.,* (2013), and a P&G and Walmart case study, which indicates the importance of reducing costs and improving asset utilisation to a business' profitability and ROA.
4. H5: Profitability and ROA and Business Sustainability – Saving. This linkage is statistically significant, indicating that improved profitability and ROA has a positive effect

on business sustainability relating to liquidity, cash reserves, and savings for unfavourable periods. This linkage supports the assertion of Summer (2018), who highlights the importance of SMMEs saving for unforeseeable business challenges.

5. H6: Profitability and ROA and Business Sustainability – Growth. This linkage is statistically significant, indicating that improved profitability and ROA has a positive effect on business sustainability relating to liquidity, cash reserves, and re-investment for growth. This is supports Nichter & Goldmark (2009) who propose the expansion of profitable opportunities and the enhancement of an orgnaisation's capability to harness opporttunities as key levers for business growth.
6. H8: Supply chain cost and infrastructure (facilities) and Business Sustainability – Growth. This linkage is statistically significant, indicating that the reduction of supply chain collaboration and improvement of access to and utilisation of infrastructure relating to supply chain facilities has a positive effect on business sustainability relating to liquidity, cash reserves, and re-investment for growth. This supports the assertion of Nichter & Goldmark (2009) who link horizontal collaboration, access to market, improved negotiating position with suppliers and customers, sharing of equipment and machinery and joint development of products to the facilitation of business growth in SMMEs.
7. H9: Supply chain cost and infrastructure (services) and Business Sustainability – Saving. This linkage is statistically significant, indicating that reduction of supply chain collaboration and improvement of access to and utilisation of infrastructure relating to supply chain services has a positive effect on business sustainability relating to liquidity, cash reserves, and savings for unfavourable periods. This is line with the guidelines provided by Binion (1998), where members of a collaborative purchasing group (such as a cooperative) are accountable to strict cooperative structures that seek to ensure members' continued liquidity and solvency and thereby ensuring the collective liquidity and solvency. This fosters disciplined purchasing and cash preservation, as the member is accountable to the broader team.
8. H12: Business Sustainability – Growth and collaboration. This linkage is statistically significant, indicating that business sustainability relating to liquidity, cash reserves, and re-investment for growth has a positive effect on the willingness to seek further collaboration opportunities. This linkage confirms the initial hypothesis.

The central research question was:

Can an investigative framework be developed linking collaborative supply chains to SMMEs business sustainability?

The framework and linkages established in the research clearly indicate a link between collaborative supply chain models to SMMEs business sustainability. This is demonstrated by the literature review, the investigational framework, the research results, and the expert panel. Therefore, it may be concluded that a link has been supply chain collaboration and SMMEs business sustainability is statistically significant. It is also recognised that more research is required to assess the factors that link supply chain collaboration to business sustainability.

The literature provides answers to the research sub-questions:

1. How can collaborative supply chain models be utilised to reduce supply chain costs and improve accessibility to and utilisation of infrastructure?
2. What is the link between reduced supply chain costs, and improved accessibility to and utilisation of infrastructure and SMMEs profitability and efficiency (ROA)?
3. What is the link between profitability and efficiency, and liquidity and access to free cash flows, as well as the inclination to build cash reserves?
4. What is the link between the ability to access free cash flows and build cash reserves, and business sustainability (the ability to save for unfavourable periods or re-investment for business growth)?
5. What is the link between business suitability (the ability to save for unfavourable periods or re-investment for business growth) improved through collaborative supply chain and the propensity to seek further collaboration opportunities?

All three objectives set out for the research were achieved, as indicated in Table 5.1.

Table 5.1: Research objectives

The objective of this research is:	**Achieved?**
a) To develop an investigational framework linking supply chain collaboration to the sustainability of SMMEs in South Africa (Figure 1.1).	√
b) To explore the use of collaborative supply chains models in South African SMMEs.	√
c) To test the investigative framework using known statistical analysis.	√

5.2 Contributions and implications of study

The study has both theoretical and practical contributions and application to the SMMEs and industry.

Theoretical, the study explores primary failures of South African SMMEs and provides insights into how they may be addressed. In addition, the study provides a framework that details relationships between supply chain methodologies and business sustainability. The study also highlights the significance of innovative solutions and technology in addressing 21st century supply chain and business problems. This research contributes to the body of knowledge that seeks to understand the relationship between collaboration and business sustainability. The study demonstrates the importance of collective supply chain solutions in combating the severity of South African SMMEs failure rate. This research is intended to help entrepreneurs, business leaders, cooperative bodies, and government to make informed decision in ensuring SMMEs business sustainability.

Practically the study forms basis for a practical implementation of collaborative supply chain models in SMMEs. It also provides a framework that details the links between action that can be taken in modelling the supply chain and the impact that such models is expected to have on the performance of the business as well as its sustainability. Finally, the research provides examples of how collaborative models have been historically applied (particularly in large corporations) and how this may be applied to south African SMMEs.

Although the research was conducted on South African SMMEs, it was based on sound and tested supply chain principles and therefore may be explored in other countries as well particularly in Africa. Furthermore, the study shows the needs of appropriate supply chain strategies of different size SMMEs; e.g. the degree to which different size SMMEs are willing to collaborate on R&D activities (SMMEs with the turnover of more than R30 million are less willing to collaborate than smaller ones). This research is a step towards ensuring an appropriate response to the 21st century's ever changing supply chain demands as well as SMMEs business sustainability.

5.3 Assumptions, limitations, and further research

In conducting this research, the following primary assumptions were made, that:

a) the participants would answer the questionnaires truthfully and the best of their knowledge, and
b) the literature review, research design and methodology as well as the three dimensions representation used in the questionnaire (position in company, industry, and company revenue) are sufficient to draw a conclusive representation of the broader South African SMME population.

While this research focused on the utilisation of collaboration to improve SMME business sustainability at a national level, it was not the scope of this research to drill down to the geographical and economic drivers of each sector. It is suggested that a more finite view by sector and by geography would deliver further understanding of the impact of collaboration on business sustainability. Furthermore, the study did not focus on the effort of collaboration in comparison to the benefits that may be gained, further understanding of effort versus benefit analysis would provide insight into the feasibility of supply chain collaboration adoption. Furthermore, although it was not the focus of this research, vertical collaboration may greatly enhance horizontal collaboration and in areas such as demonstrating guaranteed flow or orders an information through the collaborative value chain (Nichter & Goldmark, 2009).

Based on the literature review, discoveries made from the research and the views presented by the expert panel the following further research may conducted:

1. The impact of collaboration on customer satisfaction and customer service – literature and the expert panel indicated a need for further investigation on how collaboration may impact on customer satisfaction and customer service, as these are key drivers of sustained relationships with customers, business performance and growth (Fawcett, Magnan, & Mccarter, 2008).
2. The segmentation of SMMEs by geographic and sectoral segment, and the influence of government in fostering collaboration. Nichter & Goldmark (2009) asset the possibility of institutionalising collaboration by forming structures such as cooperatives, consortia, and producer groups to foster collaboration at a mass level, this may be a government drive or an industry drive. They further indicate geography and sectoral bounds as important consideration to make in stabling collaborative efforts.
3. The focus of SMMEs depending on their maturity, objectives (e.g. grow or survive, or survive then grow) and size (i.e. saving or growth); both expert panel and literature indicate

the need for further research to be conducted on what the focus of the SMME should be depending on their objectives and maturity cycle. Nichter & Goldmark (2009) make an example of the objectives, maturity and focus dimensions of growing SMMEs relating to the growth rate of a 'young' (0 – 3 years) SMME as opposed to an older one, where a younger SMMEs generally experience faster growth than older ones. They further assert that young firms generally start off with high growth and low productivity, but as they reach their optimal size of operation, growth slows and productivity increases (Nichter & Goldmark, 2009). However, as an organisation ages, it may start to lose productivity as it may fail to invest in emerging technology leaving them with outdated equipment; therefore, it may be beneficial to further unpack they type of collaboration to prioritise at different ages of the organisation.

4. E-commerce and transparency, the e-commerce related construct was not retained after the t-test was done for this research. Pomponi *et al*., (2013), Naesens *et al*. (2009), Wilhelm (2011) and Schulz & Blecken (2011), Bowersox *et al*. (2013) and Nanehkaran (2013) indicate the importance of transparency and e-commerce in enabling and fostering collaboration. Although this research does not provide a conclusive view on the impact of e-commerce and transparency in the context of South African SMMEs and their willingness to collaborate, further research in needed in exploring the impact of e-commerce and transparency in enabling and fostering coloration.

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Appendix A: Questionnaire

Collaboration and Business Sustainability

This questionnaire forms part of a Wits University Msc research paper that looks into the influence of collaborative business models on business sustainability across multiple industries. The questionnaire is completely anonymous and is NOT traceable to your company.

Collaboration in this questionnaire is defined as - strategically working with another company to - supply to a demand, share resources, costs, ideas, accounts and e.t.c. in order to achieve greater success than when acting in isolation.

The questionnaire should take 10 - 12 minutes to complete.

Thank you for your participation.
* Required

Company profile

1. Which Industry does your business operates in *

Mark only one oval.

- ◯ Manufacturing (including fabrications and repairs and maintenance of equipment)
- ◯ Transportation and Logistics
- ◯ Warehousing and storage
- ◯ Construction
- ◯ Wholesale Distribution
- ◯ General Distribution
- ◯ Utilities
- ◯ Retail and Supplies
- ◯ Motor Vehicles
- ◯ Lodging, Catering and Restaurants
- ◯ Travel and Tourism
- ◯ Business/Management Services
- ◯ Other Service Provider

2. If Other, please specify your industry below.

_____

3. Please select your position in the organisation *

Mark only one oval.

- ◯ Executive
- ◯ Manager
- ◯ Foreman/Supervisor
- ◯ Technician
- ◯ Operator
- ◯ Sales

4. What is your annual Revenue?

Mark only one oval.

- ◯ Less than R 1mil
- ◯ R 1mil - R 5mil
- ◯ R 5mil - R 15mil
- ◯ R 15 mil - R 30mil
- ◯ R 30mil - R 70 mil
- ◯ R 70mil +

Collaboration in ACCESSING resources and Infrastructure

To what degree would collaborations with other companies IMPROVE your ACCESS to the following resources and infrastructure?
(please rate each on a scale of 1 – 5; 1 = Least Likely; 5 = Most Likely):

5. Collaborating with other companies would improve my access to PROCUREMENT resources and infrastructure (e.g. buying expertise, procurement systems, tracking and monitoring systems like excel/software-based model that reconciles orders and optimises procurement activities) *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

6. Collaborating with other companies would improve my access to MANUFACTURING/OPERATIONAL resources and infrastructure (e.g. machinery, equipment and infrastructure) *

Mark only one oval.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ N/A

7. Collaborating with other companies would improve my access to FINANCIAL resources and infrastructure (e.g. collaborating to access and/or shared book keepers and accountants; fund managers, fund obtainment...) *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

8. Collaborating with other companies would improve my access to LOGISTICS resources and infrastructure (e.g. collaborating to access and shared transportation, storage facilities, handling equipment...) *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

9. Collaborating with other companies would improve my access to R&D resources and infrastructure (e.g. collaborating to access and share testing facilities, laboratories and other research facilities; innovative idea generation think tanks...) *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

10. Collaborating with other companies would improve my access to MARKETING resources and infrastructure (e.g. collaborating to access and share marketing expertise like advertising, collective campaigning, collaborating in campaigning events...) *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

Collaboration and reduced supply chain costs

To what degree would collaborating in the following supply chain activities lead to REDUCED SUPPLY CHAIN COSTS in your organisation? (please rate each on a scale of 1 – 5; 1 = Least Likely; 5 = Most Likely):

11. Collaboration in PROCUREMENT activities (e.g. discounts obtained through economies of scale) would lead to reduced supply chain costs *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

12. Collaboration in MANUFACTURING/OPERATING activities (e.g. shared machinery, equipment and infrastructure; contract manufacturing facilities) would lead to reduced costs *

Mark only one oval.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ N/A

13. Collaborating in FINANCIAL services (e.g. sharing of expertise and financial services like book keepers, accountants, fund managers, fund obtainment…) would lead to reduced costs *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

14. Collaboration in R&D activities (e.g. expertise and infrastructure like testing facilities, laboratories and other research facilities; innovative idea generation think tanks) would lead to reduced costs *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

15. Collaborating in MARKETING activities (e.g. expertise and infrastructure like advertising, collective campaigning, collaborating in campaigning events...) would lead to reduced costs *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

16. To what degree would collaborating in ORDER FULFILLMENT activities, improve your access to market (e.g. WORKING WITH ANOTHER COMPANY TO TENDER FOR A LARGE CONTRACT, WORKING WITH ANOTHER SA/INTERNATIONAL COMPANY TO ADDRESS A MARKET...)? *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

17. To what degree would you be willing to collaborate with a NON-COMPETITOR in procuring a 3rd party data analysis service and SHARING the COST of utilising the service? *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

18. To what degree would you be willing to collaborate with a COMPETITOR in procuring a 3rd party data analysis service and SHARING the COST of utilising the service? *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

Willingness to collaborate

To what degree would you be willing to collaborate in accessing the following supply chain services and facilities and sharing the cost of utilising the service and facilities?
(please rate each on a scale of 1 – 5; 1 = Least Likely; 5 = Most Likely):

19. Procurement activities *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

20. Manufacturing/Operating - machinery, equipment and infrastructure... *

Mark only one oval.

- 1
- 2
- 3
- 4
- 5
- N/A

21. Finance - shared bookkeepers and accountants *

Mark only one oval.

1	2	3	4	5

22. Logistics - transportation, storage, equipment and infrastructure *

Mark only one oval.

1	2	3	4	5

23. R&D - testing facilities, laboratories and other research facilities; innovative idea generation think tanks *

Mark only one oval.

1	2	3	4	5

24. Marketing - Marketing expertise *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

25. To what degree would governance of the collaboration determine your decision to collaborate? *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

26. To what degree would trust in the system's capability to protect your information and advance your interests influence your decision to collaborate? *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

27. To what degree would e-commerce enable effective collaboration? *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

28. To which degree would collaborating in procurement activities reduce your inventory/stock holding by sharing minimum order quantity with another organisation? *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

Profitability, efficiency, Liquidity and Cash Reserves

29. To what relative extent would the following be IMPROVED by REDUCED SUPPLY CHAIN COSTS (1 - 5 as indicated below) *

Mark only one oval per row.

	1 - Least Improved	2 - Least to moderately Improved	3 - Moderately Improved	4 - Moderately to Highest Improved	5 - Highest Improved
Liquidity	◯	◯	◯	◯	◯
Profitability	◯	◯	◯	◯	◯
Return on Assets	◯	◯	◯	◯	◯

30. To what relative extent would the following be IMPROVED by better ACCESS TO infrastructure (1 - 5 as indicated below) *

Mark only one oval per row.

	1 - Least Improved	2 - Least to moderately Improved	3 - Moderately Improved	4 - Moderately to Highest Improved	5 - Highest Improved
Liquidity	◯	◯	◯	◯	◯
Profitability	◯	◯	◯	◯	◯
Return on Assets	◯	◯	◯	◯	◯

Please rate each on a sliding scale of 1 – 5; 1 = Least Likely; 5 = Most Likely):

31. To what degree would you use savings to settle short term commitments? *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

32. To what degree would liquidity improve your ability to access funding? *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

33. To what degree would you build cash reserves to survive in unfavorable conditions if you had access to unencumbered cash? *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

Building cash reserves and financial sustainability

Building cash reserves and financial sustainability
On a scale of 1 - 4 how would you prioritise the following if you had access to unencumbered cash?

1 = High Priority; 2 = Medium Priority; 3 = Low Priority; 4 = Lowest Priority

34. (Assuming that your objective is business sustainability); If you had access to unencumbered cash, how would you prioritise the following (if you only had the following four choices) *

Mark only one oval per row.

	1 - Low Priority	2 - Low to Moderate Priority	3 - Moderate Priority	4 - Moderate to High Priority	5 - High Priority
Paying off debt	◯	◯	◯	◯	◯
Reinvestment and Growth	◯	◯	◯	◯	◯
Paying Shareholders Dividends	◯	◯	◯	◯	◯
Building Cash Reserves for Unfavorable times	◯	◯	◯	◯	◯

Collaboration and business sustainability

Collaboration and business sustainability
(please rate each on a scale of 1 – 5; 1 = Least Likely; 5 = Most Likely):

35. If you gained competitive advantage through collaboration, would that motivate you to seek more collaborative opportunities? *

Mark only one oval.

1	2	3	4	5
◯	◯	◯	◯	◯

Thank you

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